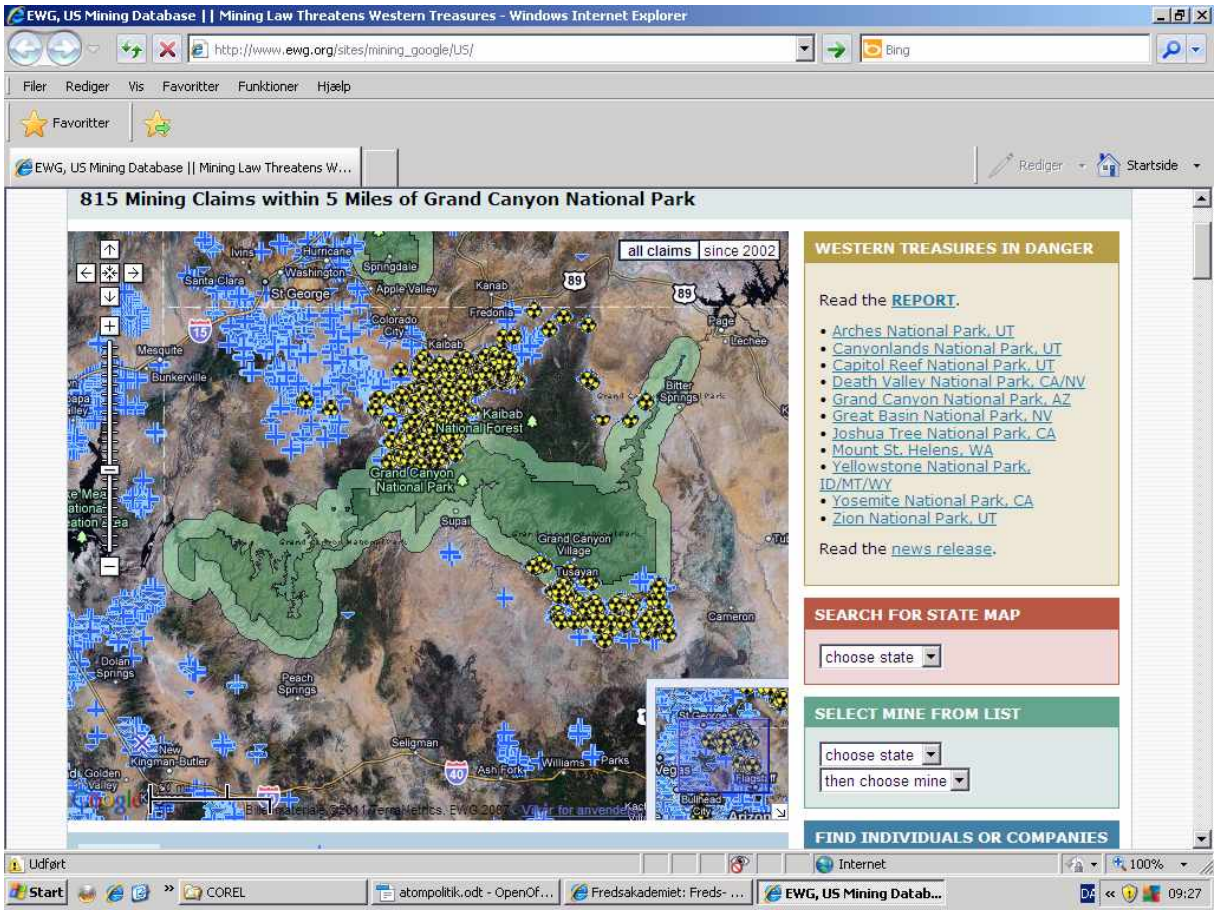
Nuclear Weapons Production in the US, 1941-2011

By Holger Terp, The Danish Peace Academy

The nuclear military-industrial complex in the US, as far as I know, has not been described in Denmark.

Nuclear policy in Denmark has since 1945 engaged in general with nuclear physics,[1] and nuclear weapons problems - such as their deployment and the different perceptions of how this policy has affected everybody's safety.[2]



But there is nobody in this country who has described the mines, where the raw materials for nuclear weapons production are, the factories that manufactured nuclear weapons, the councils which took and still make the decisions in secret, the nuclear experiments, and their human, environmental and economic costs.

1 Issaacson, Walter: **Einstein : Hans liv og univers**. Gyldendal, 2006. - 742 pp. : ill.

2 National Security Archive: **How Many and Where Were the Nukes?** What the US. Government No Longer Wants You to Know about Nuclear Weapons During the Cold War. National Security Archive Electronic Briefing Book No. 197, 2006.

National Security Archive:**US. Strategic Nuclear Policy**: A Video History, 1945-2004 : Sandia Labs Historical Video Documents History of US. Strategic Nuclear Policy, 2011.

Air Force Special Film Project 416, "**Power of Decision**". Produced by Air Photographic and Charting Service. Circa 1958, For Official Use Only. Source: Digital copy prepared by National Archives and Records Administration Motion Pictures Unit, Record Group 342, Department of the Air Force.

Wittner, Lawrence S.: **The Struggle Against the Bomb**, I-III. Stanford University Press, 1993, 1997 & 2003.

I got the idea for the project about a year ago and there is much yet to be done.

The following is a taste of a very extensive and complex history that is very likely to be commented on and debated. There is additional documentation on this subject in the Peace Academy. Virtually all the documentation, source material and references are naturally in English. The exception here is the American journalist and author Walter Isaacsons's brick piece Einstein biography, showing the nuclear political development up to 1955 - as seen with Einstein's glasses.

The Ministry of Defense and the Department of Energy is responsible for the development of nuclear weapons in US. out of a desire for a partial civilian control of the development and the policy. It all began with the Office of Scientific Research and Development (OSRD)[3], and the Manhattan Project during World War II[4], virtually the sole story in this context that is described in Danish because of the participation of the nuclear physicist Niels Bohr[5].

During the Cold War there were two main directions in the development of nuclear weapons.[6] The first was to give them larger and larger explosive force, more bang for their buck - in the hope that a nuclear war between the superpowers would never materialize and, secondly, to make these weapons so tiny that they could be used on the battlefield - in the hope that the damage could be limited to an acceptable level. The

3 National Archives: **Records of the Office of Scientific Research and Development [OSRD]** (Record Group 227) 1939-50 (Bulk 1939-47).
- http://www.archives.gov/research/guide-fed-records/groups/227.html
Stewart, Irvin: **Organizing scientific research for war; the administrative history of the Office of Scientific Research and Development** (1948) - 388 pp.
- http://www.archive.org/details/organizingscient00stew
4 The National Historic Landmarks Program: **World War II and the American Home Front**. National Park Service, 2007. - 198 pp. - http://www.nps.gov/nhl/themes/HomefrontStudy.pdf
5 **Henningsen, Svend: Atompolitik 1939-1945**. *In*:: Festskrift udgivet af Københavns Universitet, 1971 pp. 7-254.
Ashley W. Oughterson, Henry L. Barnett,George V. LeRoy, Jack D. Rosenbaum, Averill A. Liebow, B. Aubrey Schneider, and E. Cuylar Hammond: **Medical Effects of Atomic Bombs** : The Report of the Joint Commission for the Investigation of the Effects of the Atomic Bomb in Japan; Volume VI. / Army Institute of Pathology: published (July 6, 1951).
Bohr, Niels: **Essays 1958-62 on Atomic Physics and Human Knowledge**. - New York : Interscience Publishers, 1963. - 122 pp. - http://www.archive.org/details/essays19581962at010046mbp
Smyth, Henry De Wolf: **Atomic energy for military purposes; the official report on the development of the atomic bomb under the auspices of the United States Government**, 1940-1945. - Princeton, Princeton University Press, 1945. - 298 pp.
6 **Beyond the United Kingdom: Trends in the Other Nuclear Armed States** / Ian Kearns
Discussion Paper 1 of the BASIC Trident Commission An independent, cross-party commission to examine UK nuclear weapons policy. British American Security Information Council (BASIC) 2011. - 40 pp.
Nuclear Weapon Archive : **Complete List of All US. Nuclear Weapons**, 2006.

latter way of thinking permeates the current American thinking on modernization of the country's nuclear weapons, such as is expressed through the Doctrine for Joint Nuclear Operations from 2005 onwards[7], for as Ambassador Linton F. Brooks said it 2005: "Older nuclear weapons systems do not have "new precision-guided technologies as our conventional systems have the full benefit of." He added, older nuclear weapons "[are] not geared for small attacks or flexibility in command, control and attacks."[8]

In the latter part of the Cold War - and later - a number of international climate scientists made the plausible claim that even a limited nuclear war would cause a global ultimate environmental[9] destruction.[10]

The military structure

Overall, the military defense consists of, led by the president and the Joint Chiefs of Staff[11] the following departments:

- Army[12]
- Navy[13]

7 Kristensen, Hans M.: **Global Strike** : A Chronology of the Pentagon's New Offensive Strike Plan. - Washington DC : Federation of American Scientists, 2006. - 250 pp.
USSTRATCOM: **Doctrine for Joint Nuclear Operations**. 2005. - 96 pp.
Nuclear Brief February 2, 2006: **Pentagon Cancels Controversial Nuclear Doctrine**
'The Pentagon has formally cancelled a controversial revision of Doctrine for Joint Nuclear Operations after the doctrine was exposed last year in an article in Arms Control Today in September 2005 and the Washington Post. The revised draft included for the first time descriptions of preemptive use of US nuclear weapons, and caused the Senate Armed Services Committee to ask for a briefing, and 16 lawmakers to protest to President Bush'.
CRS: **U.S. Nuclear Weapons: Changes in Policy and Force Structure**. / Amy F. Woolf. 2002. - 49 pp.
8 Gilmore, Gerry J.: **QDR to Address Transformation of US. Nuclear Arsenal**. American Forces Press Service, April 5, 2005.
Building Budgetary Transparency and Accountability for the US Nuclear Weapons Program / Stephen I. Schwartz. James Martin Center for Nonproliferation Studies September 8, 2011. - 12 pp.
9 **Linking Legacies: Connecting the Cold War Nuclear Weapons Production Processes to Their Environmental Consequences**. The U.S. Department of Energy. Office of Environmental Management, 1997. - 229 pp.
10 The Encyclopedia of Earth, **Nuclear Winter** Lead Author: Alan Robock. 2008, Cutler J. Cleveland, Ed. (Washington, D.C.: Environmental Information Coalition, National Council for Science and the Environment), herunder New studies of climatic consequences of regional nuclear conflict from Alan Robock, including links to new studies published in 2007.
U.S. Congress, Office of Technology Assessment: **Technologies Underlying Weapons of Mass Destruction**, OTA-BP-ISC-115 (Washington, DC: U.S. Government Printing Office, December 1993). - 265 pp. - http://www.fas.org/ota/reports/9344.pdf
11 Sample histories: Schnabel, James F. **History of the Joint Chiefs of Staff. The Joint Chiefs of Staff and National Policy 1945–1947. Volume I**. Washington, D.C.: Joint History Office, The Joint Staff, 1996.
The Joint Chiefs of Staff and National Policy: History of the Joint Chiefs of Staff Volume VIII, 1961-1964 Willard S. Poole. Office of Joint History. Office of the Chairman of the Joint Chiefs of Staff. Washington, DC, 2011. - 380 pp.
12 **Summary Report on the U.S. Army Environmental Center's Native American Graves Protection and Repatriation Act Compliance Project. Section 6 Summary Investigations**, Prepared for the U.S. Army Environmental Center, Environmental Compliance Division, Aberdeen Proving Ground, Maryland / U.S. Army Engineer District, St. Louis. Mandatory Center of Expertise for the Curation and Management of Archaeological Collections. U.S. Army NAGPRA Compliance Project. 1996. 179 pp. ; Technical Report No. 98) - http://aec.army.mil/usaec/cultural/section6.pdf
13 Department of the Navy **Fiscal Year (FY) 2011 Budget Estimates: Justification of Estimates**. February

- Air Force[14]
- Marine Corps
- National Guard
- Federal Civil Defense Administration, now the US Department of Homeland Security
- The Coast Guard

and the US. Nuclear Security and Enterprise, US. Special Operations Forces as well as various civilian and military intelligence agencies. Only the navy and the air force[15] is in possession of conventional nuclear weapons.[16]

After the Vietnam War, conscription was abolished in the United States.

The president has, in cooperation with Congress, the right to declare war[17] - and, it is believed, also the right to decide the use of nuclear weapons. For good reasons, no proposals on this is in the US. Constitution and the literature on this topic are for policy reasons, very sparse or masked. Also the Defense Production Act of 1950 contains three major sections. The first authorizes the President to require businesses to sign contracts or fulfill orders deemed necessary for national defense. The second authorizes the President to establish mechanisms (such as regulations, orders or agencies) to allocate materials, services and facilities to promote the national defense. The third section authorizes the President to control the civilian economy so that sscarce and/or critical materials necessary to the national defense effort are available for defense needs. The Act also authorizes the President to requisition property, force industry to expand production and the supply of basic resources, impose wage and price controls, settle labor disputes, control consumer and real estate credit, establish contractual priorities, and allocate raw materials to aid the national defenseThe law on atomic energy is from 1954.[18]

The military command for nuclear war is called the Nuclear Command and Control

2010. - 196 pp. - http://www.finance.hq.navy.mil/fmb/11pres/wpn_book.pdf

14 **Acquisition Management in the United States Air Force and its Predecessors**. / Lawrence R. Benson. Air Force History Support Office, 1997. - 60 pp. ; Air Force History and Museums Program. 1997) - http://www.dtic.mil/dtic/tr/fulltext/u2/a433213.pdf

The Development of Ballistic Missiles in the United States Air Force 1945-1960. / Jacob Neufeld. - Washington DC : US Air Force History, 1990. - 424 pp. - http://www.dtic.mil/dtic/tr/fulltext/u2/a439957.pdf

Locating Air Force Base Sites History's Legacy. / Frederick J. Shaw. Editor. - Washington DC : US Air Force History and Museums Program, 2004. - 228 pp. - http://www.dtic.mil/dtic/tr/fulltext/u2/a476351.pdf

15 **The Office of the Secretary of the Air Force, 1947-1965** / George M. Watson, Jr.. - Washington, D.C.: Center for Air Force History, 1993. - 389 pp. - http://www.dtic.mil/dtic/tr/fulltext/u2/a433203.pdf

16 **NNSA, Y-12 Complete Dismantlement of W70 Components** : Last Cold War US. Army nuclear weapon dismantled from US. nuclear weapons stockpile. - http://nnsa.energy.gov/mediaroom/pressreleases/w70dismantle102111

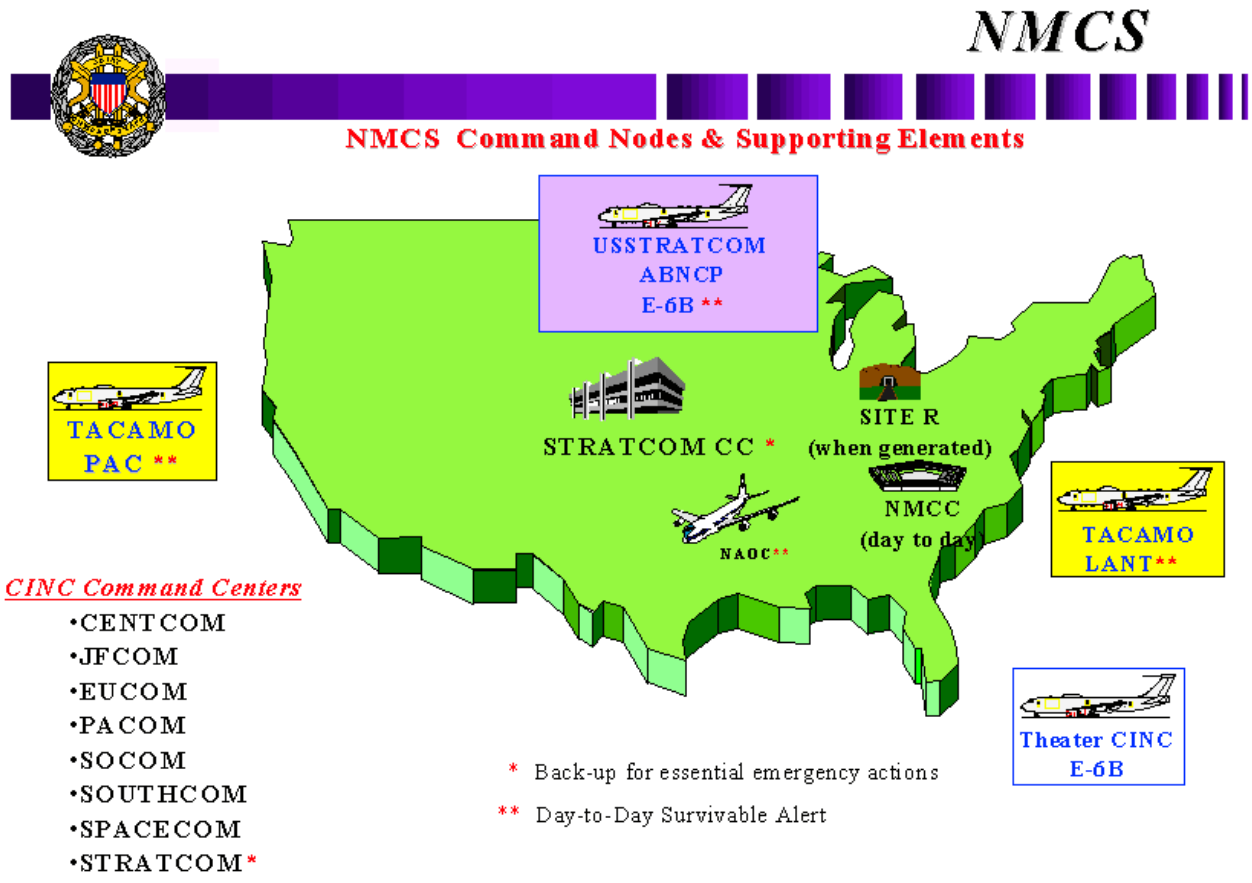
Report of the Secretary of Defense Task Force on DoD Nuclear Weapons Management. Phase I:: The Air Force's Nuclear Mission. September 2008. - 92 pp. - http://www.defense.gov/pubs/phase_i_report_sept_10.pdf

17 Fisher, Louis: **When Wars Begin**: Misleading Statements by Presidents. Presidential Studies Quarterly 40, no. 1 (March) 171. 2010. Center for the Study of the Presidency.

18 Atomic Energy Act (AEA) of 1954 (as amended). - 181 pp. - http://epw.senate.gov/atomic54.pdf

System.[19] This consists in particular of the National Military Command Center, the US. Strategic Command Global Operations Center, and Site-R or Raven Rock Mountain Complex, and mobile units in Operation Looking Glass, such as the E-4B National Airborne Operations Center, the E-6B Airborne Command Post, and the Mobile Consolidated Command Center.

Located in the Pentagon, houses the the National Military Command Center the National Command Authority, its logistics and communications center, including the hot Moscow-Washington line. The National Command Authority is a term used by the Defense Department to refer to the ultimate lawful source of military orders. The command consists of the president (as commander) and the minister of defense jointly or of their appropriate deputy successor, ie vice president and vice defense minister.

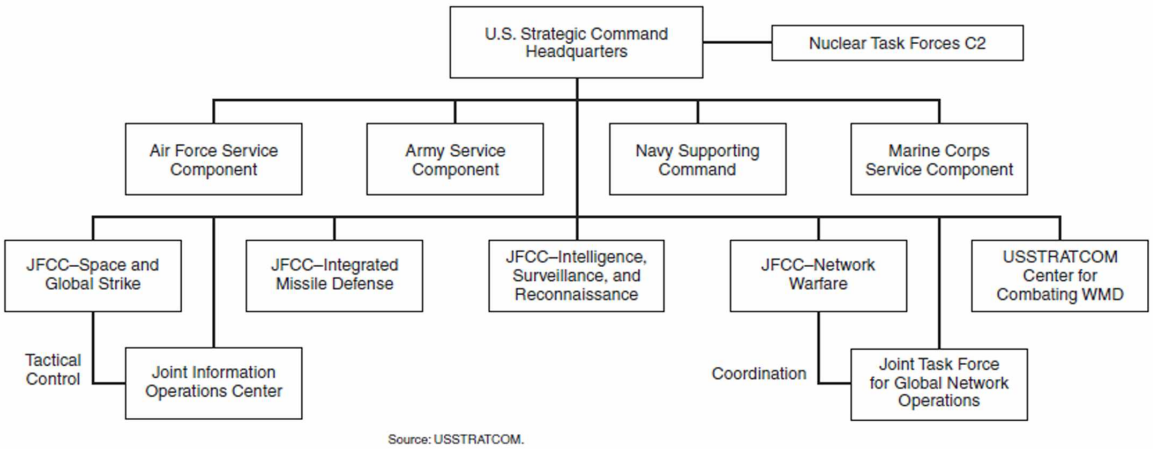


The US. Strategic Command (USSTRATCOM) is one of the ten commands in the DOD. The command which employs more than 2,700 people, representing all military branches, including the Ministry of civilians and contractors and oversees the command's operationally focused global strategic operations.[20]

19 CRS: Nuclear Command and Control: Current Programs and Issues May 3, 2006 - 40 pp.
The Nuclear Matters Handbook : Expanded and Revised Version / Office of the Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs, 2011.- 350 pp.

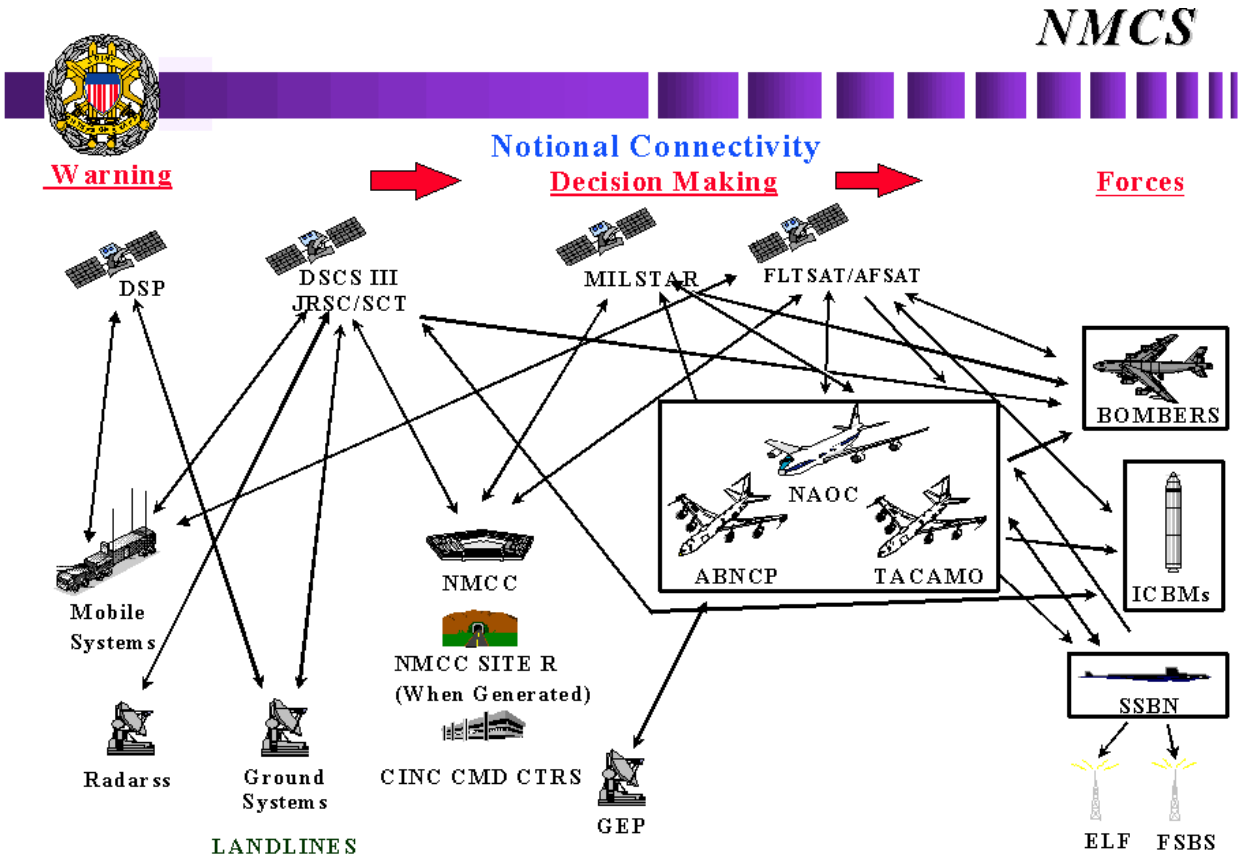
20 GAO: **Military Transformation** : Additional Actions Needed by US. Strategic Command to Strengthen Implementation of Its Many Missions and New Organization, 2006. - 71 pp.

Figure 1: USSTRATCOM Organization



Source: USSTRATCOM.

Notes: C2= command and control; JFCC= Joint Functional Component Command; WMD= weapons of mass destruction.



Archives

Nuclear History at the National Security Archive, including the
National Security Archive : U.S Nuclear History. Nuclear Arms and Politics in the Missile Age, 1955 – 1968.
- http://www.gwu.edu/~nsarchiv/nsa/publications/nh/
'U.S. Nuclear History: Nuclear Arms and Politics in the Missile Age, 1955-1968 documents one of the most formidable military buildups of the nuclear era. It begins with 1955, when the U.S. Air Force acquired its first B-52 bomber, massively destructive thermonuclear weapons entered the weapons stockpile in large numbers, and President Eisenhower declared the production of operational intercontinental ballistic missiles (ICBMs) the highest national priority. During the following years, the United States produced and deployed a potentially devastating array of Atlas, Titan[21], and Minuteman ICBMs and Polaris submarine-launched ballistic missiles (SLBMs), all poised for rapid retaliation or first-strike in a crisis. In addition to its own rapid nuclear expansion, the United States also deployed thousands of nuclear missiles in Western Europe during the 1960s to uphold alliance commitments with European powers. This collection concludes with 1968, when a new phase in nuclear history was approaching; with the Soviets reaching strategic parity, the White House began making arms control negotiations a priority, and the Air Force successfully tested multiple independently targetable reentry vehicles (MIRVs) to enhance the destructive reach of ballistic missiles.'[22]
According to the Locating Air Force Base Sites History's Legacy, 'By the late 1950s, each air materiel area, headquartered at a specific base, managed a set of weapon systems or components after it had completed an ARDC testing cycle. Locations of manufacturers influenced AMC assignments of weapon systems to certain AMC bases. The San Antonio Air Materiel Area (AMA) at Kelly AFB, Texas, was responsible for B–36s and later B–58s as well as F–102 and F–106 interceptors. All of these aircraft were products of the Convair Corporation which maintained a large production facility at nearby Fort Worth. Oklahoma City AMA at Tinker AFB, Oklahoma, managed B–47 and B–52 bombers and the KC–97 and KC–135 tankers that refueled them. Many of these Boeing aircraft were built at a large plant in Wichita in the adjacent state of Kansas. The Sacramento AMA at McClellan AFB in California handled F–80s and later F–104s, products of Lockheed, and F–86s and later F–100s, produced by North American. Both Lockheed and North American maintained production facilities in California. The Warner Robins AMA at Robins AFB in Georgia handled the C–130s that another Lockheed plant produced in the same state, and Middletown AMA (later, Olmsted AFB) in Pennsylvania administered helicopter systems partly because it was not too far from the Sikorsky and Vertol factories that produced the H–19 and H–21. The San Bernardino AMA at Norton AFB in California administered the C–124 and C–133 systems in the 1950s, aircraft produced by the Douglas Aircraft Corporation located in the same state. San Bernardino also assumed responsibility for ballistic missiles such as Thor, Atlas, and Titan by 1960. In early 1959, AMC selected Ogden

21 **Titan II Missile Site Coordinates** - http://asuwlink.uwyo.edu/~jimkirk/titan2.html

22 The classification rules are found among other things in Aftergood, Steven **Reducing Government Secrecy: Finding What Works**, Yale Law & Policy Review, 2009.

Restricted Data Declassification Decisions 1946 to the Present. US. Department of Energy. Office of Health, Safety and Security. Office of Classification, 2001. - 169 pp.

(later, Hill AFB) in Utah to manage Snark and Minuteman, partly because the Hercules and Thiokol plants that manufactured some of the missiles' rocket engines were located in the same state. Griffiss AFB, New York, home of the Rome AMC, specialized in Air Force electronics like the kind used in early warning radar. Rome was located in an area known for its electronics industry and nearby universities (Cornell, Rochester, and Syracuse) whose research resources were readily available.'[23]

The U.S. Atomic Energy Commission

Historical American government organization established 1947 as a continuation of the Manhattan Project[24]. The Commission was responsible for U.S. nuclear weapons tests[25] in the early part of the cold war - including those in the proving grounds in the Pacific and Nevada,[26] and overtook responsibly for the newly proposed Manhattan Project Signature Facilities, including the plutonium factories the Hanford Engineer Works and the Savannah River Site until the administration of them were privatized.. DOE's Manhattan Project Signature Facilities are 'those defined as "nationally significant historic properties that best convey and interpret the scale and importance of the Manhattan Project, and provide the core for the Department's ability to successfully interpret, whether in situ or through museum or other interpretive setting, its Manhattan Project mission of developing atomic bombs during World War II.".[27]

23 **Locating Air Force Base Sites History's Legacy**. / Frederick J. Shaw. Editor.
- Washington DC : US Air Force History and Museums Program, 2004. - p. 86.

24 National Archives: **Records of the Atomic Energy Commission** [AEC] (Record Group 326) 1923-75.

The New World: A History of the United States Atomic Energy Commission, Volume I, 1939-1946. / Richard G. Hewlett, Oscar E. Anderson, Jr.. U.S. Atomic Energy Commission, 1972. - 824 pp.
- http://www.osti.gov/bridge/servlets/purl/4597121-bHOE2p/

Atomic Shield, 1947–1952: A History of the United States Atomic Energy Commission, Volume II / Richard C. Hewlett and Francis Duncan. Pennsylvania State University Press, 1962 ; 1969. - 768 pp.
- http://www.osti.gov/bridge/servlets/purl/4582828-c0Mpnp/

Atoms for Peace and War, 1953-1961. Eisenhower and the Atomic Energy Commission. A History of the United States Atomic Energy Commission, Volume III. / Richard G. Hewlett and Jack M. Holl.
- Berkeley: University of California Press, 1989. xxx, 696 pp. ; California Studies in the History of Science, vol. 4.)

25 **The Atomic Cafe** 1982 - http://www.youtube.com/watch?v=NOUtZOqgSG8

26 **Draft Site-Wide Environmental Impact Statement for the Continued Operation of the Department of Energy/National Nuclear Security Administration Nevada National Security Site and Off-Site Locations in the State of Nevada**, 2009?

Abstract: This Site-Wide Environmental Impact Statement ... analyzes the potential environmental impacts of proposed alternatives for continued management and Operation of the Nevada National Security Site (NNSS) (formerly known as the Nevada Test Site) and other US. Department of Energy/National Nuclear Security Administration managed sites in Nevada, including the Remote Sensing Laboratory (RSL) on Nellis Air Force Base in North Las Vegas, the North Las Vegas Facility (NLVF), the Tonopah Test Range (TTR), and environmental restoration areas on the US. Air Force Nevada Test and Training Range.

United States Geologic Survey / Dennis N. Grasso: **Nevada Test Site: Geologic Surface Effects of Underground Nuclear Testing: Buckboard Mesa, Climax Stock, Dome Mountain, Frenchman Flat, Rainier/Aqueduct Mesa, and Shoshone Mountain**, Nevada Test Site, Nevada, 2003. - 1 p.

Nuclear Weapons Testing at the Nevada Test Site: The First Decade. / John C. Hopkins and Barbara Killian. Defense Threat Reduction Agency, 2011. - 662 pp.
- http://www.dtic.mil/dtic/tr/fulltext/u2/a552638.pdf

27 Advisory Council on Historic Preservation: **ACHP Supports Department of Energy Policy Statement on Historic Hanford Nuclear Reactor**, March 10, 2008 - 2 pp.
- http://www.achp.gov/docs/ReactorRelease.pdf

This organization was split as Nuclear Regulatory Commission with the commercial nuclear industry responsibility allocated and the Energy Research and Development Administration which administered energy research, development of nuclear weapons and naval reactor programs in 1975.[28] These bodies merged in 1977 to the U.S. Department of Energy.

Former AEC sites. This refers here to the high security installations built by the Atomic Energy Commission after World War II to store and maintain nuclear weapons. These are:

Barksdale AFB
Bossier AFB
Caribou AF'S
Deep Creek AFS
Ellsworth AFB
Fairchild AFB
Kirtland AFB
Lackland AFB
Lake Mead AFB
Loring AFB
Manzano AFB
Medina AFB
Nellis A FB
Rushhmore AFS
Stoney Brook AFS
Travis AFB
Westover AFB

Manhattan Project Sites, Draft Special Resource Study/Environmental Assessment. National Park Service, U.S. Department of the Interior, 2009. - 216 pp.
- http://parkplanning.nps.gov/document.cfm?parkID=482&projectId=14946&documentID=30977

28 Department of Energy: **Naval Reactors**. 2004. - 76 pp.

FEDERAL LANDS IN SOUTHERN NEVADA

Land use:

- Wildlife Reserve
- Nellis Air Force Range
- Nevada Test Site
- Area 51

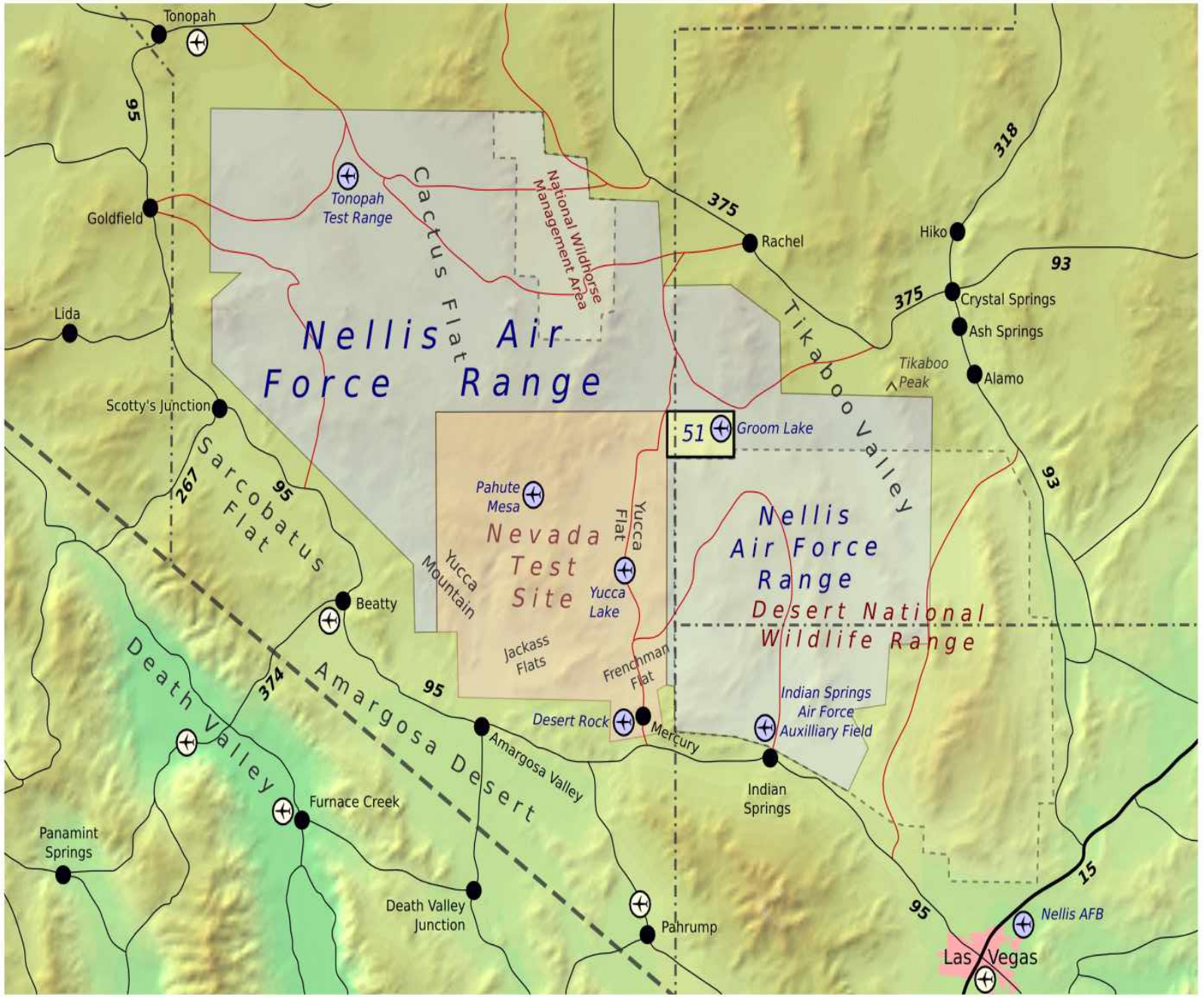
Sources differ as to whether the "Area 51" box is part of the Nevada Test Site, or is in joint NTS / Air Force control

Legend:

- Military Airfield
- Civilian Airfield
- City
- Town or village
- Public road
- Private road
- State boundary
- County boundary

Location:

Location of main map



Department of Energy

The U.S. Energy Department was created in 1977 by a merger of Nuclear Regulatory Commission and the the Energy Research and Development Administration. A lot of research, development, maintenance, cleanup and the cost to the U.S. Nuclear Weapons industrial complex is administered by the Department of Energy among other things through the National Nuclear Security Administration, created in 2000.[29] It should also be mentioned in passing that that "the U.S. defense and military are with 80% of the government's total energy as the largest consumer of energy. Including military vessels such as navy fleets, aircraft, vehicles and buildings 75% of energy consumption', writes the Danish Foreign Ministry website' environmental and energy. "The National Nuclear Security Administration also administers nuclear weapons laboratories organized by the Ministry of Energy National Laboratories, for example:

29 GAO: **Modernizing the Nuclear Security Enterprise**: The National Nuclear Security Administration's Proposed Acquisition Strategy Needs Further Clarification and Assessment, September 20, 2011.

'DOE)-- proposed in March 2010 a new acquisition strategy that includes consolidating the management and operating (M&O) contracts for two of its eight sites--the Y-12 National Security Complex (Y-12) in Tennessee and the Pantex Plant in Texas.'

DOE **Fundamentals Handbook: Nuclear Physics and Reactor Theory**. 1993. - 142 pp.

'The Nuclear Physics and Reactor Theory Handbook was developed to assist nuclear facility operating contractors in providing operators, maintenance personnel, and the technical staff with the necessary fundamentals training to ensure a basic understanding of nuclear physics and reactor theory. The handbook includes information on atomic and nuclear physics; neutron characteristics; reactor theory and nuclear parameters; and the theory of reactor Operation. This information will provide personnel with a foundation for understanding the scientific principles that are associated with various DOE nuclear facility operations and maintenance.'

- Argonne National Laboratory
- Ames Laboratory
- Bettis Atomic Power Laboratory
- Brookhaven National Laboratory
- Fermi National Accelerator Laboratory
- General Electric Vallecitos Nuclear Center
- Idaho National Laboratory
- Idaho Nuclear Technology and Engineering Center
- Knolls Atomic Power Laboratory
- Lawrence Berkeley National Laboratory
- Lawrence Livermore National Laboratory
- Los Alamos National Laboratory
- National Energy Technology Laboratory in Albany, Oregon; Fairbanks, Alaska; Morgantown, West Virginia; Pittsburgh, Pennsylvania; and Sugar Land, Texas
- National Renewable Energy Laboratory
- Oak Ridge National Laboratory
- Pacific Northwest National Laboratory
- Paducah Gaseous Diffusion Plant
- Princeton Plasma Physics Laboratory
- Sandia National Laboratories, Albuquerque, New Mexico and Livermore, California
- Savannah River National Laboratory or Savannah River Site
- Separations Process Research Unit
- SLAC National Accelerator Laboratory
- Thomas Jefferson National Accelerator Facility

A complete list of the Ministry's laboratory appears from of its current budget proposal for 2012.[30]The Ministry of Energy's overall responsibility and economics associated with nuclear weapons appears from the current budget proposal for 2012.[31]

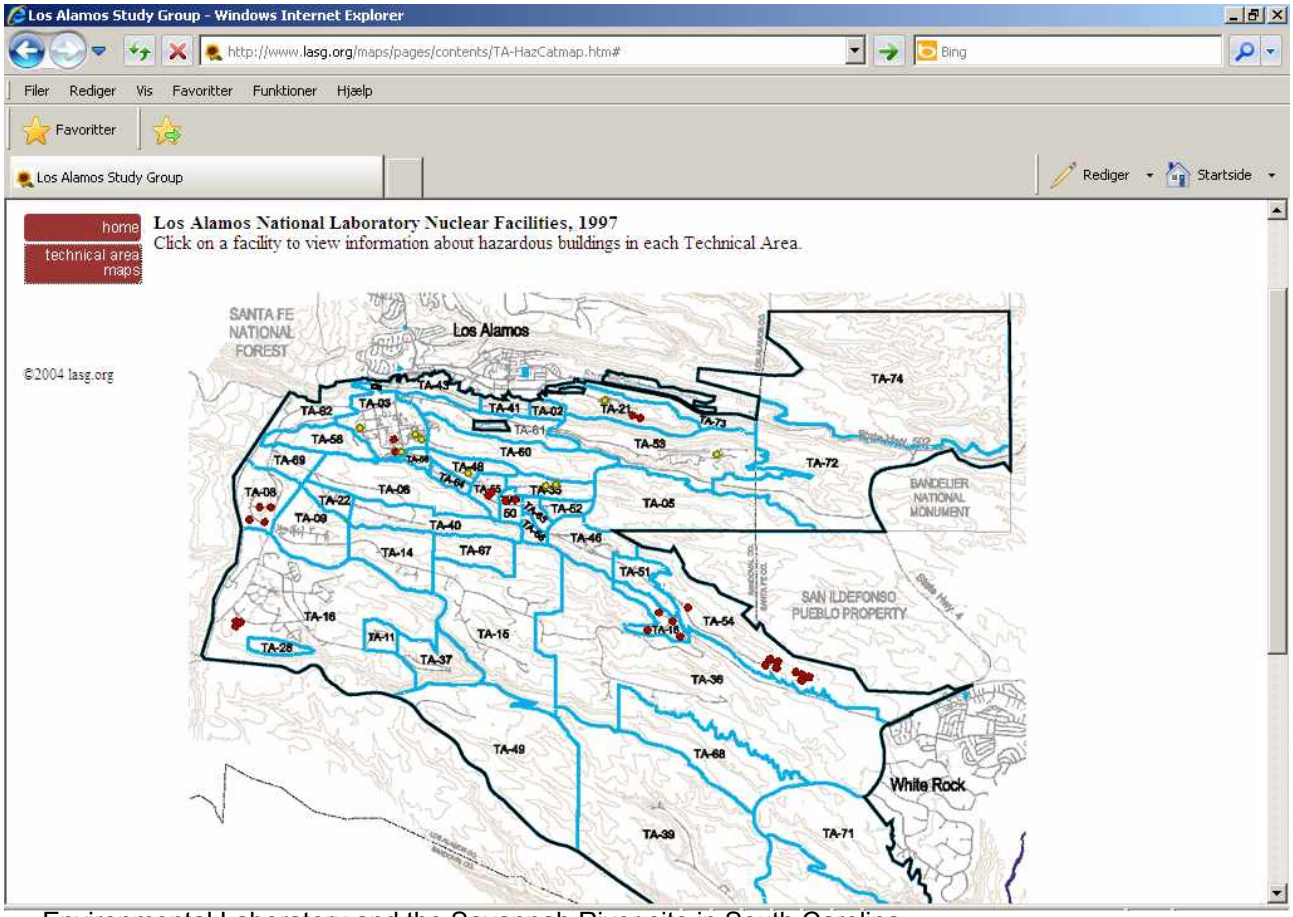
30 Department of Energy, Office of Chief Financial Officer: **FY 2012, Laboratory Tables Preliminary**. Congressional Budget Request, February 2012. - 133 pp.
See also: **Master Government List of Federally Funded R&D Centers** (FFRDCs).
- http://www.nsf.gov/statistics/ffrdclist/, and
Historical Notes: Decertifications, closures and renaming, and other associated notes
- http://www.nsf.gov/statistics/ffrdclist/historic.cfm
Western States Legal Foundation, Nevada Desert Experience: **The Nevada Test Site: Desert Annex of the Nuclear Weapons Laboratories**. Information Bulletin Summer 2005 update. - 14 pp.
31 Department of Energy, Office of Chief Financial Office: **FY 2012 Congressional Budget Request, National Nuclear Security Administration, Office of the Administrator, Weapons Activities, Defense Nuclear Nonproliferation, Naval Reactors**. February 2011, Volume 1. - 562 pp.
Se også **Nuclear Security Spending: Assessing Costs, Examining Priorities** / Stephen I. Schwartz with Deepti Choubey. Carnegie Endowment for International Peace, 2009. - 78 pp.

Los Alamos National Laboratory

Part of America's nuclear industrial complex under the Department of Energy.[32]

32 **Fogbank: Lost Knowledge Regained**. Nuclear Weapons Journal, Issue 2 • 2009.
Los Alamos Historical Document Retrieval and Assessment (LAHDRA) Project. - http://www.lahdra.org/
Draft Final Report of the Los Alamos Historical Document Retrieval and Assessment (LAHDRA) Project. (June 2009) - 558 pp.
ChemRisk review of off-site releases at Los Alamos National Laboratory. January 27, 1999.
'IRVINE, CA – McLaren/Hart's ChemRisk service group announced it began a 3-year, $4.2 million effort to review historical documents about off-site releases of hazardous chemicals and radionuclides from Los Alamos National Laboratory operations dating back to the 1940s. Working for the Centers for Disease Control and Prevention (CDC), an independent team from ChemRisk and subcontractor Shonka Research Associates will further remove the secrecy that has obscured many operations a the facility since the development of the first atomic bomb. A comprehensive summary of historical operations will be prepared, as will a list of materials that were likely released to off-site areas. ChemRisk expects to be able to bring about public release of documents important to the assessment of potential off-site health effects, most of which have long been classified.
Characterizing operations undertaken since 1943 will involve the review of millions of documents on paper and microfilm, interviewing active and retired workers, and identifying the materials that were used in ways that likely led to off-site releases. Materials that were used will be prioritized based on toxicity, quantities that were present, the nature of the operations they were used in, and any evidence of off-site

The laboratory was founded during World War II in 1943 as a secret, centralized facility to coordinate scientific research in different universities under the Manhattan Project that developed the the first American atomic bombs. Among the nuclear physicists who worked in Los Alemos were: Niels Bohr, Enrico Fermi, J. Robert Oppenheimer[33] and Edward Teller.[34]



Environmental Laboratory and the Savannah River site in South Carolina.

Much has been written about operations at the secret city during World War II, but relatively little has been publicly released concerning the multitude of operations at the laboratory since. The missions of the laboratory have grown considerably over the years to include thermonuclear weapon design, high explosives and ordnance development and testing, nuclear reactor and accelerator research and development, fusion research, waste disposal and incineration, and other chemical, biological, and energy related studies.'

Discussion: **Nuclear Dumps by the Riverside**: Threats to the Savannah River from Radioactive Contamination at the Savannah River Site. / Arjun Makhijani, Ph.D., Michele Boyd. Institute for Energy and Environmental Research, Takoma Park, Maryland, 2004. - 77 pp.

- http://www.ieer.org/reports/srs/fullrpt.pdf

33 **The Atomic Bomb and the End of World War II: A Collection of Primary Sources**. National Security Archive Electronic Briefing Book No. 162. Edited by William Burr. 2007.

- http://www.gwu.edu/~nsarchiv/NSAEBB/NSAEBB162/index.htm

Up For Sale:Bidding for Management of the Nuclear Weapons Labs : Western States Legal Foundation Special Report. Fall 2004. - Oakland, CA: Western States Legal Foundation, - 34 pp.

United States Atomic Energy Commission, Personnel Security Board: **In The Matter Of J. Robert Oppenheimer**. Autobiography pp. 11-19. Government Printing Office, (1954). - 1008 pp.

- http://www.archive.org/details/unitedstatesatom007206mbp

34 Mcnamara, Laura Agnes: **Ways of Knowing About Weapons**: the cold war's end at the Los Alamos National Laboratory. Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy, Anthropology. The University of New Mexico, Albuquerque, New Mexico. May, 2001. - 297 pp.

Oak Ridge, National Laboratory

American city in the state of Tennessee, where the Army Corps of Engineers established three different plants for the production of enriched uranium, then called the Clinton Engineer Works, in 1943[35], as part of the Manhattan Project.[36]. Now under the Ministry of Energy named East Tennessee Technology Park.[37] Up to and including

35 **The metal fabrication program for the Clinton Engineer Works and the Hanford Engineer Works. Including the Dummy Slug Program and the Unbonded Slug Program - Project 1553.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Engineering Dept., 1945 - 300 pp.
- http://www.osti.gov/bridge/product.biblio.jsp?osti_id=10158630

Status of Upcoming SEC Petitions / LaVon B. Rutherford, CHP. National Institute for Occupational Safety and Health Division of Compensation Analysis and Support. 2011. - 6 pp.
- http://www.cdc.gov/niosh/ocas/pdfs/abrwh/pres/secstat0811bw.pdf

United States Army in World War II – The Corps of Engineers: Construction in the United States. / Lenore Fine and Jesse A. Remington. - Washington, D. C.: Center of Military History, 1972. - 747 pp

36 National Archives: **Records of the Atomic Energy Commission** [AEC] (Record Group 326) 1923-75

Chamberlain, Owen: Physicist at Los Alamos, Berkeley professor, 1950-1989, and Nobel Laureate : oral history transcript / 2000. Bancroft Library. History of Science and Technology Program; Bancroft Library. Regional Oral History Office. - http://www.archive.org/details/physlosalamos00chamrich

37 Carl Malamud on behalf of the US. Congress: **Continuing Security Concerns at Los Alamos National Laboratory** (2007. US. House of Representatives, Committee on Energy and Commerce, Subcommittee on Oversight and Investigations, Tuesday, January 30, 2007.
- http://www.archive.org/details/gov.house.energycommerce.013007.oi.hrg.lanl)

1964, all enriched uranium in the U.S. was used for the nuclear weapons or of the U.S. Navy. The area, which according to the Nuclear Wastelands p. 226 is heavily polluted is therefore subject to the National Oil and Hazardous Substances Pollution Contingency Plan. [38]

Peace Movements:: Coalition to Demilitarize the University of California is a current American peace group founded in 2002 to provide a framework for cooperation between the campus and local organizations working to challenge California's University's commitment to design, research, testing and production of nuclear weapons at Los Alamos National Laboratory and the Lawrence Livermore National Laboratory.

38 US. Department of Energy, Office of Environment: **Safety, and Health. Independent investigation of the East Tennessee Technology Park.** Vol. 1: Past environment, safety, and health practices. October 2000. - http://www.archive.org/details/IndependentInvestigationOfTheEastTennesseeTechnologyPark

Davis, Adam : **What's In Your Glovebox?** The Costs of Plutonium Exposure at Los Alamos National Laboratory.
http://www.archive.org/details/WhatsInYourGloveboxTheCostsOfPlutoniumExposureAtLosAlamosNational

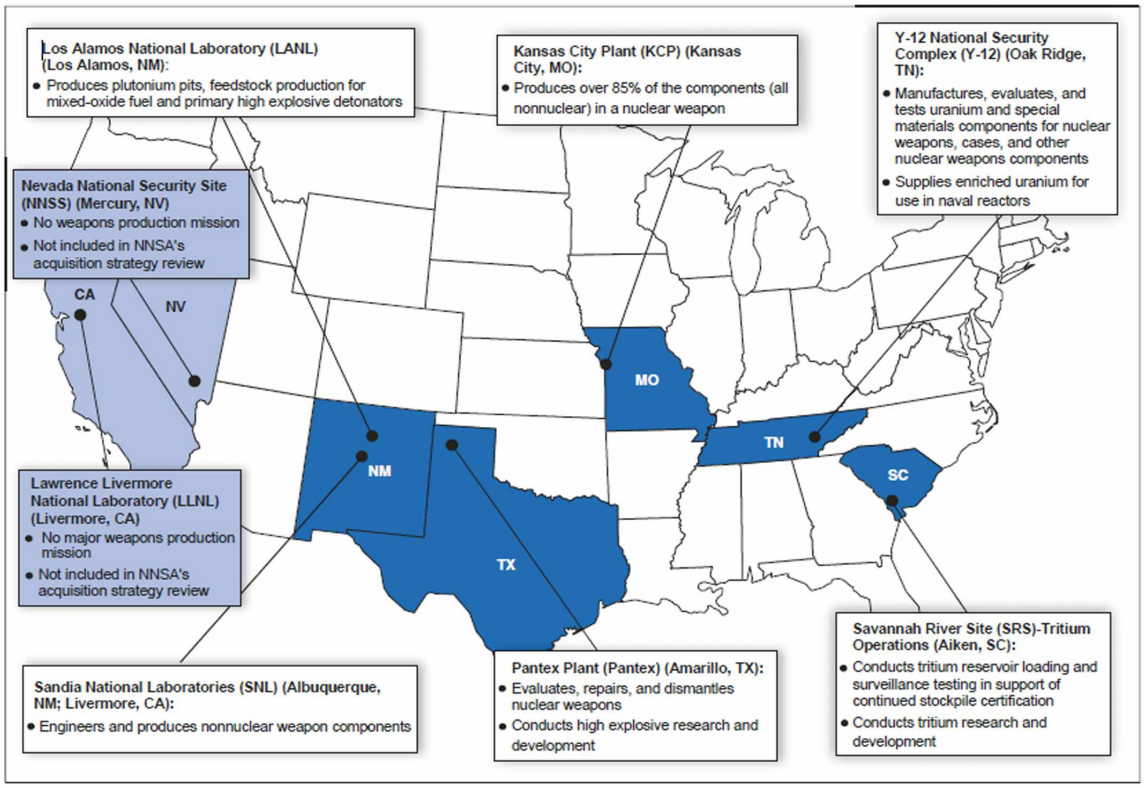
DOE National Laboratory restructuring : hearing before the Subcommittee on Basic Research of the Committee on Science, US. House of Representatives, One Hundred Fourth Congress, first session, on H.R. 884 to authorize retirement incentives for certain employees of the national laboratories and H.R. 2301 to designate an enclosed area of the Oak Ridge National Laboratory in Oak Ridge, Tennessee as the "Marilyn Lloyd Environmental, Life and Social Sciences Complex." (1996).

The Oak Ridge Health Agreement Studies, 1999:
Final Report of the Oak Ridge Health Agreement Steering Panel
Final Report for Iodine 131 Releases
Final Report for PCB Releases
Final Mercury Releases
Final Mercury Releases, Appendices
Final Uranium Releases Report.
Final Report for Screening Evaluation
Final Report for Radionuclides Releases from White Oak Creek
Final Report for Radionuclides Releases from White Oak Creek, Appendices

Robinson, George O: **The Oak Ridge story**: the saga of a people who share in history.
- Kingsport, Tenn., Southern Publishers, 1950. - 222 pp.

Working groups in the Ministry of Energy recommends the development of new nuclear weapons and modernization of nuclear weapons factories such as Pantex and Kansas City plants.

Figure 1: NNSA's Nuclear Security Enterprise Sites



Sources: NNSA; Map Resources (map).

Current and historic U.S. nuclear weapons factories appears from Ministry of Energy, Energy Employees Occupational Illness Compensation Act of 2000; List of Covered Facilities,[39] including:

1) Atomic weapons employer facilities
2) Department of Energy facilities
3) Beryllium vendors.

39 **Energy Employees Occupational Illness Compensation Act of 2000: List of Covered Facilities**.
Government Accountability Office (GAO): **Energy Employees Compensation**: Even with Needed Improvements in Case Processing, Program Structure May Result in Inconsistent Benefit Outcomes, 2004. - 44 pp. - http://www.gao.gov/new.items/d04516.pdf
GAO: Report to the Chairman, Subcommittee on Immigration, Border Security, and Claims, Committee on the Judiciary, House of Representatives: **Energy Employees Compensation**-Many Claims Have Been Processed, but Action is Needed to Expedite Processing of Claims Requiring Radiation Exposure Estimates, 2004. - 45 pp. - http://www.cdc.gov/niosh/ocas/pdfs/misc/gao2004.pdf

Pentagon, US Department of Defense

U.S. Department of Defense, former Ministry of War.[40]

The building which the Ministry is in a pentagram or pentagonal.[41]

The Pentagon report on the Vietnam War / Report of the Office of the Secretary of Defense Vietnam Task Force, published in 1971 and in its entirety in 2011. The ministry develops a new generation of nukes around January 2003, for example, earth penetrating weapons. Pentagon recommends the use of torture, has the primary responsibility for rebuilding Iraq and more Information Operations Roadmap's.

See also: Aerospace Defense Command ; Air Force Satellite Communications System ; Airborne Alert; Area 51, Nevada ; Area-Wide Missile Defense System ; ARPANET ; Army Security Service ;
Bases and other overseas military presence Program ;
CENTCOM (the US. Central Command) ; Chemical Weapons Stockpile Destruction Program ; CIFA Counterintelligence Field Activity ; Combat Operation Centre ; Comision to Asses US National Security Space Management and Organization ; Counter Communications System ; CREEL ;
DAPANET ; DAPRA ; DEFCON ; Defense Airborne Reconnaissance Office ; Defense Base Closure and Realignment Commission[42] ; Defense Contract Management Agency ; Defense HUMINT Management Office ; Defense Environmental Restoration Program ; Defense Mapping Agency ; Defense Meteorological Satellite Program ; Defense Nuclear Agency ; Defense Policy Board ; Defense Science Board ; Defense Security Cooperation Agency ; Defense Support Program ; Defense Technology Security Administration ; Defense Threat Reduction Agency[43] ; Deployments for Training Program ; DEW-line[44] ; DIA;

40 Barringer, Felicity: **Pentagon is Pressing to Bypass Environmental Laws for War Games and Arms Testing. -** http://www.nytimes.com/2004/12/28/politics/28exempt.html?th=&pagewanted=print&position=
CRS: **The Cost of Iraq, Afghanistan, and Other Global War on Terror Operations Since 9/11**.
GAO: **Defense Acquisitions : Assessments of Selected Major Weapon Programs**, March 2006
Mollenhoff, Clark R.: **The Pentagon : Policies, Profits and Plunder**.
- New York : G. P. Putnam's Sons, 1967. - 450 pp.
Program Acquisition Costs by Weapon System : Department of Defense Budget for Fiscal Year 2007, February 2006.

41 **The Pentagon:: The First Fifty Years**. / Alfred Goldberg. Historical Office, Office of the Secretary of Defense, 1992 - 197 pp.

42 Department of Defense: **Report to the Defense Base Closure and Realignment Commission: Department of the Air Force: Analysis and Recommendations**. BRAC 2005 (Volume V, Part 1 of 2). May 2005. - 432 pp. - http://www.defense.gov/brac/pdf/VAirForce-o.pdf

43 **Responding to War, Terrorism, and WMD Proliferation: History of DTRA, 1998-2008** / Adams, Bianka J. Harahan, Joseph P.. DTRA History Series, Defense Threat Reduction Agency, US Department of Defense, 2008. - 163 pp.

44 **The Distant Early Warning (DEW) Line: A Bibliography and Documentary Resource List**. Prepared for the Arctic Institute of North America / P. Whitney Lackenbauer, Ph.D., Matthew J. Farish, Ph.D., Jennifer Arthur-Lackenbauer, M.Sc.. 2005. - 125 pp. - http://pubs.aina.ucalgary.ca/aina/DEWLineBib.pdf
Joint Chiefs of Staff Historical Division: **Chronology of JCS Involvement in North American Air Defense, 1946-1975.** 1975. - 126 pp.
- http://www.dod.gov/pubs/foi/joint_staff/jointStaff_jointOperations/271.pdf
The relative influence of distant and local (DEW-line) PCB sources in the Canadian Arctic. / Stow JP, Sova J, Reimer KJ. Sci Total Environ. 2005 Apr 15;342(1-3):107-18.

e bomb ; DSCS (I, II, III) EUCOM ;
Federal Procurement Data Center ; Formerly Used Defense Sites (528 Sites and 1935 Documents match your request) ; Forward Based Systems ;
Global Information Grid ; GPS ;
HAARP ; Humanitarian Assistance Program ;
Information Operation Cell ;
Joint Chiefs of Staff ; Joint UAV Overarching Integrated Product Team ; Joint UAV Center of Excellence ;
Military Airlift Command ; Military Sealift Command ; Milsatcom ; Milsatcom Joint Programs Office ; Milstar (Blok II) ; Missile Defense Agency ; MITRA ; MX ; National Command Authority ;
National Geospatial-Intelligence Agency ; National Guard ; National Missile Defense System ; National Reconnaissance Office ; National Security Agency ; Naval Oceanographic Office (NAVO) ; Naval Security Group ; Naval Small Craft Instruction and Technical Training School ; US. Naval Base, Guantanamo Bay, Cuba ; Navy's Ocean Surveillance Information System ; Net Evaluation Subcommittee ; NOrth American Air Defense Command ; North Atlantic Radio System ; Northern Command (Northcom) ; NRO ; Nuclear Emergency Search Team ;
Office of Forces Transformation ; Office of Public Safety ; OMEGA ; ONR ; OSS ;
PACOM (the Pacific Command) ;
Reliable Replacement Warhead[45] ;
SAC ; SATCOM ; Sexual Assault Prevention and Response Office ; STRATCOM ; SPACECOM ; Thule[46] ;
US Southern Command.

'Soil PCB contamination has been delineated at 18 of 21 Distant Early Warning Line (DEW-line) stations being cleaned up by the Canadian Department of National Defence (DND).'

45 Medalia, Jonathan: **Nuclear Warheads**: The Reliable Replacement Warhead Program and the Life Extension Program, CRS. 2007. - 51 pp.

Medalia, Jonathan: **The Reliable Replacement Warhead Program**: Background and Current Developments. CRS, 2009 - 49 pp.

46 **On Weapons Plutonium in the Arctic Environment (Thule, Greenland)**. / Mats Eriksson. Risø National Laboratory, Roskilde, Denmark. 2002. - 150 pp. 'This thesis concerns a nuclear accident that occurred in the Thule (Pituffik) area, NW Greenland in 1968, called the Thule accident. Results are based on different analytical techniques, i.e. gamma spectrometry, alpha spectrometry, ICPMS, SEM with EDX and different sediment models, i.e. (CRS, CIC). The scope of the thesis is the study of hot particles. Studies on these have shown several interesting features, e.g. that they carry most of the activity dispersed from the accident, moreover, they have been very useful in the determination of the source term for the Thule accident debris.'

Wikipedia: **1968 Thule Air Base B-52 crash** - http://en.wikipedia.org/wiki/1968_Thule_Air_Base_B-52_crash
This article has references to the Danish nuclear policy debate.

Peace Keeper train wagon used to transport MX missiles

See also: CIA; Countervailing Strategy of Defense deep strike; Department of Homeland Security ; depleted uranium; Deterrence; devices; Direct Commercial Sales Program; draw downs, Darleen Druyun, Economic Support Fund; Ministry of Energy, FBI, first strike, flexible response, the Food for Peace; Foreign Assistance Act; Foreign Military Financing Program, Foreign Military Interaction Program; Foreign Military Sales Credit Program, Foreign Military Sales Program ; advance storage; amplification agreements; GAO, Joint Strike Fighter; Mutual Assured Destruction ; Military Assistance program; Military Reserve Fund, National Aeronautics and Space Administration ; Nuclear Posture Review, Plan Colombia Support Program; Total Information Awareness; Tricare

Nuclear Weapons Complex

The public and private companies which in interaction with politicians researches, develops and manufactures nuclear weapons. Defense and Energy Ministry has shared responsibility for the country's nuclear activities within described in a Memorandum of Understanding from 1983 between the two ministries. The National Agency for Nuclear Safety is responsible for stock to be 'secure a credible U.S. nuclear deterrent without full-scale nuclear explosions. The Nuclear Posture Program is a comprehensive program that includes activities related to monitoring, evaluation, maintenance, refurbishment, construction and operation of stocks and, new research, development and approval of certification.[47]

47 **Transforming the US. Strategic Posture and Weapons Complex for Transition to a Nuclear Weapons-Free World**. Prepared by the Nuclear Weapons Complex Consolidation (NWCC) Policy Network, Natural Resources Defense Council, Washington, DC, Nuclear Watch New Mexico, Santa Fe, NM, Tri-Valley CAREs, Livermore, CA, Just Peace of Texas, Amarillo, TX, Physicians for Social Responsibility (Greater Kansas City Chapter). With contributions from Project On Government Oversight, Washington, DC. Lead Author Robert L. Civiak. Contributing authors Christopher Paine, Natural Resources Defense Council, Peter Stockton and Ingrid Drake, Project On Government Oversight, Jay Coghlan, Nuclear Watch New Mexico, Marylia Kelley, Tri-Valley CAREs. April 2009. - 157 pp.

Basic Terminology of the Nuclear Posture Review

· Strategic Nuclear Forces (Strategic Weapon Systems): Strategic nuclear platforms with their associated strategic nuclear weapons. - Strategic nuclear platforms: (retained in the NPR)

§ 14 SSBNs

§ 500 MMIII

With a science and technology budget, which currently stands at around U.S. $ 12 billion a year, the U.S. defense complex the world's largest investor in military research.[48]

The nuclear weapons complex is made up by the Department of Energy's weapons laboratories, factories and plants that perform this task: development, manufacture or production, repair, modification, support or services relating to nuclear weapons, including uranium[49] plant Fernald Feed Materials Production Center, Ohio, Kansas City plant is part of Honeywell Federal Manufacturing & Technologies, Lawrence Livermore National Laboratory, California University, Los Alamos national Laboratory, the Nevada test area, Pantex plant in Texas, Sandia national Laboratories, Albuquerque, New Mexico, Savannah River National Laboratory, Aiken, South Carolina and the Y-12 national Security Complex, Oak Ridge, Tennessee, the neutron bomb factory Mound Laboratories, Miamisburg, Ohio, formerly the Dayton Project, the Paducah Gaseous Diffusion Plant, Kentucky, Portsmouth Gaseous Diffusion Plant, Ohio, Rocky Flats plant, Denver, Colorado, Waste[50] Isolation Pilot plant, Carlsbad, New Mexico.

§ 76 B-52s & 21 B-2s
- Strategic nuclear platform reductions:
§ 50 Peacekeeper missiles
§ 4 Trident submarines
§ All B-1s (nuclear re-role requirement eliminated)
· Strategic Nuclear Weapon: A nuclear warhead and its necessary arming, fuzing and firing components necessary to produce a nuclear yield that can be loaded on a strategic platform.
· Nuclear Warhead: A device that contains the nuclear or thermonuclear system.
· Strategic Active Stockpile: Operationally Deployed Weapons, the responsive force and logistic spares.
- Operationally Deployed Weapons: Strategic nuclear weapons that are on operational ballistic missiles or on bombers or in bomber base weapon storage areas (logistic spares in bomber weapon storage areas would not be counted). Operationally Deployed Weapons are for immediate and unexpected threats.
- Responsive Force: Strategic nuclear weapons available for uploading on existing strategic nuclear platforms. (Note: Some weapons may be in inactive stockpile.)
- Logistic Spares: Strategic nuclear weapons required to meet Operationally Deployed
Strategic Nuclear Weapons maintenance requirements.
· Strategic Inactive Stockpile: Strategic nuclear warheads reserved for DOE's Quality
Assurance and Reliability Testing (QART) and Reliability Replacement requirements. These warheads have certain limited life components removed, but are otherwise maintained to the same standards as weapons in the active stockpile.
- Quality Assurance and Reliability Testing (QART): Nuclear warheads retained in the inactive stockpile to replace weapons in the active stockpile withdrawn for DOE's surveillance program.
- Reliability Replacement: Nuclear warheads retained in the inactive stockpile to replace similar weapons in the stockpile that suffer a catastrophic failure.
· Total Strategic Stockpile: The summation of the strategic active stockpile and strategic inactive stockpile
The following are not part of the stockpile.
· Retired Warheads: Warheads no longer required for military use and are not part of the active and inactive stockpiles. These warheads are awaiting dismantlement by DOE.
· Dismantlement: The physical separation of high explosives from special nuclear material. Usually critical nuclear components are retained and non-nuclear components are placed in a demilitarization program.

48 **Beyond the bomb** : Twenty years after the end of the cold war scientists and the military still need each other. Nature Volume:477, pp. 369.

49 **Transuranic elements in the environment** : a summary of environmental research on transuranium radionuclides funded by the US. Department of Energy through calendar year 1979. United States. Dept. of Energy. Office of Health and Environmental Research; Hanson, Wayne C. - [Oak Ridge, TN] : Technical Information Center/US. Dept. of Energy ; Springfield, Va. 1980. - 764 pp.

50 **Groundwater and Soil Cleanup**: Improving Management of Persistent Contaminants / Committee on Technologies for Cleanup of Subsurface Contaminants in the DOE Weapons Complex, National Research Council. National Academies Press,1996. - 304 pp.

Berylliosis, or Chronic Beryllium Disease

Beylliosis, or chronic beryllium disease (CBD), is a chronic allergic-type lung response and chronic lung disease caused by exposure to beryllium and its compounds, particularly the oxide, and produces scarring of the lung tissue. The lung condition may take years (average 10 to 15) to develop symptoms.[51]

'Until late 1947, it was not known that cases of chronic disease had occurred in the Ohio production plants, but evidence then accumulated rapidly that such cases existed among both employees and residents in the vicinity of the Lorain plant. One case developed symptoms in 1944. and died in 1946 with a diagnosis of Boeck's sarcoid (AEC, 1948b), a granulomatous lung disease that resembles berylliosis in some respects. The physician who reviewed the history of that case in the fall of 1947 changed the diagnosis to berylliosis, in view of what had been learned about the disease in other parts of the country. The AEC field investigating team, with the knowledge and encouragement of the Brush Beryllium Company,began to canvass the local physicians and gather information about these cases. 'By July 1948 it was known that at least five cases of chronic disease had developed among former employees of the plant and that eight cases were known among nearby residents who had no history of occupational exposure.' In 1948, the first of many cases among workers' wives was diagnosed. These women were exposed to the toxic metal dust while washing their husband's work clothes.'[52]

'The use and handling (preparation) of the metal and its compounds, however, have caused an appreciable number of dramatic illnessess, and, therefore, the injurious

CRS: **Radioactive Waste Streams:Waste Classification for Disposa**l / Anthony Andrews. 2006. - 41 pp. - http://www.fas.org/sgp/crs/misc/RL32163.pdf

Ritchie, J.C. & Ritchie, C.A.. **Bibliography of Publications of 137Caesium Studies Related to Erosion and Sediment deposition1**. United States Department of Agriculture Botanical Consultant. Agricultural Research Service. (2005). - http://hydrolab.arsusda.gov/cesium/Cesium137bib.htm.

[233]**Uranium Downblending and Disposition Project: Technology Readiness Assessmen**t. / Herbert G. Sutter, Team Lead et al . Prepared by the Office of Waste Processing. Office of Engineering and Technology. U.S. Department of Energy. 2008. - 64 pp.

51 **Toxicological Profile for Beryllium**. U.S. Department of Health and Human Services. Public Health Service. Agency for Toxic Substances and Disease Registry. 2002. - 290 pp.
- http://www.atsdr.cdc.gov/toxprofiles/tp4.pdf

52 **Origins of the Standards for Control of Beryllium Disease (1947-1949)** / Merril Eisenbud. Institute of Environmental Medicine. New York University Medical Center. Enviromental Research, Vol. 27, No. 1, February 1982.

Beryllium and Air Pollution : An annotated bibliography / Office of Technical Information and Publications, Air Polution Technical Information Center. Research Triangle Park, N. C., U. S. Environmental Protection Agency, Air Pollution Control Office . - Washington, U.S. Govt. Print. Off. 1971- 75 pp. Online at EPA.

Bibliography on Beryllium Health Problems, 1951. American Ceramic Society Bulletin

Bibliography on the Toxicology of Beryllium, 1957.
This bibliography on the toxicology of beryllium includes references from the medical literature between 1942 and 1956.

The Environmental Working Group: **Chemical Industry Archives**:
- http://www.chemicalindustryarchives.org/dirtysecrets/beryllium/1.asp

Beryllium-Related Industries / John Martyny, Lisa A. Maier, Lee S. Newman. Undated.
- http://toxicology.ws/Greenberg/Chapter%2044%20-%20Beryllium-Related%20Industries.pdf

Agency for Toxic Substances and Disease Registry (ATSDR): **Case Studies in Environmental Medicine.** Beryllium Toxicity, 2008. - 50 pp.

effects of contact with and absorption of these substances are matters of deep concern. Much information concerning the toxicity of beryllium has been collected, but the nature and extent of the hazard associated with its use under a wide variety of conditions are still controversial,'[53] but 'efficacy is unknown for interventions after early identification of beryllium sensitization and disease-such as removal from exposure or early treatment. In this context, the main justification of screening is scientific investigation of risk factors and of natural history. Understanding of risk factors can lead to effective primary prevention. Understanding of natural history of beryllium sensitization, perhaps in concert with genetic risk factors, can lead to consideration of intervention trials and appropriate policy for secondary prevention.'[54]

'26. In its Welcome to Brush Wellman Elmore, Ohio Contractor Orientation Manual" Brush Wellman acknowledged it knew that historically, two percent of the Brush Wellman employees had developed Chronic Beryllium Disease.'[55]

'"We absolutely could have and should have informed the employees about this sooner."
— Susan Houghton, Lab SpokeswomanFebruary 8, 2008 — At Lawrence Livermore Labs in California, as many as 178 GSE Construction workers may have been exposed to the known carcinogen beryllium, a toxic metal that can cause lung cancer and chronic beryllium disease. '[56]

The Energy Employees Occupational Illness Compensation Program

The program, under the Ministry of Labour, provides compensation and health benefits to the U.S. Department of Energy nuclear weapons workers (employees, former employees, contractors and subcontractors) as well as, compensation to certain survivors if the worker has already died. In September 2011, the program had identified 52,407 civilians who lost their health (including 23 851 who developed cancer) from exposure to radiation[57] and toxic substances while producing nuclear weapons for the

53 **Toxic Hazards of Beryllium Propellant Operations** : Critique of Current Safety Practices / Cholak, J., Kehoe, Robert A., Schafer, L. J. . The Kettering Laboratory of the Dept of Preventive Medicine and Industrial Health, College of Medicine, University of Cincinnati, Cincinnati, Ohio. 1964. - 53 pp.
- http://www.dtic.mil/dtic/tr/fulltext/u2/450928.pdf
'Particular emphasis is given to potential hazards arising from plant operations and test firings.'

54 **Risks of beryllium disease related to work processes at a metal, alloy, and oxide production plant** / Kathleen Kreiss, Margaret M Mroz, Boguang Zhen, Herbert Wiedemann, Barbara Barna. Occupational and Environmental Medicine Division, National Jewish Center for Immunology and Respiratory Medicine, University of Colorado Health Sciences Center, Denver, USA. Occupational and Environmental Medicine, 1997 August; 54(8): 605–612.
- http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1128986/pdf/oenvmed00092-0077.pdf

Residual radioactivity in the vicinity of formerly utilized MED/AEC sites / F. F. Haywood and W. A. Goldsmith. Health and Safety Research Division, Oak Ridge National Laboratory, undated. - 14 pp.

55 - http://www.chemicalindustryarchives.org/dirtysecrets/beryllium/pdfs/doc-l.pdf#page=6

56 **Beryllium Exposure Warning Arrives Too Late for Contract Workers at Livermore Lab**.
- http://chronicberylliumdisease.com/news/nw_020808_contract_workers_livermore_lab.htm

57 **Medical effects of ionizing radiation**: nuclear weapons effects / COL John R. Mercier. Military Medical Operations. Armed Forces Radiobiology Research Institute, 2008. - 59 pp.

Medical Management of Radiological Casualties Handbook. Armed Forces Radiobiology Research Institute, 2010. - 57 pp. - http://www.usuhs.mil/afrri/outreach/pdf/3edmmrchandbook.pdf

Deadly Radiation Hazards USA Database: U.S. Radiation Sites. / Louise Franklin-Ramirez and John

U.S.[58]

Radiation Exposure Compensation Act, October 5, 1990

The Congress passed the Radiation Exposure Compensation Act (RECA or the Act)[59], 42 U.S.C. § 2210 note, providing for compassionate payments to individuals who contracted certain cancers and other serious diseases as a result of their exposure to radiation released during above-ground nuclear weapons tests or as a result of their exposure to radiation during employment in underground uranium mines.[60] The 1990 Act provided fixed payments in the following amounts: $50,000 to individuals residing or working "downwind" of The Nevada Test Site; $75,000 for workers participating in above-ground nuclear weapons tests; and $100,000 for uranium miners.
On November 2, 2002, then President Bush signed the Justice Department's FY2002 Authorization bill, which contains several provisions amending the Radiation Exposure Compensation Act (RECA). The changes include revisions to the downwinder and on site participant categories, as well as uranium workers. 'One of the revisions reinserts a portion of Mohave County, Arizona that was inadvertently eliminated when RECA was amended in July 2000. The change also clarifies the requirement that lung cancer must be "primary" for all claimant categories. '[61]

Steinbach. the Visual Information Project . - http://prop1.org/prop1/radiated/states.htm

58 US Labor Department : Office of Workers' Compensation Programs: **EEOICP Program Statistics** http://www.dol.gov/opa/media/press/OWCP/OWCP20111160.htm

59 Civil Division United States Department of Justice: **Radiation Exposure Compensation Act Trust Fund. FY 2012 Performance Budget Congressional Budget Submission**. Undated. - 6 pp. - http://www.justice.gov/jmd/2012justification/pdf/fy12-reca-justification.pdf

GAO: **Radiation Exposure Compensation Act: Program Status**, 2007. - 17 pp. - http://www.gao.gov/new.items/d071037r.pdf

GAO: **Radiation Exposure Compensation Act: Program Status**, 2005. - 13 pp. - http://www.gao.gov/assets/100/93622.pdf

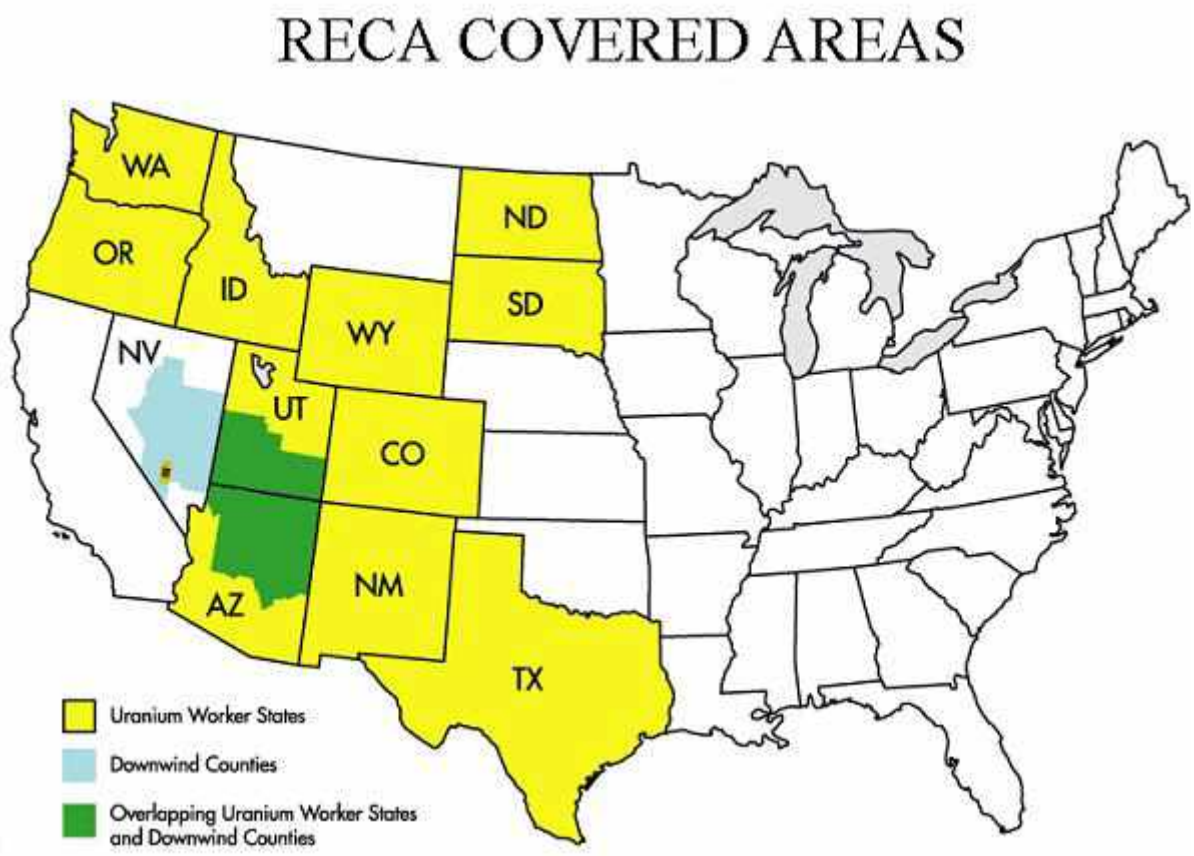
Unfinished Business: Radiation Exposure Compensation Act (RECA) for Post-1971 U.S. Uranium Underground Miners. / Madsen GE, Dawson SE.. J Health Soc Policy. 2004;19(4):45-59. See also:Pubmed

Committee to Assess the Scientific Information for the Radiation Exposure Screening and Education Program, National Research Council: **Assessment of the Scientific Information for the Radiation Exposure Screening and Education Program**. National Academic Press, 2005. - 430 pp. - http://books.nap.edu/catalog.php?record_id=11279

GAO: **Radiation Exposure Compensation: Funding to Pay Claims May Be Inadequate to Meet Projected Needs**, 2003. - 33 pp. -http://www.gao.gov/assets/240/237836.pdf

60 **Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities**: Chapters 1–4 (NUREG-1910, Volume 1) . Office of Federal and State Materials and Environmental Management Programs and Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities: Chapters 5–12 and Appendices A–G (NUREG-1910, Volume 2). U.S. Nuclear Regulatory Commission and Land Quality Division, Wyoming Department of Environmental Quality, 2010. - 1302 pp. - http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/v2/ and, 2009. pp. - http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/v1/

61 - http://www.justice.gov/opa/pr/2002/November/02_civ_646.htm



RECA Covered Areas:- http://www.justice.gov/civil/common/reca.html

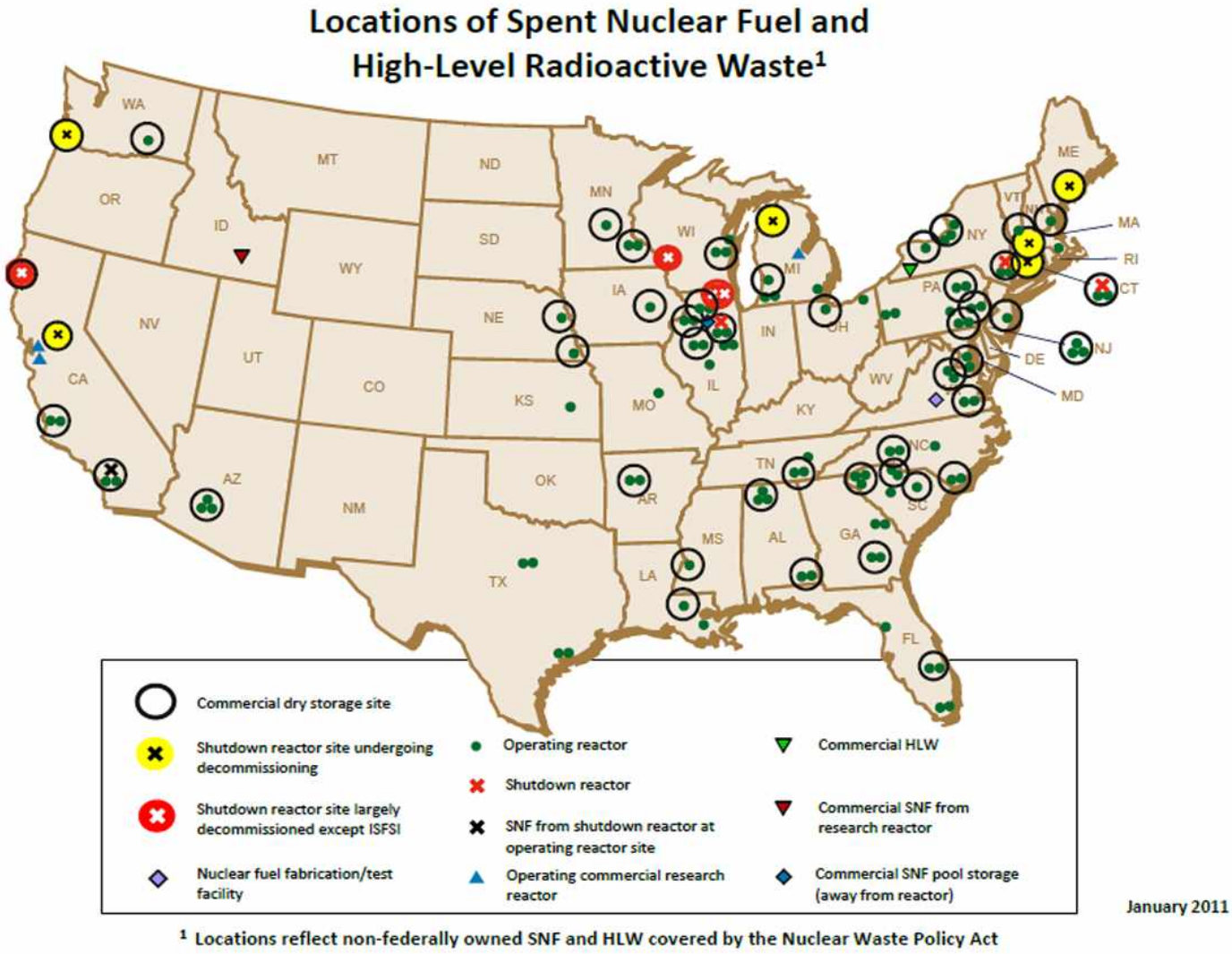
'Uranium Worker States: Arizona, Colorado, Idaho, New Mexico, North Dakota, Oregon, South Dakota, Texas, Utah, Washington, and Wyoming. Downwind, Counties and other: in the State of Utah, the counties of Beaver, Garfield, Iron, Kane, Millard, Piute, San Juan, Sevier, Washington, and Wayne; in the State of Nevada, the counties of Eureka, Lander, Lincoln, Nye, White Pine, and that portion of Clark County that consists of townships 13 through 16 at ranges 63 through 71; and in the State of Arizona, the counties of Apache, Coconino, Gila, Navajo, Yavapai, and that part of Arizona that is north of the Grand Canyon.'

Epidemiological studies at a former nuclear weapons plant

'We outline methods for integrating epidemiologic and industrial hygiene data systems for the purpose of exposure estimation, exposure surveillance, worker notification, and occupational medicine practice. We present examples of these methods from our work at the Rocky Flats Plant--a former nuclear weapons facility that fabricated plutonium triggers for nuclear weapons and is now being decontaminated and decommissioned.

The weapons production processes exposed workers to plutonium, gamma photons, neutrons, beryllium, asbestos, and several hazardous chemical agents, including chlor-

inated hydrocarbons and heavy metals. We developed a job exposure matrix (JEM) for estimating exposures to 10 chemical agents in 20 buildings for 120 different job categories over a production history spanning 34 years. With the JEM, we estimated lifetime chemical exposures for about 12,000 of the 16,000 former production workers.'[62]



62 **Integrating workplace exposure databases for occupational medicine services and epidemiologic studies at a former nuclear weapons facility** / Ruttenber AJ, McCrea JS, Wade TD, Schonbeck MF, LaMontagne AD, Van Dyke MV, Martyny JW. University of Colorado Health Sciences Center, Denver, USA. Appl Occup Environ Hyg. 2001 Feb;16(2):192-200.

American Natural Resources

US. Defense Logistics Agency: Federal Strategic and Critical Materials Inventory[63], including: ferrochromium, ferromanganese, germanium, cobalt, chromium, iridium, tin, tungsten ores and concentrates, and zinc. Oil[64], including the Alaska Oil Pipeline - Deepwater Horizon oil spill, 2010; Prudhoe Bay oil spill, 2006. Rare earth metals. Rhenium. Salt, including the Salmon Site or Tatum Salt Dome[65] in Lamar County, Mississippi, U.S.. Mining Database: Uranium[66] and the Uranium Location Database.

63 **Strategic and Critical Materials Operations Report To Congress** : Operations under the Strategic and Critical Materials Stockpiling Act during the Period October 2009 through September 2010. Under Secretary of Defense for Acquisition, Technology and Logistics. January 2011. - 75 pp.

64 Anthony Sampson. **The Seven Sisters**: The Great Oil Companies and the World They Shaped. New York: Viking Press, 1975.

65 The Salmon Test Site was the location for two nuclear and two methane-oxygen gas explosion tests conducted deep underground in the Tatum Salt Dome. The tests were part of a program designed to detect, identify, and locate underground nuclear explosions Drilling for the "Salmon" event began in April 1963. The Salmon test shot was fired on October 22, 1964. Post-shot activities were completed by June 30, 1965. After the Salmon post-shot activities were completed, the Sterling shot was detonated in the Salmon cavity on December 3, 1966. In March 1968, Sterling cavity reentry drilling, surveying, and coring was begun. The facilities were shut down and the site was placed on standby status on April 12, 1968.
In November 1968, the cavity was prepared for the non-nuclear experiment called "Diode Tube." The shot was fired on February 1, 1969; post-shot activities were completed and the Operation ended in June 1969. Another non-nuclear event, called "Humid Water" took place in 1970. The cavity was prepared in February 1970 and the shot was fired on April 19, 1970. The site was decommissioned on June 29, 1972.

66 **Uranium Location Database Compilation**. EPA: Office of Radiation & Indoor Air Radiation Protection Division, 2006. - 26 pp. - http://www.epa.gov/radiation/docs/tenorm/402-r-05-009.pdf

Tritium

Heavy hydrogen. Tritium has two neutrons, one proton and one electron, where hydrogen usually has only one proton as a nucleus and one electron - is used in hydrogen bombs to enhance fission, a nuclear weapon primary explosion (it can also be used in fission bombs). Tritium was inter alia in the U.S. produced in Oak Ridge and the Savannah River Site, and used in Pinellas Factory, Largo, Florida.[67]

67 Bergeron, Kenneth D.: **Tritium on Ice**: The Dangerous New Alliance of Nuclear Weapons and Nuclear Power. MIT Press, 2004 - 246 pp.

Doney, Scott C.; Williams, P (1992). "**Bomb Tritium in the Deep North Atlantic**". Oceanography 5: 169–170.

NLM Hazardous Substances Databank – Tritium, Radioactive
- http://toxnet.nlm.nih.gov/cgi-bin/sis/download.txt

Oversight hearing on tritium production : hearing before the Subcommittee on Energy and Power of the Committee on Commerce, House of Representatives, One Hundred Fourth Congress, first session, November 15, 1995 (1996). - http://www.archive.org/details/oversighthearingo1996unit

Pinellas Plant - Site Description / Marquis P. Orr, Paul J. Demopoulos, and Brian P. Gleckler.
National Institute for Occupational Safety and Health, 2011. - 41 pp.

Review of Risks from Tritium. Report of the independent Advisory Group on Ionising Radiation on behalf of the Health Protection Agency, 2007 - ISBN: 978-0-85951-610-5

Greek: Beryllium[68] compounds are produced in Japan, Russia and the United States and is mainly used to manufacture military aircraft disc brakes, components for nuclear reactors[69] and nuclear weapons, navigation systems, rocket fuel and mirrors. World production of beryllium in 2010 was about 300 tons.[70] Proven reserves were 16,000 tons, mostly in the USA, and estimated world resources were about 80,000 tons. Thin sheets of beryllium is used in nuclear weapons design as the outer layer of plutonium component of thermonuclear bombs core, positioned to surround the fissile materials. These layers of beryllium are "pushers" for the implosion of plutonium-239, and they are also neutron reflectors, like those is used in beryllium-moderated nuclear reactors. Beryllium oxide is used to make products such as ceramics, gyroscopes, military vehicles, armor, and electrical insulators. Alloys containing beryllium are also used in production of precision instruments, aircraft engines and electrical connections.

68 Sample bibliographies: Defense Documentation Center for Scientific and Technical Information. Cameron Station. Alexandria. Virginia: **Beryllium. A Survey of the Literature, January-March 1962**. An Annotated Bibliography / Compiled by Jack B. Goldmann. Lockheed Missiles & Space Company, 1962. - 123 pp

Defense Documentation Center for Scientific and Technical Information. Cameron Station. Alexandria. Virginia: **Beryllium: An Annotated Bibliography July - September 1962. Supplement II** / Compiled by Jack B. Goldmann. Lockheed Missiles & Space Company, 1963. - 66 pp

- http://www.dtic.mil/dtic/tr/fulltext/u2/404466.pdf

Defense Documentation Center for Scientific and Technical Information. Cameron Station. Alexandria. Virginia: Beryllium: **An Annotated Bibliography October - December 1962. Supplement III** / Compiled by Jack B. Goldmann. Lockheed Missiles & Space Company, 1963. - 60 pp

- http://www.dtic.mil/dtic/tr/fulltext/u2/438176.pdf

' Citations are arranged alphabetically by author under the broad subject headings of Alloys; Analysis; Applications; Bibliographies; Compounds; Corrosion; Fabrication Techniques; Joining; Mineralogy; Oxides; Powder Metallurgy;and Casting; Processing, Properties and Miscellaneous.

Beryllium Pollution (a bibliography with abstracts). Report for 1964-oct 76. National Technical Information Service, Springfield, VA, 1976. - 109 pp.

Fabrication of Beryllium: A Bibliography, 1960. Pratt and Whitney Aircraft Div., United Aircraft Corp., Middletown, Conn.

Report of the Ad Hoc Committee on Beryllium. National Materials Advisory Board, Division of Engineering, National Research Council, 1971. - 93 pp.

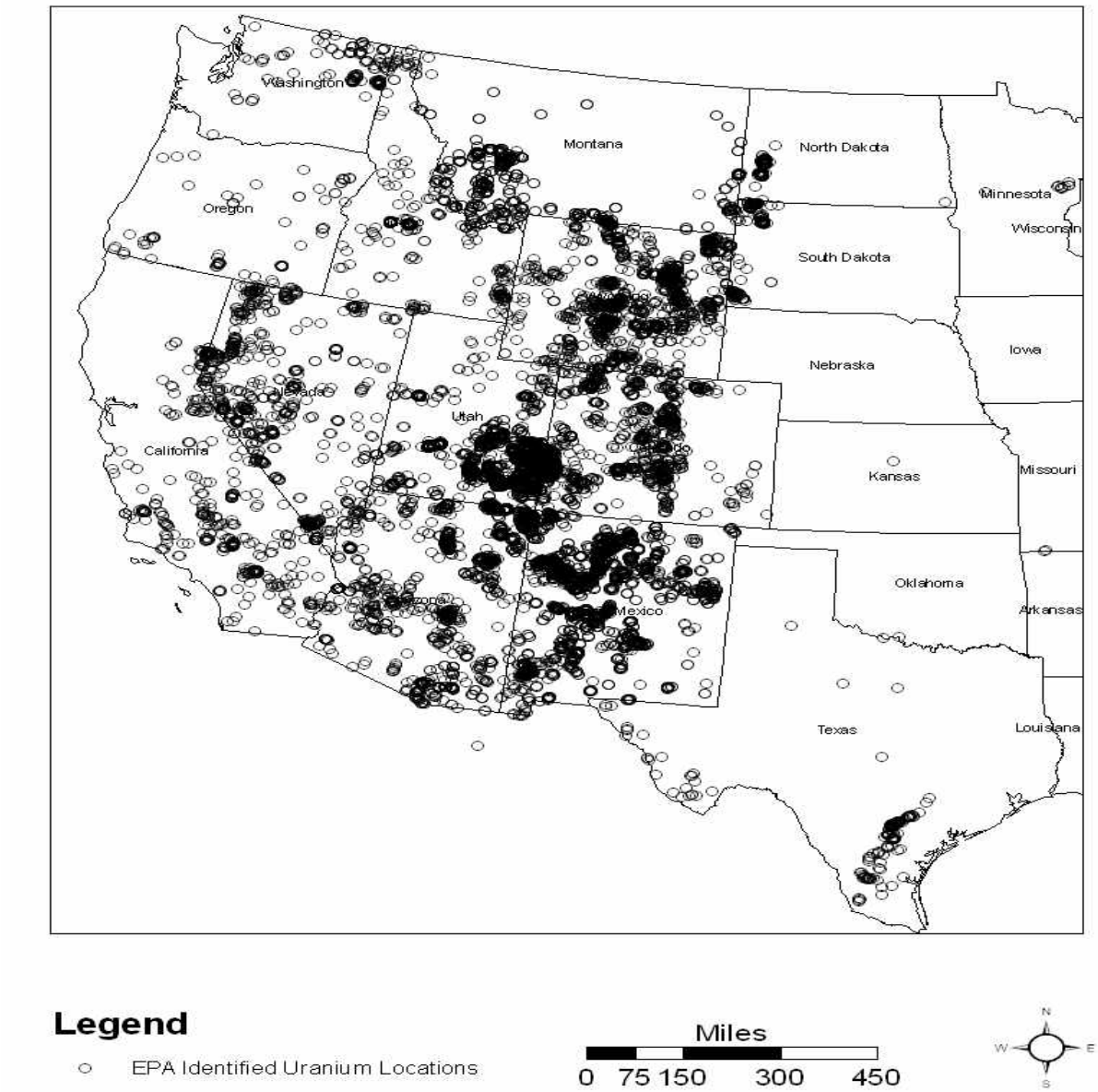
69 DOE: **Nuclear Reactors Built, Being Built, or Planned: 2003 In the United States**, 2003. - 71 pp.

- http://www.ne.doe.gov/pdfFiles/BLUEBOOK2003.pdf

70 **Tritium**. The MITRE Corporation, McLean, Virginia. 2011- 40 pp.

- http://www.fas.org/irp/agency/dod/jason/tritium.pdf

Uranium[71]



Western Uranium Locations From the EPA Uranium Location Database

71 U.S. Energy Information Administration: **2010 Domestic Uranium Production Report**, 2010. - 14 pp. - http://www.eia.gov/uranium/production/annual/pdf/dupr.pdf

In 1958 alone, 850 underground mines and 200 US open pit mines were producing uranium.[72] According to Abandoned Mine Lands, and its Abandoned Uranium Mines, "The uranium mining industry began in the 1940s primarily to produce uranium for weapons and later for nuclear fuel. Although there are about 4,000 mines with documented production, a database compiled by EPA, with information provided by other federal, state, and tribal agencies, includes 15,000 mine locations with uranium occurrence in 14 western states. Most of those locations are found in Colorado, Utah, New Mexico, Arizona, and Wyoming, with about 75% of those on federal and tribal lands'[73] and according to the U.S. Department of Labor, Facilities associated with the Uranium Mill Tailings Radiation Control Act are

1. Uranium Mill in Monument Valley, from May 1989 through February 1990 and September 1992 through May 1994
2. Uranium Mill in Tuba City, from January 1985 through February 1986 and January 1988 through April 1990
3. Climax Uranium Mill from December 1988 through August 1994
4. Uranium Mill in Gunnison, Colo., September 1991 through December 1995
5. Uranium Mill in Maybell, Colo., from May 1995 through September 1998
6. Uranium Mill in Naturita, Colo., May 1994 through November 1994 and June 1996 through September 1998
7. New Uranium Mill in Rifle, Colo., September 1988 through September 1989 and April 1992 through October 1996
8. Old Uranium Mill in Rifle, Colo., September 1988 through September 1989 and April 1992 through October 1996
9. Uranium Mill No. 1 in Slick Rock (East), Colo., in 1995 and 1996
10. Uranium Mill No. 2 in Slick Rock (West), Colo., in 1995 and 1996
11. Uranium Mill in Lowman, Idaho, in 1992 and from 1994 to the present
12. Uranium Mill in Ambrosia Lake, N.M., from July 1987 through April 1989 and October 1992 through July 1995
13. Uranium Mill and Disposal Cell in Lakeview, Ore., from 1986 through 1989
14. Uranium Mill in Falls City, Texas, from January 1992 through June 1994
15. Uranium Mill in Mexican Hat, Utah, from July 1987 through October 1987 and September 1992 through February 1995
16. Uranium Mill in Riverton, from May 1988 through September 1990
17. Uranium Mill in Converse County (Spook Site), Wyo., from April 1989 through September 1989
18. Uranium Mill in Durango, Colo., already covered for 1948 through 1953, now also is covered for October 1986 through May 1991
19. Vitro Manufacturing in Canonsburg, Pa., already covered as a beryllium vendor facility for 1948, and as an Atomic Weapons Employer facility for 1942 through 1959 (with residual radiation coverage for 1958 through 1985), now also is covered for 1983 through 1985 and for 1996
20. Uranium Mill in Monticello, already covered for 1948 through 1960, now also is covered for remediation performed by DOE and DOE contractors under the Comprehensive Environmental Response, Compensation and Liability Act for 1983 through 2000

72 See also **World Distribution of Uranium Deposits (UDEPO) with Uranium Deposit Classification 2009 Edition**. International Atomic Energy Agency. Vienna International Centre, 2009. - 126 pp.
- http://www-pub.iaea.org/MTCD/publications/PDF/TE_1629_web.pdf

73 **Cleaning Up: Abandoned Hardrock & Noncoal Mines in the West** : A Partnership Report. The Western Governors' Association and the National Mining Association. Undated, 25 pp.
- http://www.westgov.org/wga/publicat/miningre.pdf

Plutonium

Plutonium is the 94th (toxic) element in the periodic system, and has the chemical symbol Pu, which is produced by uranium in nuclear reactors. One pound of the drug would theoretically could provide every person on earth lung cancer. Is a necessary part in producing nuclear weapons.[74] Plutonium was first produced in 1940, and only later, it was found in nature however, only in a marginal amount.

Between 1944 and 1994, the Department of Energy estimates that the United States produced and acquired a total of 111.4 tonnes of plutonium, writes the researcher Robert Alvarez and the world's stockpiles of plutonium is growing

Close to Tokyo are there plutonium articles in the sea match U.S. nuclear explosions between 1946 and 1958 at Bikini Atoll in the Pacific, writes the Danish daily Berlingske Tidende, 08/06/2004.

During the Cold War exposed the U.S. government thousands of human guinea pigs with radioactive pollutants, including 18 Americans who had plutonium injected directly into their bloodstream. In a school in Massachusetts, 73 disabled children were fed with oatmeal irradiated with radioactive isotopes.

MOX, Mixed Oxide Fuel

Mixed oxide fuel = connection between oxygen and another element, here a mixture which includes natural uranium, processed uranium and depleted uranium and weapons grade plutonium. Nuclear waste from nuclear weapons is reused as fuel for

74 **Annotated Bibliography of Literature relating to wind transport of plutonium-contaminated soils at the Nevada Test Site** / N. Lancaster, R.Bamford. Quatemary Sciences Center Desert Research Institute, University and Community College System of Nevada prepared for Nevada Operations Office US. Department of Energy Las Vegas, Nevada, December 1993. - 49 pp.

Alvarez, Robert Plutonium Wastes from the US. Nuclear Weapons Complex.
- Washington DC : - Institute for Policy Studies, 2010. - 16 pp.

The Amount of Plutonium and Highly-Enriched Uranium Needed for Pure Fission Nuclear Weapons / Thomas B. Cochran and Christopher E. Paine. - Washington, DC : Natural Resources Defense Council. Inc. 20005. - 26 pp.

GAO: **Securing US. Nuclear Materials**: DOE Needs to Take Action to Safely Consolidate Plutonium. July 2005. - http://www.gao.gov/cgi-bin/getrpt?GAO-05-665.

Global Stocks of Nuclear Explosive Materials.
http://www.isis-online.org/global_stocks/end2003/tableofcontents.html

National Academy Of Sciences: **Management And Disposition Of Excess Weapons Plutonium** (1994).

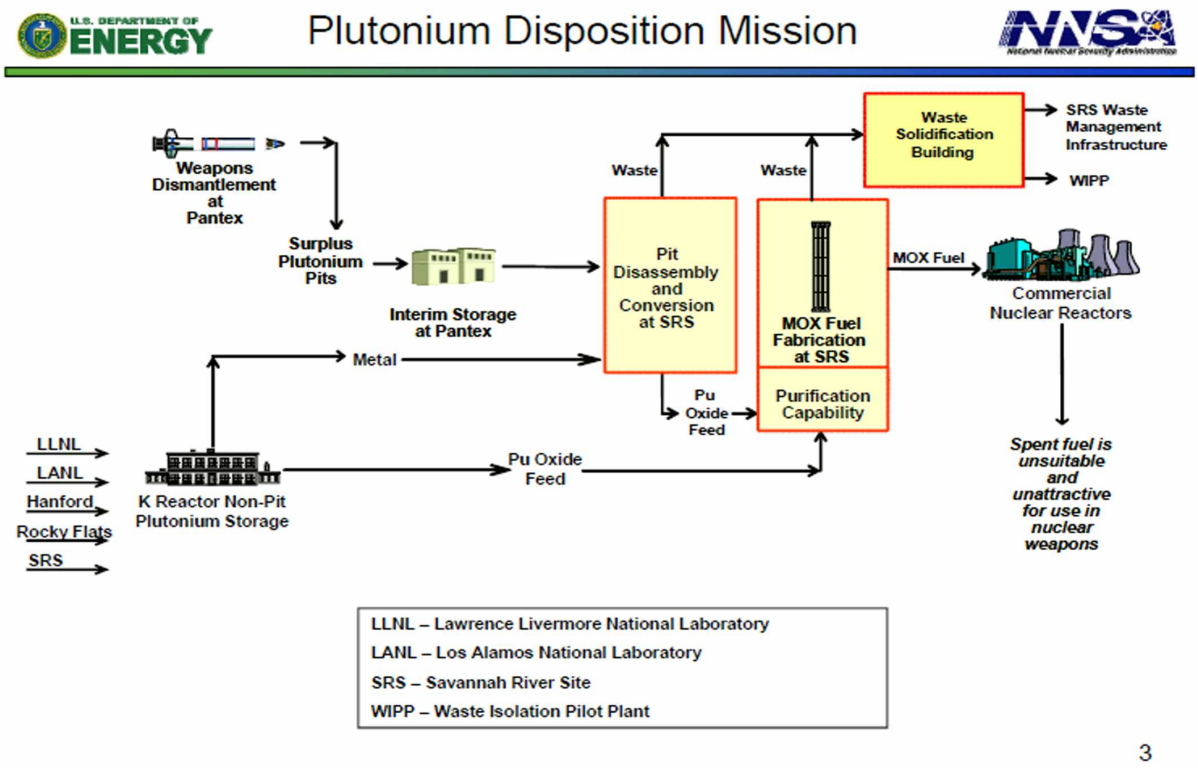
Ritzaus Bureau: Still plutonium in Thule. / Stadig plutonium i Thule. In: Politiken, 06/01/2006.

Stemming the plutonium tide : limiting the accumulation of excess weapon-usable nuclear materials : hearing before the Subcommittee on International Security, International Organizations, and Human Rights of the Committee on Foreign Affairs, House of Representatives, One Hundred Third Congress, second session, March 23, 1994 (1994).
http://www.archive.org/details/stemmingplutoniu00unit

Weapons Plutonium in Los Alamos Soil and Waste: Environmental, Health, and Security Implications. Brice Smith, Ph.D. ; Arjun Makhijani, Ph.D. November 29, 2005

Welsome, Eileen: **The Plutonium Files** : America's Secret Medical Experiments in the Cold War. 1999.

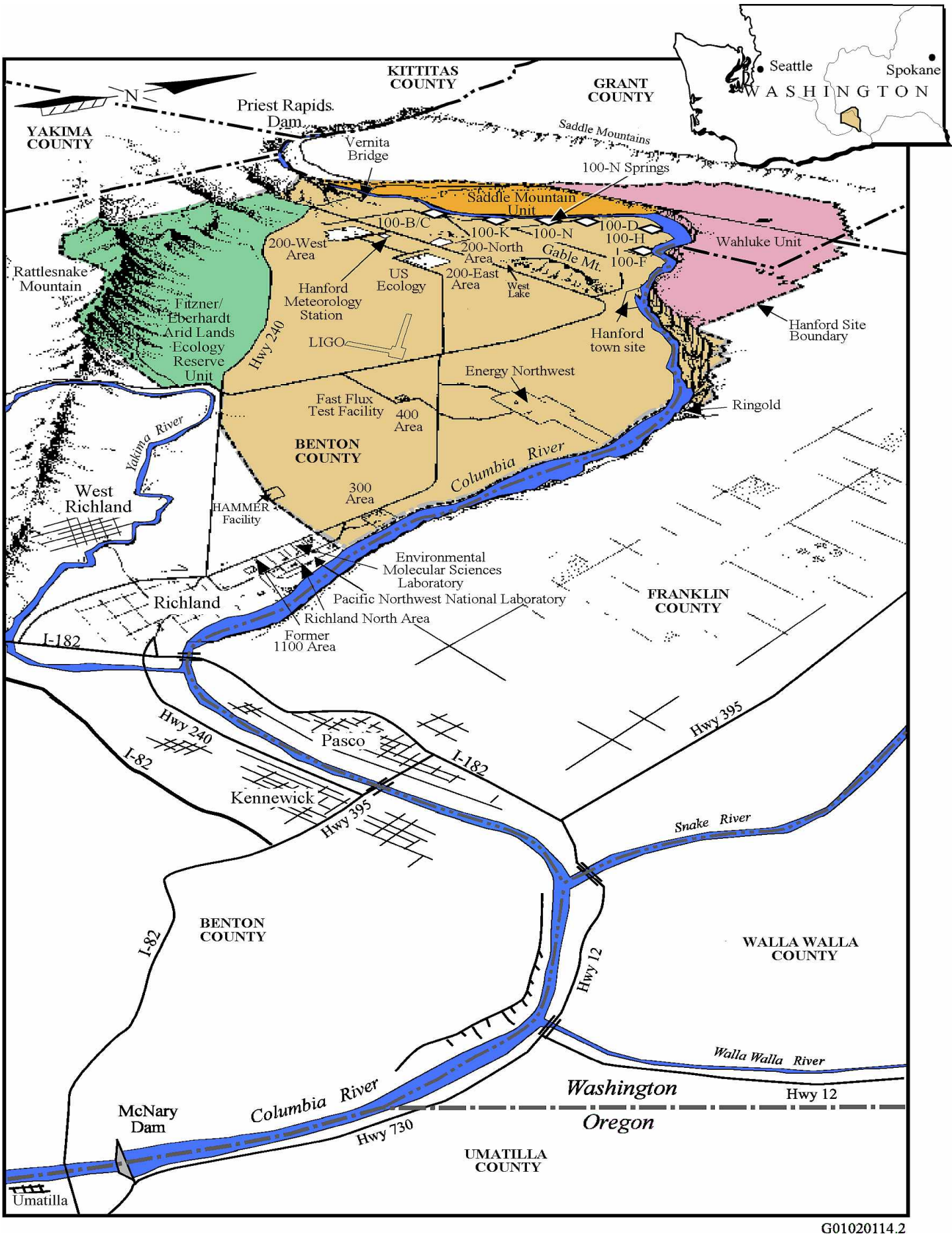
rector production of nuclear power.[75].



See also: Belgonucléaire SA: Dessel, Cadarache, Hanford Site; Marcoule; mineral chemistry ; mineralogy; ; Mixed Oxide Fuel Fabrication Facility,[76] ; nuclear technology ; Savannah River Site ; Sellafield ; Tarapur , Tokai-Mura.

75 DOE: **Mixed Oxide Fuel Fabrication Facility**, 2011. - 9 pp.

76 **The Mixed Oxide (MOX) Fuel Fabrication Facility Project** / McConaghy, John M., Johnson, James V.), Bradley, Terry L., Li, Chin T., Meisenheimer, James K., Tsai, Nien C., 2001. - http://www.iasmirt.org/SMiRT16/K1254.PDF


KITTITAS COUNTY
GRANT COUNTY
YAKIMA COUNTY
N
Priest Rapids Dam
Vernita Bridge
Saddle Mountains
100-N Springs
Saddle Mountain Unit
100-B/C
100-K
100-N
100-D
100-H
100-F
Wahluke Unit
200-West Area
200-North Area
200-East Area
Gable Mt.
West Lake
US Ecology
Hanford Meteorology Station
Rattlesnake Mountain
Fitzner/ Eberhardt Arid Lands Ecology Reserve Unit
Hwy 240
LIGO
Hanford town site
Hanford Site Boundary
Energy Northwest
Fast Flux Test Facility
400 Area
Ringold
Yakima River
BENTON COUNTY
Columbia River
West Richland
300 Area
HAMMER Facility
Environmental Molecular Sciences Laboratory
Pacific Northwest National Laboratory
Richland
Richland North Area
Former 1100 Area
FRANKLIN COUNTY
I-182
Hwy 395
Hwy 240
I-82
Pasco
Kennewick
Snake River
BENTON COUNTY
WALLA WALLA COUNTY
Hwy 12
Walla Walla River
McNary Dam
Columbia River
Washington
Oregon
Hwy 730
UMATILLA COUNTY
Umatilla
Seattle
Spokane
WASHINGTON

G01020114.2

Hanford Engineer Works or Hanford Nuclear Reservation

American facilities to process plutonium for weapons use near the Richland and Columbia River in the Washington State. Started during WWII by the U.S. government as part of the Manhattan Project who invented and developed the first atomic bombs. Later, during the Cold War, the project was expanded to include nine nuclear reactors and five large-scale plutonium reprocessing and MOX plants.[77] Today the area is heavily polluted.[78]

77 **Surveillance of Hearing Loss Among Older Construction and Trade Workers at Department of Energy Nuclear Sites** / John Dement, Knut Ringen, Laura Welch, Eula Bingham, and Patricia Quinn. American Journal of Industrial Medicine 48:348–358 (2005).

'Medical screening programs at three Departments of Energy (DOE) nuclear weapons facilities (Hanford Nuclear Reservation, Oak Ridge, and the Savannah River Site) have included audiometric testing since approximately 1996. This report summarizes hearing evaluations through March 31, 2003.'

'Hearing thresholds among DOE workers were much higher than observed in a comparison population of industrial workers with low noise exposures. Overall, 59.7% of workers examined were found to have material hearing impairment by NIOSH criteria. Age, duration of construction work, smoking [sic], and self-reported noise exposure increased the risk of hearing loss.'

78 **U.S. nuclear storage is »one of the most polluted places on Earth«** : A report from the U.S. National Audit Office call the state of 177 underground tanks with chemical and radioactive waste from nuclear weapons production for uncertain. 67 of the tanks leaking already. Kalika Bro-Jorgensen In the Danish weekly: The Engineer, Tuesday July, 15th. 2008.

- http://ing.dk/artikel/89712-amerikansk-atomlager-er-et-af-de-mest-forurenede-steder-paa-jorden

Contractors: Entire area: Fluor Daniel (1994 -.); Westinghouse Hanford (1987-1994), General Electric Company (1946-1965); EI Du Pont de Nemours & Company (1943 to 1946). Reactor operations: UNC Nuclear Industries (1973-1987); United Nuclear Industries (1967-1973); Douglas United Nuclear (1965-1967). Chemical Processing: Rockwell Hanford Company (1977-1987), Atlantic Richfield Hanford Company (1967-1977); Isochem, Incorporated (1965-1967).[79]

Washington Closure Hanford manages the $2.3 billion River Corridor Closure Project for the DOE's Richland Operations Office. The company is responsible for protecting the Columbia River by cleaning up 555 waste sites, demolishing 329 buildings, placing two plutonium production reactors and one nuclear facility in interim safe storage, and operating the Environmental Restoration Disposal Facility.

Peace Movements: Hanford Challenge.
The Hanford Downwinders Litigation website

Disposal of plutonium-contaminated wastes, 1960s

GAO: Report to the Subcommittee on Energy and Water Development, Committee on Appropriations, House of Representatives : **Nuclear Waste** : DOE Lacks Critical Information Needed to Assess Its Tank Management Strategy at Hanford, 2008. - 51 pp. - http://www.gao.gov/new.items/d08793.pdf

GAO: **Nuclear Waste: Department of Energy's Hanford Tank Waste Project— Schedule, Cost, and Management Issues**. 1998.- 36 pp. - http://www.ricllc.com/gao9913.pdf

GAO: Report to the Subcommittee on Energy and Water Development, Committee on Appropriations, House of Representatives : **Hanford Waste Treatment Plant** : Department of Energy Needs to Strengthen Controls over Contractor Payments and Project Assets, 2008. - 48 pp. - http://www.gao.gov/new.items/d07888.pdf

Hanford Site Environmental Report for Calendar Year 2009 (Including Some Early 2010 Information). / Editors: TM Poston, JP Duncan, RL Dirkes. September 2010. Prepared for the U.S. Department of Energy by personnel from the Pacific Northwest National Laboratory. 393 pp.
- http://hanford-site.pnnl.gov/envreport/2009/index.htm

US Dept of Energy: **Accelerating Hanford Cleanup**.- http://www.archive.org/details/acc300

US Dept of Energy: **Five Decades of Hanford Plutonium Production** (1997).
'A documentary featuring the history of plutonium production at Hanford. Film footage, photographs, and animation is used to highlight key facilities and to explain how plutonium is produced'.

Hanford: the Real Story. Michael Fox, Ph.D.
'Dr. Fox, a consultant with Westinghouse Hanford Co., has worked at Hanford for 22 years. Doctors for Disaster Preparedness 17th Annual Meeting 1999- Seattle, WA'.
- http://www.archive.org/details/HanfordTheRealStory.MichaelFoxPh.d

79 **The Hanford Thyroid Disease Study**."HTDS is a study of thyroid disease among people who were exposed to radioactive iodine (iodine-131) from the Hanford Nuclear Site in Washington State. The exposures occurred from 1944 through 1957. The question of the study was, "Did exposure to iodine-131 from Hanford result in increased incidence of thyroid disease?" Centers for Disease Control and Prevention and the Fred Hutchinson Cancer Research Center released the Final Report in June 2002'.- 614 pp.

Kansas City Plant

American nuclear weapons plant in Kansas City in the state with the same name. The Kansas plant is part of the U.S. Department of Energy's nuclear weapons industrial complex run by the multinational arms factory Honywell. The company assembles the conventional nuclear weapons parts. The factory is located in a heavily polluted industrial area on the outskirts of town, cooperates the Pantex plant in Texas, where the final assembly of warheads takes place.[80]

80 **Environmental Assessment for the Modernization of Facilities and Infrastructure for the Non-Nuclear Production Activities Conducted at the Kansas City Plant**. DOE/EA – 1592, April 21, 2008.

US. Environmental Protection Agency, Office of Inspector General: **Vapor Intrusion Health Risks at Bannister Federal Complex Not a Concern for Buildings 50 and 52, Unknown for Other Buildings**. 2011. - 22 pp.

U.S Nuke Parts Site Nearly Half Done. Global Security Newswire Tuesday, Oct. 18, 2011

'One year after work began, construction is roughly 45 percent complete for a facility in Kansas City, Mo., that will produce non-nuclear parts for the US. strategic arsenal, the Kansas City Star reported on Monday.

The 1.57 million square foot complex is set to replace the Bannister Federal Complex plant, which opened in 1949. Work on the new Kansas City facility is projected to finish in November 2012. The $1 billion plant, expected to be fully operational in 2014, is being built by private developer CenterPoint Zimmer LLC, for Honeywell Federal Manufacturing and Technologies.

That company has an agreement with the US. National Nuclear Security Administration to produce 85 percent of the non-nuclear pieces in an atomic warhead. The replacement complex, which will include five concrete structures, is expected to operate until at least 2042, according to one federal estimate.'

Wittner, Lawrence S.: **Kansas City Here It Comes: A New Nuclear Weapons Plant!**. In: The Time Line of the Danish Peace Academy, 09/05/2011.

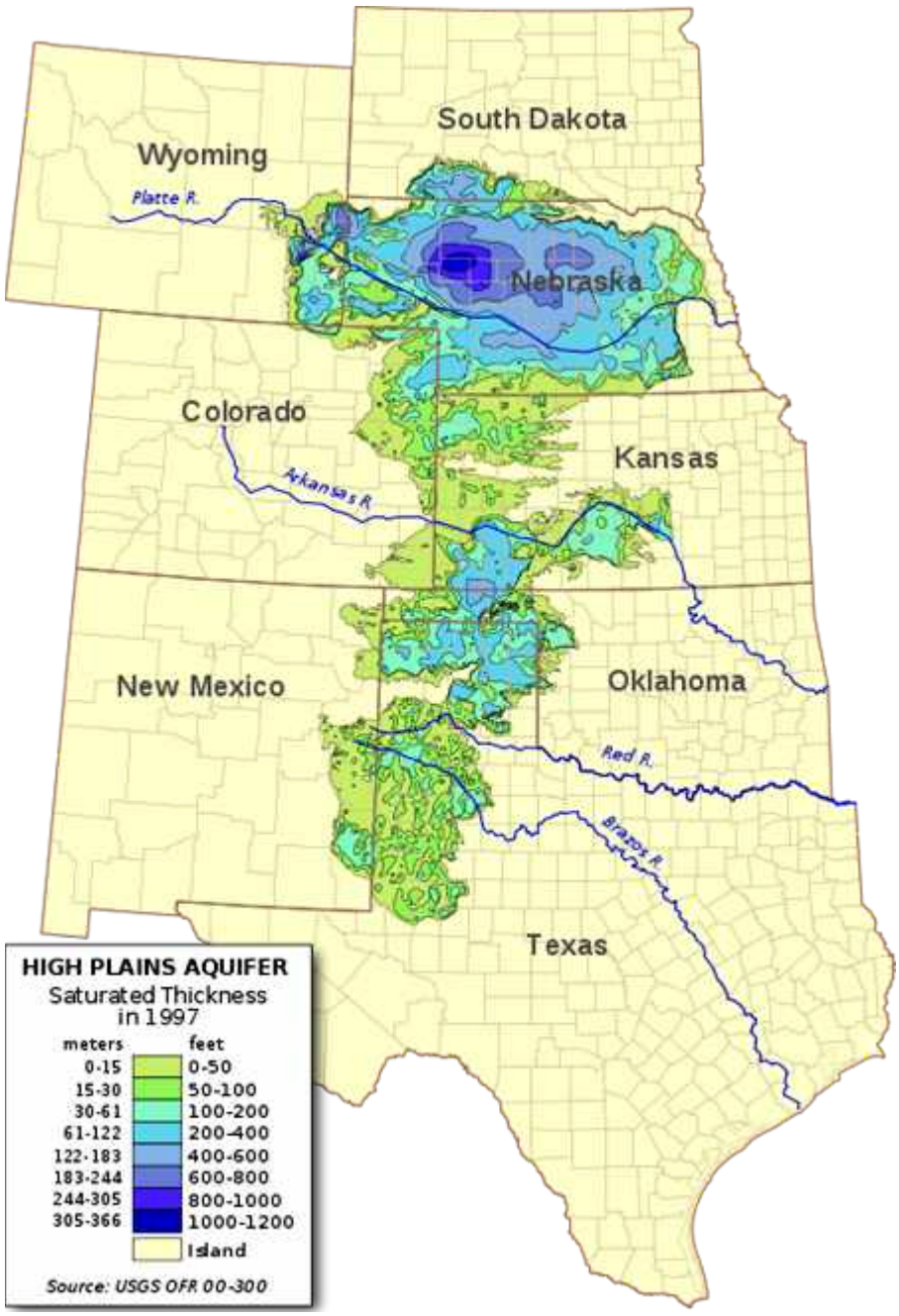
Pantex Plant

The Pantex Plant near Amarillo, Texas began operations in 1942. During the Second World War, its main function was to load conventional ordnance [81], bombs and shells with explosive materials. This factory was decommissioned in 1945.

In 1949, the government sold the plant to Texas Technological College (now Texas Tech University) for one dollar. The army required the site in 1951 at the request of the Atomic Energy Commission, so that the AEC could build a facility to assemble and disassemble nuclear weapons. Procter and Gamble was the operating contractor. The Mason and Hanger-Silas Mason Company, contracted to rehabilitate the facility, took over operating the plant in 1956 when Procter and Gamble declined to renew its five-year contract. In 1963, the AEC assumed full control of the site. In 1984, and again in 1989, several thousand additional acres were leased from Texas Tech as a security buffer.

Pantex has been the main facility to put together nuclear weapons components into the final product, having assembled almost all of the over 60,000 nuclear weapons produced in the United States. It has also been responsible for dissembling nuclear weapons, but the exact number involved is not clear because the lines between assembly and disassemble are blurred. The US Department of Energy has implied that some 50,000 nuclear weapons were permanently disassembly between 1945 and 1992 at Pantex, but in 1993, the DOE admitted that probably only 10,000 to 15,000 were actually permanently disassembled (emphasis added). Pantex has facilities for fabricating the non-nuclear high explosives that compress the plutonium trigger of a nuclear weapon. When a weapon is disassembled, the high explosive is removed to avoid an accidental detonation. The high explosives are burned in the open air in an area known as the burning ground.

81 **Ammunition and Explosives Storage for the Navy (1939-1989) and the Air Force (1946-1989)**. Draft / Dean A. Doerrfeld, M.A. Principal Investigator, Kathryn Dixon, B.A., Dean A. Doerrfeld, M.A., Christine Heidenrich, M.A., and Rebecca Gatewood, M.H.P. R. Christopher Goodwin & Associates, Inc. for Naval Facilities Engineering Command. Washington Navy Yard, DC and United States Air Force Center for Environmental Excellence. Brooks City-Base Texas, 2008. - 200 pp.
- http://www.denix.osd.mil/cr/upload/af-navy-ammunition-storage-public-rfs_pg1-200_rev.pdf

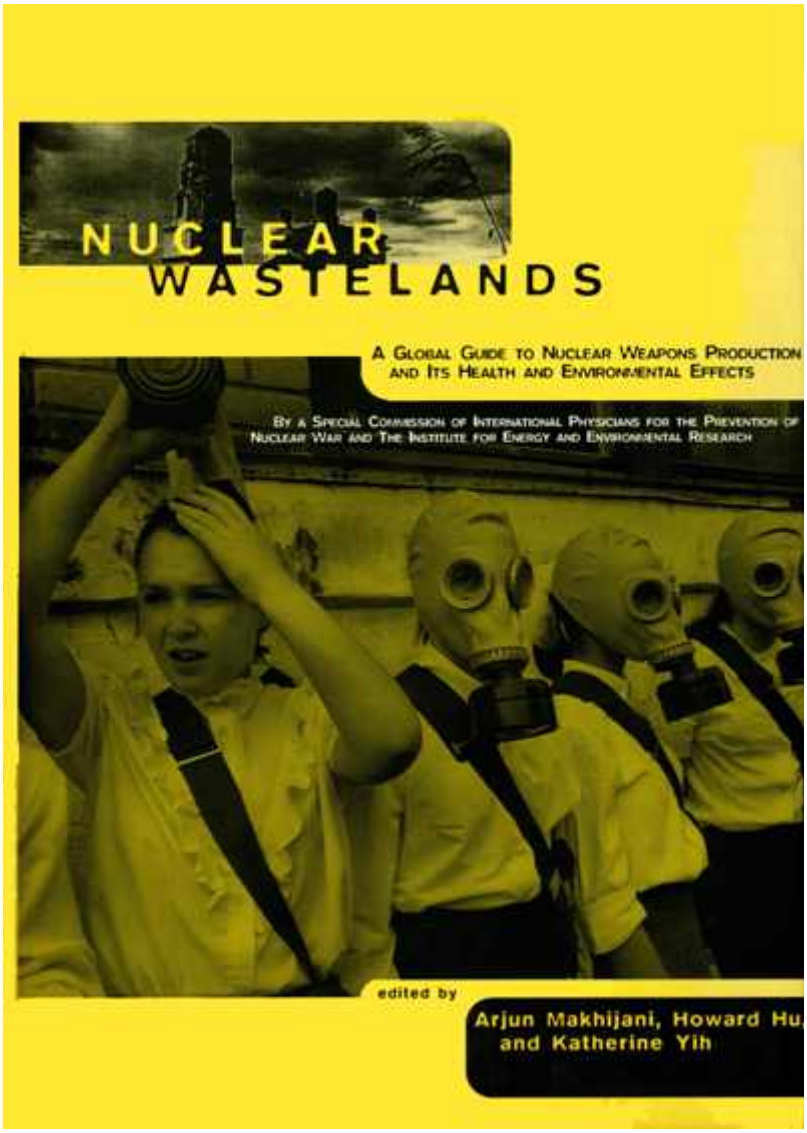


Pantex has released both radioactive and non-radioactive hazardous materials into the environment.[82] DOE reports only 134 cubic meters of low-level radioactive waste is buried at Pantex. This relatively small volume is explained by the fact that the plant ships most of its waste to other facilities in the US.

One of the main environmental concerns arising from Pantex is the potential contamination of the Ogallala Aquifer which is about 150 meters deep in the area of Pantex. To date, no contamination has been detected in the aquifer. However, a number of crucial water systems at Pantex have been contaminated, (emphasis added) and some evidence points to possible future contamination of the Ogallala

82 Oak Ridge Associated Universities: **Pantex Plant – Site Description**, 2006. - 18 pp.

Pantex has on-site, a continuous system of 'perched'aquifers, comprising shallow, local zones of water. In 1993, the DOE reported that ground water sampling in one of the perched aquifers indicated the presence of various solvents, heavy metals, and high explosives, but the Department maintained that perched aquifers are "distinctly separate" from the Ogallala. However, a 1993 study found that "all recharging ground water that is perched" will eventually migrate "downward to the Ogallala aquifer"; and residents near the plant use this aquifer for drinking water and agriculture, although it is not used for these purposes on-site. Furthermore, a 1988 DOE study found that the release of waste chemicals to unlined waste pits from 1954 to 1980 posed a risk of migration into ground water, which would contaminate aquifers used for local water supplies. The study ranked this chemical contamination risk at Pantex among the greatest hazards in the overall US nuclear weapons complex. The chemicals involved include toluene, acetone, tetrahydrofurane, methanol, dimethylformamide, methyl ethyl ketone, and ethanol.



There is also evidence of uranium releases into the environment at Pantex. According to a 1985 DOE report, uranium in vegetation samples at Pantex exceed background by

70 times, and uranium concentrations in the kidneys of jackrabbits on the site were four to six times greater than background.

Pantex officially stopped assembling nuclear weapons in the early 1990s. However, it continues to maintain existing weapons systems, and also dismantles them. In some cases, dissembled weapons may be refurbished and reassembled for subsequent deployment. Currently, activity at Pantex is centered on the dismantlement of nuclear weapons and the storage of plutonium pits.

Plutonium pits from dismantled warheads are accumulating rapidly at Pantex. In times past these pits were sent to the DOE's Rocky Flats Plant near Denver Colorado for reworking into new warheads.[83] Now that the mission at the Rocky Flats site has changed from production to clean-up, the pits are being stored at Pantex for what the DOE has called an "interim period". Since the long-term disposition of plutonium has yet to be firmly decided, the interim storage of thousands of plutonium pits at Pantex could stretch into the decades. As Pantex has not been designed as a plutonium storage facility, this practice as mandated by the DOE is highly dubious.[84]

Examples of environmental contamination at Pantex plant in Texas in connection with the production of nuclear weapons during the Cold War, quoted from Nuclear Wastelands pp. 236-237:

- Radionuclides[85] (radioactive substances) in soil: alpha and beta decay of plutonium, tritium, thorium, uranium
- Metal contamination in soil and water: beryllium, lead, chromium, copper, silver
- Inorganic compounds in soil and water: barium (used primarily for drying), cyanides - including hydrogen cyanide, hydrofluoric and sulfuric
- Volatile organic compounds or organic solvents in the soil: acetone, benzene, dimethylformamide, ethyl acetate (flammable chemical of connection between acetic acid and ethanol), chloroform (here, presumably used as a cleaning agent (see also: radiolysis of chloroform in the intense radiation pulse from a nuclear explosion)), methylene chloride (glue), methyl ethyl ketone (eg used as cellulose thinners), methylisobutyl ketone, carbon tetrachloride or carbon tetrachloride (also fire-extinguishing agent), tetrahydrofuran (mainly used for PVC), toluene (used as glue and manufacture of the explosive TNT) , Trichloroethylene (cleaning agent to clean and degrease metal parts)
- Volatile organic compounds precipitated in the groundwater, including the Ogallala aquifer: acetone, dimethylformamide, ethyl acetate, chloroform, methylene chloride, methyl-ethylketon, methylisobutyl, ketones, alcohols, benzene, carbon tetrachloride, tetrachloroethane, tetrahydrofuran, toluene, tri-

83 Amarillo Railroad Museum, Inc:: **Department of Energy Nuclear Weapons Transport Cars**. http://amarillorailmuseum.com/white_train.html

84 Source: **Nuclear Wastelands: A Global Guide to Nuclear Weapons Production and It's Health and Environmental Effects**, Arjun Makhijani et al (eds.), The MIT Press, 1995.

85 ITRC (Interstate Technology & Regulatory Council). 2006. **Real-Time Measurement of Radionuclides in Soil: Technology and Case Studies**. RAD-4. - Washington, D.C.: Interstate Technology & Regulatory Council, Real-Time Radionuclide Team. - http:www.itrcweb.org.

chlorethylene
- Various soil contamination: acetic acid, benzene, dioxins, polychlorinated biphenyls and TNT

Pinellas Plant, Largo, Florida

Part of U.S. nuclear weapons industrial complex.
The Pinellas plant facilities consist of approximately 70,195 square feet under roof in an area of 40.4 hectares (99.9 acres). General Electric Corporation built the original facility in 1956.

The Atomic Energy Commission, bought the facility in June 1957 and awarded a 25-year operating contract to GE that lasted until May 31, 1992. The Pinellas Plant, as it was named, continued to be used to engineer, develop, and manufacture components, such as neutron generators, to support the U.S. nuclear weapons program. DOE expanded the Pinellas Plant mission to produce multiple electronic and support components for other DOE programs. The expanded mission included the design, development, and manufacture of special electronic and mechanical nuclear weapons components, such as neutron-generating devices, neutron detectors, and associated product testers. Other work involved electronic, ceramic, and high-vacuum technology. Spe-

cifically, the expanded mission included the manufacture of thermal and long-life ambient temperature batteries, specialized shock-absorbing foam supports, ferroelectric- and glass-ceramic encapsulation materials, and Radioisotopically-powered Thermoelectric Generators.
Extensive environmental contamination with various heavy metals.[86]

Portsmouth Gasdiffusion Plant

The Portsmouth Gasdiffusion Plant, located in Piketon, Ohio, began operations in 1954 as part of the U.S. government's development program for the production of highly enriched uranium to fuel military reactors and components for nuclear weapons production.[87]
The primary form of uranium enrichment was gaseous diffusion of uranium hexaflourid, to separate the lighter fissile isotope, U-235 from the heavier non-fissionable isotope, U-238. Production ceased in 1991. During the nearly 60 years of operation, cleaning, maintenance and replacement of process equipment in situ generated spent solvents and other contaminants, which was disposed in landfills and in storage buildings.[88] To date, contamination is found at various locations at the plant, including

86 **Pinellas Plant - Site Description** / Marquis P. Orr, Paul J. Demopoulos, and Brian P. Gleckler. National Institute for Occupational Safety and Health, 2011. - 41 pp.
Pinellas Plant Environmental Baseline Report. Lockheed Martin Specialty Components, Inc.. Environmental, Safety and Health Division for The US Department of Energy. Pinellas Area Office, 1997. - 363 pp.
Status of Upcoming SEC Petitions / LaVon B. Rutherford, CHP. National Institute for Occupational Safety and Health Division of Compensation Analysis and Support. 2011. - 6 pp.
- http://www.cdc.gov/niosh/ocas/pdfs/abrwh/pres/secstat0811bw.pdf
87 United States Department of Energy. Environmental Information Center: **Information Repository Index for the Portsmouth Gaseous Diffusion Plant.** 2008.- 50 pp.
88 DOE, Office of Oversight, Environment, Safety and Health: **Portsmouth Gaseous Diffusion Plant**

process buildings, past the cooling towers, landfills, sewage ponds and in other buildings. There is also groundwater plumes from landfills. Contractors: USEC 2001 -., Los Alamos Technical Associates and Parallax Portsmouth 2005-2009 (cleanup); Theta Pro2Serve Management Company in 2005 -2009 (cleanup); Bechtel Jacobs Company 1998-2005 (cleanup), Lockheed Martin Energy Systems, Inc. 1995 -1998, Martin Marietta Energy Systems 1986-1995; Goodyear Atomic Corporation 1954-1986. Contractors: design, construction and operation of the Depleted Uranium Hexaflouride Conversion Project:: Uranium Disposition Services 2002 -.

Savannah River Site

The Tritium plant from 2007

American plutonium, tritium and heavy water[89] factory located in the state of South Carolina created early in a Cold War, 1950, now under the U.S. Department of Energy. Information about the company is still concealed or masked as classified information.[90]

The Savannah River Site[91] located in the Sandhills region of South Carolina and covers an area of 800 square kilometers. In the southern half of the area is a group of buildings with reflective white rooftops. The nearby Savannah River and its tributary rivers gave water for nuclear reactors and to this end, two artificial lakes "L" Lake and two ponds created. Meandering river channel and its floodplain, dominated by gray-brown sediments. When the river is so close to the nuclear field, and because the underlying geological materials (sand, clay, gravel and limestone) are permeable, is a comprehensive and ongoing environmental monitoring and remediation efforts needed to reduce potential contamination of local water sources.

Volume 1: Past Environment, Safety, and Health Practices, 2000. - 99 pp.

89 **Savannah River Site Cold War Historic Property Documentation. Narrative and Photography 400/d area – heavy water production**, Aiken County, South Carolina / Report prepared by: New South Associates, Mary Beth Reed and Mark T. Swanson. 2008. - 236 pp. - http://nationalregister.sc.gov/SurveyReports/HC02002.pdf

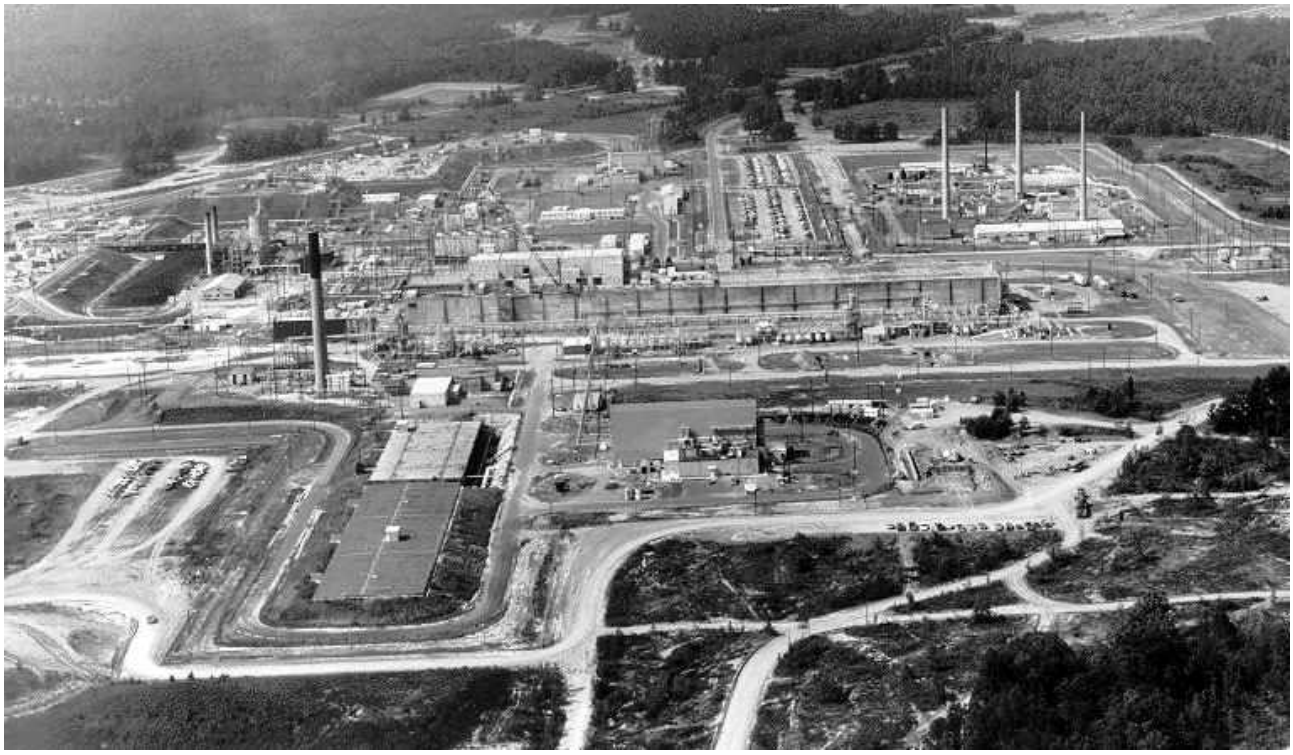
90 **Preservation and Dissemination of the Hardcopy Documentation Portion of the NCSP Nuclear Criticality Bibliographic Database** / B. L. Koponen, D. Heinrichs. May 20, 2009. Topical Meeting of the ANS Nuclear Criticality Safety Division. Richland, WA, United States September 13, 2009 through September 17. - 7 pp.

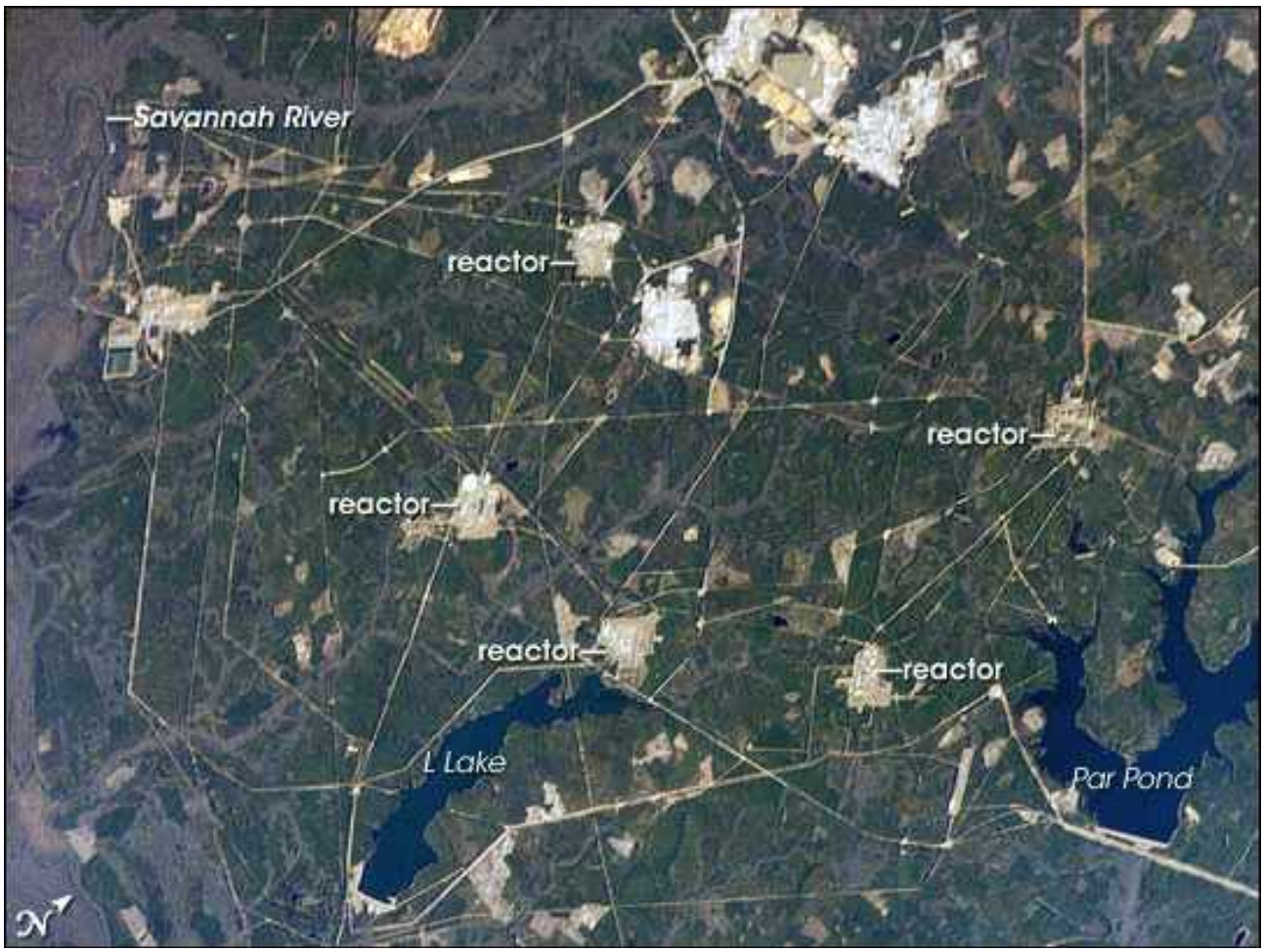
91 National Institute for Occupational Safety and Health: **Misinterpreted dosimetry records resulting in an underestimate of Page 1 of 4 missed dose in SRS dose reconstructions**. 2003. - 4 pp. - http://www.cdc.gov/niosh/ocas/pdfs/pers/oc-per-001-r0.pdf

Richardson D, Wing S. **Mortality among workers at the Savannah River Site**. American Journal of Industrial Medicine. 2007; 50(12):881-891.

Richardson D, Wing S. **Leukemia mortality among workers at the Savannah River Site**. American Journal of Epidemiology. 2007; 166(9):1015-22.

The radioactive production was inter alia from the Operation Greenhouse in 1951, used in hydrogen bombs.





Current peace and environmental movements:

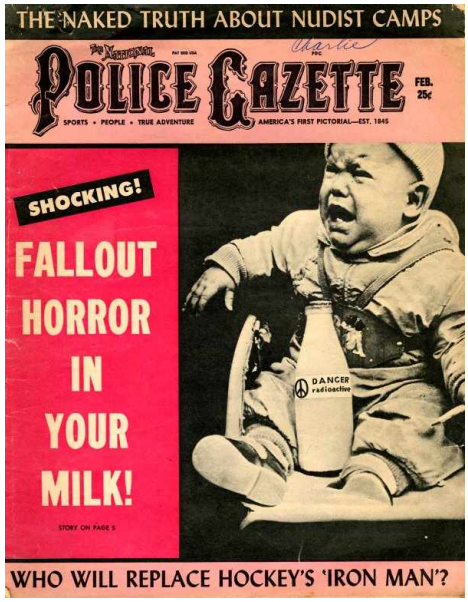
Atlanta WAND - www.atlantawand.org,
Blue Ridge Environmental Defense League - www.bredl.org,
Carolina Peace Resource Center - www.carolinapeace.org,
Nuclear Watch South - www.nonukesyall.org

Yucca Mountain Underground Laboratory

Underground American research and final repository for nuclear waste which was located in test sites in Nevada during the DOE Office for Civilian Radioactive Waste Management[92]. "Yucca Mountain has been chosen as the site of the Ministry geological repository designed to store and dispose of spent nuclear fuel and radioactive waste. Once constructed, the location will be the nation's first geologic repository for disposal of this type of radioactive waste", the Ministry announced in Yucca Mountain: The Most Studied Real Estate on the Planet. The plant was abandoned in 2010

92 GAO: **DOE Nuclear Waste : Better Information Needed on Waste Storage at DOE Sites as a Result of Yucca Mountain Shutdown**. 2011. - 40 pp.
Underground exploration and testing at Yucca Mountain : A report to Congress and the Secretary of Energy (1993).

Nuclear Weapons Tests



Greek: All military and scientific experiments with nuclear weapons, their hardware and software. A total of 1030 American and 24 British nuclear weapons tests were performed in 55 operations in USA.[93] Apart from a few recitation of the number of nuclear weapons tests and their chronology is there because of military and political causes virtually no technical literature on this subject. All of these experiments are classified or masked as is the case with the few downgraded technical reports that have been released in connection with atomic veterans' claims. Some of the classification rules on nuclear experiments appears in : Control of Nuclear Weapon Data. U.S. DOE: National Nuclear Security Administration, Office of Nuclear Weapon Surety and Quality, 2011. Similarly, non nuclear tests in connection with nuclear tests - such as safety tests - are not the subject of much attention.[94] Has there been two or more blasts on the same day they are as a rule recorded as one experiment. This reduces the apparent extent of the problem.

93 Geoscience Australia: **Nuclear Explosions database** - http://www.ga.gov.au/oracle/nuclear-explosion.jsp

94 Annewandter, Robert: Diploma Thesis. **Modelling Pressure Response and Propagation of the Concentration Front of Tracers indicating Underground Nuclear Explosions induced by Barometric Pumping** - A Double Porosity Approach. Department of Physics Faculty of Mathematics, Informatics and Natural Sciences. University of Hamburg. 2007.- 141 pp.
- http://www.znf.uni-hamburg.de/diplomAnnewandter.pdf

The nuclear weapons club members have made nuclear weapons tests, called hotspots in the USA: Alamogordo Trinity Site and Carlsbad, New Mexico test sites and in Hattiesburg, Mississippi and Nevada as well as in the Pacific, including Johnston Island, Christmas Island (Kiribati), Marshall Islands, including Bikini, Eniwetok and Rongelap Atoll, [95] Micronesia.
France in Algeria: Ekker and Reggan in the Sahara desert, in French Polynesia: Fangatau and Muroroa.
Britain: At the Emu Field, Maralinga[96], Montebello Islands and Woomera in Australia and at Christmas Island.
Kharan desert in Pakistan, Lop Nur in China, Pokhran in India ,in the Indian ocean Prince Edward Islands (Israel and South Africa), in P'unggyeri in North Korea, and in Semipalatinsk and Novaya Zemlya in the Soviet Union, Russia..

Partial test ban with the Partial Nuclear Test Ban Treaty from 1963.[97] All nuclear weapons tests are now under international law, prohibited by the Comprehensive Nuclear-Test-Ban Treaty, 1996.[98]

95 **A Report on the People of Rongelap and Utirik Relative to Medical Aspects of the March 1, 1954 Incident Injury, Examination, and Treatment** / Presented by The Special Joint Committee Concerning Rongelap and Utirik Atolls (Public Law No. 4C-33) to the Fifth Congress of Micronesia, First Regular Session. February 1973. - 299 pp.

US. Government: **Marshall Islands Nuclear Weapons Tests - Bikini, Rongelap, Enewetak, Utrok, Eugelab Atolls, First Hydrogen Bomb - Crossroads, Ivy, Mike Tests, Radiation, Health and Environmental Effects** (CD-ROM).

Commission on Life Sciences: **Radiological Assessments for the Resettlement of Rongelap in the Republic of the Marshall Islands**, National Academic Press, (1994) .
http://books.nap.edu/openbook.php?record_id=2352&page=98

Compensation for the People of Rongelap and Utirik. A Report By The Special Joint Committee Concerning Rongelap and. Utirik Atolls to the Fifth Congress of Micronesia. Second Regular Session, February 28, 19?4 - 97 pp.

Castle Bravo nuclear test, 1954 compiled by Wm. Robert Johnston, 2005.
Database of radiological incidents and related events--Johnston's Archive
http://www.johnstonsarchive.net/nuclear/radevents/1954USA1.html

Martini Gotjé interviewed on Waiheke Radio (July 17, 2010). - http://www.archive.org/details/MartiniGotj

Memorandum of understanding by and between the republic of the Marshall Islands, the Rongeiap atoll local government council, the United States department of energy office of environment, safety and health and the united states department of the interior, office of territorial and international affairs: Memorandum made for the Rongelap resettlement project, 1992. - 13 pp.

Thyroid Absorbed Dose for People at Rongelap, Utirik, and Sifo on March 1,1954 : A Report / Edward T. Lessard, Robert P. Miltenberger, Robert A. Conard, Stephen V. Musolino, Janikiram R. Naidu, Anant Moorthy, and Carl J. Schopfer / Prepared for Roger Ray, Nevada Operations Office United States Department of Energy Safety and Environmental Protection Division Brookhaven National Laboratory Upton, Long Island, New York, Undated. - 84 pp.
- https://www.osti.gov/opennet/servlets/purl/16365783-cRMUbg/16365783.pdf

Thyroid function in a group of former workers from a nuclear weapons research and development facility. / Cadorette, Maureen Farrell, Ph.D., Johns Hopkins University, 2006. 271 pp.
- http://gradworks.umi.com/31/97/3197122.html

96 **Rehabilitation of the Maralinga and Emu Testing Sites (Australia) 2003** / Report by the Maralinga Rehabilitation Technical Advisory Committee Commonwealth Government, Department of Education, Science and Training, 2003. - 456 pp.

97 **Bekendtgørelse af traktat om forbud mod kernevåbenforsøg i atmosfæren, det ydre rum og under vandet**.

98 Medalia, Jonathan: **Comprehensive Nuclear-Test-Ban Treaty: Background and Current Developments**. CRS, 2011. - 54 pp.

See also: U.S. Citizen Alert Water Sampling Program; CTBTO (the Preparatory Commission for the Organization for the Comprehensive Ban on Nuclear Tests ; U.S. Ad Hoc Committee on Underwater Atomic Weapons Testing, 1947-1954; U.S. National Association of Atomic Veterans; experimental thermonuclear device; Exercise Desert Rock 1951; U.S. Families in the Offsite Human Surveillance Program; guinea pigs; infrasound monitoring stations; Joint Verification Experiment, nuclear nomads ; nuclear pacifism ; U.S. Nuclear Test Personnel Review (NTPR) Program; Operation Hurricane (Australia) ; Palau ; Project Gnome 1961 ; Project Rulison 1969 ; Project Sedan 1962 ; radioactivity[99] ; US Standby Air Surveillance Network ; US Standby Milk Surveillance

99 Allison, Pam **Radiation Monitoring at Pantex: A Review of the Bureau of Radiation Control Environmental Data 1993-2003**, Peace Farm, 2005.

Anspaugh, Lynn R.: **Radiation Dose to the Population of the Continental United States from the Ingestion of Food Contaminated with Radionuclides from Nuclear Tests at the Nevada Test Site.** Final Report Report to the National Cancer Institute. - Salt Lake City, UT : Lynn R. Anspaugh, Consulting, 2000. - 68 pp.

Armed Forces Special Weapons Project ; Joint Crossroads Committee: **Radiological Defense**. Volume I-III. The Principles of Military Defense against Atomic Weapons (1951).
- http://www.archive.org/details/radiologicaldefe02arme

Department of Defense: **Report on Search for Human Radiation Experiment Records 1944-1994**, 1997. I-III. - 101+60+92 pp.
Appendix I Results of DoD Human Radiation Experiment Records Search - 390 pp.
Appendix II Information Sources - 89 pp.
Appendix III Acronyms and Abbreviations/ Appendix IV Radiation Terms

Network[100] ; Sustainable Stockpile Stewardship ; Tonopah Test Range: An Outdoor Laboratory Facility 1964 ; Trinity[101] ; the UN Scientific Committee on the Effects of Atomic Radiation (UNSCEAR)[102].

http://www.defense.gov/pubs/dodhre/

Mason, Len., "**The National Police Gazette**.," in Special Collections, Item #1141, http://osulibrary.oregonstate.edu/specialcollections/omeka/exhibits/show/atomic/danger/item/1141 (accessed January 10, 2012).

DOE: Radiological Effluents Released from US. Continental Tests, 1961 Through 1992. / C R Schoengold, M E DeMarre, E M Kirkwood. 1996.- 304 pp. ' This report documents all continental tests from September 15, 1961, through September 23, 1992, from which radioactive effluents were released. The report includes both updated information previously published in the publicly available May 1990 report, DOE/NV-317, Radiological Effluents Released from Announced US. Continental Tests 1961 through 1988, and effluent release information on formerly unannounced tests.'

http://www.nv.doe.gov/library/publications/historical/DOENV_317.pdf

100**Offsite Environmental Monitoring Report: Radiation Monitoring Around United States Nuclear Test Areas, Calendar Year 1993** / Deb J. Chaloud, Don M. Daigler, Max G. Davis, Bruce B. Dicey,Scott H. Faller, Chris A. Fontana, Ken R. Giles, Polly A. Huff,Anita A. Mullen, Anne C. Neale, Frank Novielli, Mark Sells, and the Nuclear Radiation Assessment Division United States Environmental Protection Agency. 1996. - 177 pp.

101Bainbridge, K. T.: **Trinity**. Los Alamos National Laboratory & United States Energy Research and Development Administration, 1976. - 94 pp.

Bradshaw, Jessica: **Witnesses of Trinity: The first atomic bomb, July 16, 1945**, New Mexico (2003).

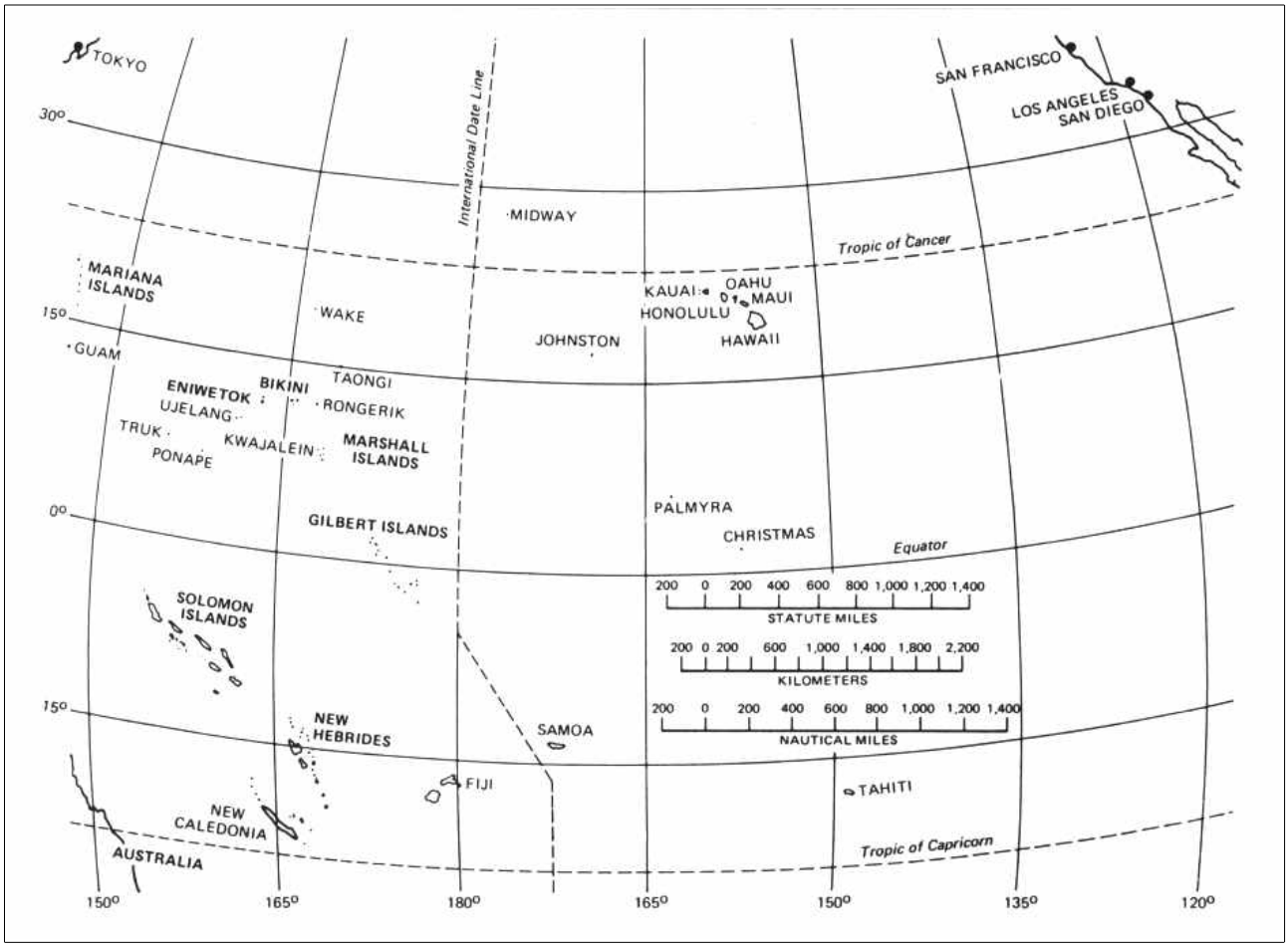
- http://www.archive.org/details/witnessesoftrini2003jess

White Sands Missile Range Public Affairs Office: **Trinity Site: 1945-1995**. a National Historic Landmark. White Sands Missile Range, New Mexico. 1995.

- http://www.atomicarchive.com/History/trinity/index.shtml

102Gusterson, Hugh: **The shared sins of Soviet and US. nuclear testing** [birth abnormalities after nuclear tests] Bulletin of the Atomic Scientists | 29 September 2009.

US Pacific Proving Grounds[103]



The sites in the Marshall Islands, including Bikini, Johnston Island and a few other places in the Pacific, used by the U.S. to conduct nuclear tests in the period 1946-1962, including Operation Crossroads (1946), Operation Sandstone (1948), Operation Greenhouse (1951), Operation Ivy (1952), Operation Castle (1954,) Operation Redwing (1956), Operation hardtack I (1958), and Operation Dominic (1962).

The U.S. nuclear testing program in the Marshall Islands has caused severe damage in Enewetak and Bikini, contaminated other northern atolls, and caused cancer and other diseases among hundreds of Marshall Islanders, including inter alia birth abnormalities in the Marshall Islands is documented.[104]

103**Nuclear Testing Program in the Marshall Islands**: Hearing before the Committee on Energy and Natural Resources United States Senate one hundred ninth Congress first session on Effects of US. Nuclear Testing Program in the Marshall Islands July 19, 2005. GPO, 2005. - 116 pp.

Summary Site Profile for the Pacific Proving Ground / Cheryl Y. Smith and Lori J. Arent. National Institute for Occupational Safety and Health: 2006. - 18 pp. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/ppgr0.pdf

104Yamada, Seiji: **Cancer, reproductive abnormalities, and diabetes in Micronesia**: the effect of nuclear testing. Pacific Health Dialog Vol 11. No. 2. 2004 pp. 216-221.

Known American Nuclear Weapons Tests[105]

Operation Anvil
Operation Aqueduct
Operation Arbor
Operation Argus
Operation Bedrock
Operation Bowline
Operation Buster
Operation Castle
Operation Charioteer
Operation Cornerstone
Operation Cresset
Operation Crossroads
Operation Crosstie
Operation Dominic
Operation Emery
Operation Fishbowl
Operation Flintlock
Operation Fulcrum
Operation Fusileer
Operation Greenhouse
Operation Grenadier
Operation Grommet
Operation Guardian
Operation Hardtack I
Operation Hardtack II
Operation Ivy
Operation Jangle
Operation Julin
Operation Latchkey
Operation Mandrel
Operation Musketeer
Operation Newsreel
Operation Niblick
Operation Nougat
Operation Phalanx
Operation Plumbbob
Operation Praetorian
Operation Project 56
Operation Project 57
Operation Project 58
Operation Project 58A
Operation Quicksilver
Operation Ranger
Operation Redwing
Operation Roller Coaster
Operation Sandstone
Operation Sculpin
Operation Storax
Operation Sunbeam
Operation Teapot
Operation Toggle
Operation Touchstone
Operation Tumbler-Snapper
Operation Upshot - Knothole

105The human cost of nuclear weapons tests is inter alia described in the following publications:

Anspaugh LR. **Radiation dose to the population on the continental United States from the ingestion of food contaminated with radionuclides from high-yield weapons tests conducted in US, UK, and USSR between 1952 and 1963**. National Cancer Institute, Department of Health and Human Services, Centers for Disease Control and Prevention. Report on the Feasibility of a Study of the Health Consequences to the American Population from Nuclear Weapons Tests Conducted by the US and Other Nations. 2000;H:29. - www.cdc.gov/nceh/radiation/fallout/

Department of Defense: **Report on Search for Human Radiation Experiment Records 1944-1994,** 1997. I-III. - 101+60+92 pp.

Appendix I Results of DoD Human Radiation Experiment Records Search - 390 pp.
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Appendix III Acronyms and Abbreviations/ Appendix IV Radiation Terms.

Operation Tumbler-Snapper 1952 : United States Atmospheric Nuclear Weapons Tests. Nuclear Test Personnel Review./ Jean Ponton, Carl Maag, Mary Francis Barrett, Robert Shepanek. - Washington, DC: Defense Nuclear Agency. 1982. - 222 pp.

Report on the Health Consequences to the American Population from Nuclear Weapons Tests Conducted by the United States and Other Nations. Centers for Disease Control and Prevention & the National Cancer Institute, 2001.

See also: **Lookout Mountain Laboratory:The 280 mm Gun at the Nevada Proving Ground**, 1953.
http://www.archive.org/details/The280mmGunattheNevadaProvingGround1953
Lookout Mountain Laboratory: Operation Upshot-Knothole, 1953.
- http://www.archive.org/details/OperationUPSHOT_KNOTHOLE1953

Operation Whetstone Operations Tinderbox
Operation Wigwam

This list could also include the Green Run tests[106], research experiment into the atmospheric diffusion of radioactive gases and the 254 RaLa experiments which were conducted between September 1944 and March 1962. LANL conducted 254 radioactive barium-lanthanum (RaLa) implosion experiments Sept. 1944-March 1962, in order to test implosion designs for nuclear weapons, an inward burst of energy, as a triggering mechanism for an atomic blast. Thousand curies of La, were involved in each experiment which was conducted in Technical Area 10, Bayo Canyon. And Operation Hudson Harbor, September-October 1951, which was part of the Radiation Warfare Program - radioactive barium-lanthanum (RaLa) implosion experiments Sept. 1944-March 1962.

The RaLa experiments

On November 23, 1993, a General Accounting Office report implied that the Air Force and the Los Alamos Laboratory exploded three simulated nuclear devices at Los Alamos to produce radioactive clouds and fallout for the Air Force to track.[107]

Secretary of Defense Les Aspin today asked the Secretaries of the Military Services and the director of the"Defense Nuclear Agency to undertake a comprehensive review of all files and data bases dating back to the 1940's that may contain information on radiation testing on humans.[108] Office of Assistant Secretary of Defense (Public Affairs), December 30, 1993.

106Oak Ridge National Laboratory (ORNL), Tennessee: An Aerial Survey of Radioactivity Associated With Atomic Energy Plants. April 1949 (ORNL-341). F. J. Davis et al.
- https://www.osti.gov/opennet/servlets/purl/16385508-XHRcc4/16385508.pdf ,republished 1992. - 166 pp.
- https://www.etde.org/etdeweb/servlets/purl/10104048-AL8pwO/webviewable/10104048.pdf

107 GAO: **Nuclear Health and Safety** : Examples of Post World War II Radiation Releases at US Nuclear Sites, 1993. - 24 pp.
- http://www.gwu.edu/~nsarchiv/radiation/dir/mstreet/commeet/meet8/brief8/tab_h/br8h6b.txt

According to GAO 'AEC conducted radiation warfare tests at its sites in Oak Ridge, Tennessee, and Dugway, Utah, to develop an air-dropped radioactive munition.' - http://www.gao.gov/products/RCED-94-51FS

GAO: Nuclear Health and Safety : Consensus on Acceptable Radiation Risk to the Public Is Lacking. 1994. - 36 pp.- http://archive.gao.gov/t2pbat2/152798.pdf , and
- http://www.gwu.edu/~nsarchiv/radiation/dir/mstreet/commeet/pm03/pm3trnsb.txt

Did Dugway conduct over 600 radiation tests? Officials remain taciturn, but newly released papers reveal massive project. / Lee Davidson. Deseret News Sunday, April 10, 1994.
- http://www.project-112shad-fdn.com/rad1.htm

'The information became available three months after congressional probers working for the U.S. General Accounting Office first revealed six other radiation weapons tests at Dugway Proving Ground that dropped cluster bombs to scatter radioactive material packed inside. Documents also suggest the program may have continued years beyond the tests in the 1949-1952 period for which information was released by the U.S. Army Chemical and Biological Defense Command. '

108 **DOE Openness: Human Radiation Experiments:Finding Aids**. Records relating to RaLa, iodine-131, and cesium-137 at the Oak Ridge National Laboratory and the Oak Ridge Operations Office: a guide to record series of the department of energy and its contractors.
- http://www.hss.doe.gov/healthsafety/ohre/new/findingaids/epidemiologic/oakridge3/index.html

The Bayo Canyon/radioactive lanthanum (RaLa) program. / Dummer, J.E. ; Taschner, J.C. ; Courtright, C.C. . Los Almos National Laboratory, 1996. - 108 pp.
- http://www.fas.org/sgp/othergov/doe/lanl/osti/M9601101.pdf

'Environmental analysis of the Bayo Canyon (TA-10) Site, Los Alamos, New Mexico: Fallout forecasting: 1945-1962A: perspective on atmospheric nuclear tests in Nevada: Fact Book, Revision 2. Los Alamos National Laboratory's Hydrogeologic Studies of the Pajarito Plateau: A Synthesis of Hydrogeologic Work-plan Activities (1998--2004)[Tennessee Health Studies Agreement] Releases of contaminants from Oak Ridge facilities and risks to public health oratory'

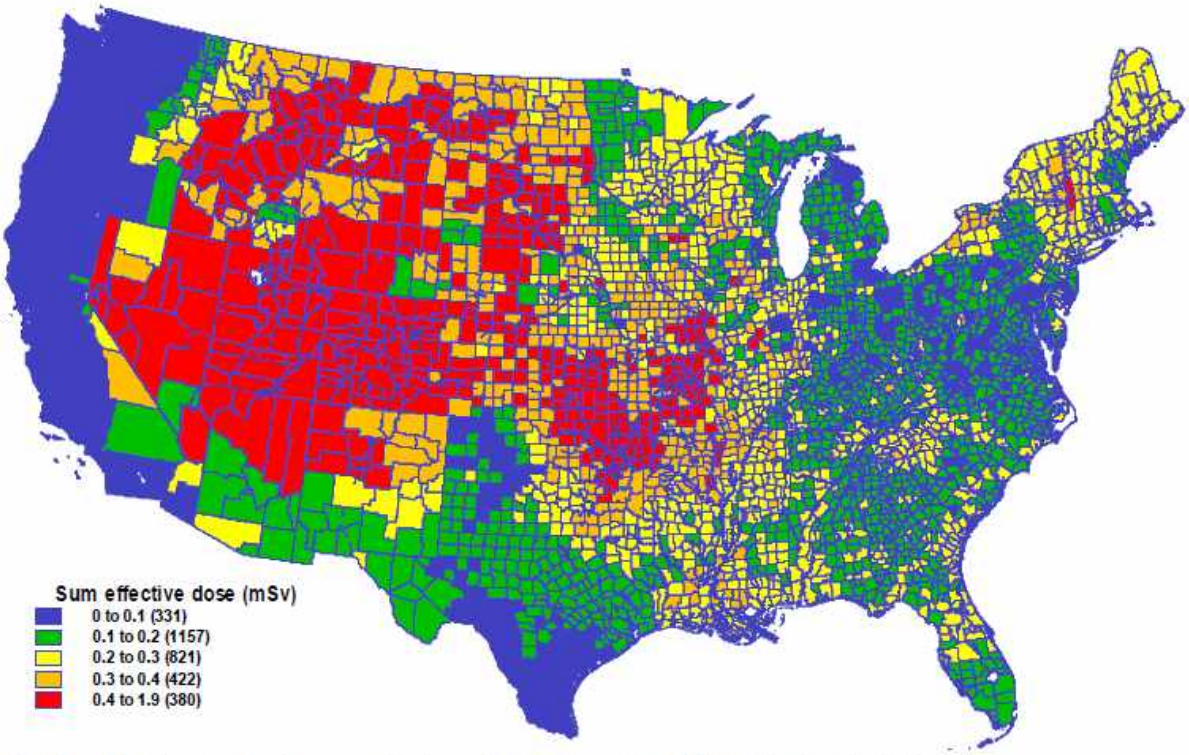
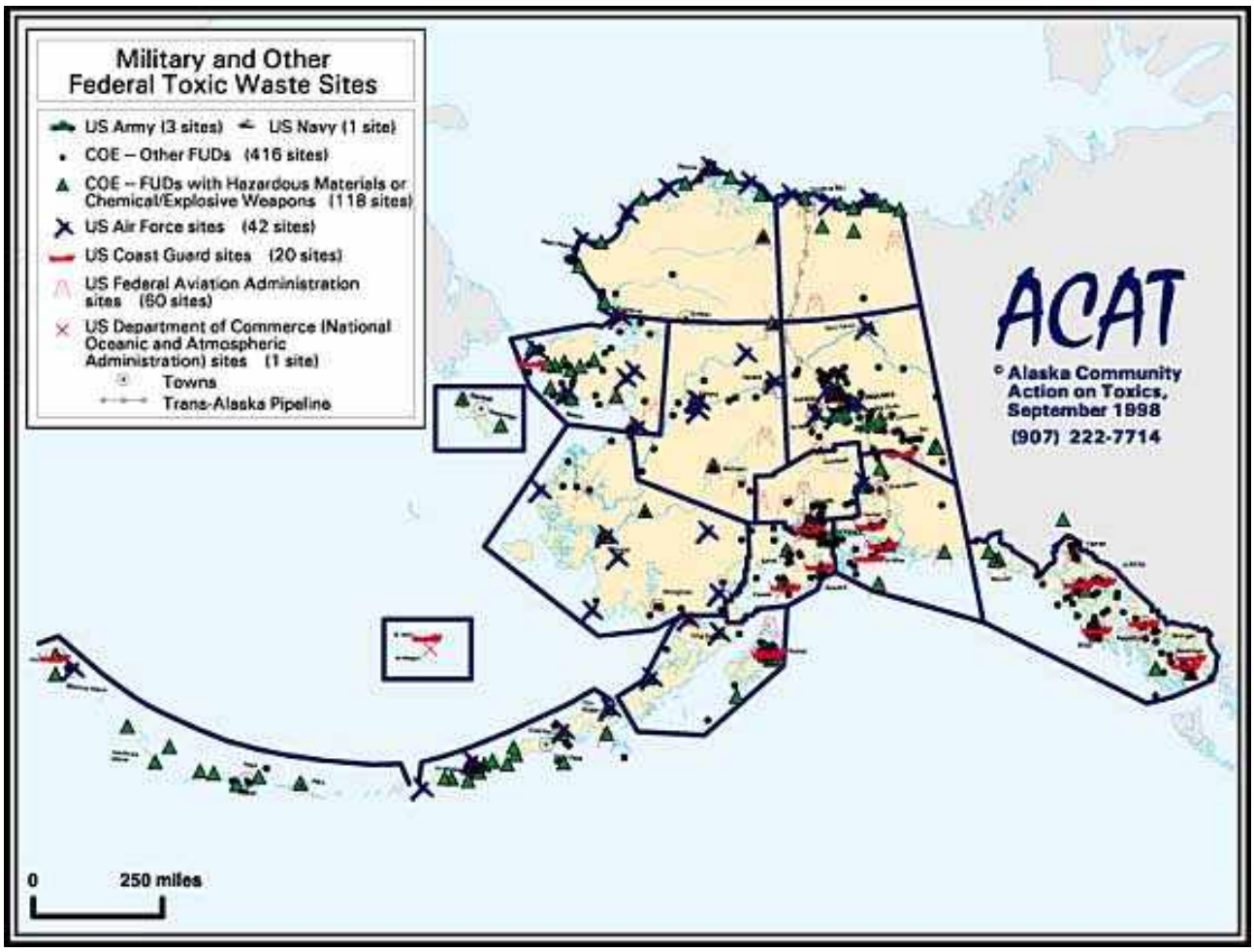


Fig. 26. Map of the effective dose by geographical area for the tests conducted from 1951 through 1962.

Examples of Nuclear Weapons Tests



Alaska

Project Chariot was part of the U.S. Atomic Energy Commission Plowshare program, established to test peaceful uses of nuclear explosions. The purpose of this project was to create a deep water port for shipping coal, oil and other natural resources believed to exist along this part of Alaska's coast. In 1962, did the U.S. Geological Survey an analysis to determine the spread of radioactive material from an underground nuclear explosion. Later in 1962, before the nuclear explosive was detonated, was Project Chariot canceled..

Three underground nuclear weapons tests at the Amchitka Island, 1965-1971.[109]

109 Consortium for Risk Evaluation with Stakeholder Participation II: **Background on Amchitka**, 2005. - 18 pp.

Hydrogeologic assessment of the Amchitka Island nuclear test site Alaska with magnetotellurics / Martyn Unsworth, Wolfgang Soyer, Volkan Tuncer, Anna Wagner, og David Barnes. Geophysics,vol. 72, no. 3 May-June 2007; p. b47–b57.

Formerly used Defense Sites in the Norton Sound Region: Location, History of Use, Contaminants Present, And Status of Clean-Up Efforts. Prepared for Alaska Community Action on Toxics / Mimi Hogan, Sandra Christopherson and Ann Rothe. 2006. - 47 pp.

Information about the Operation is still concealed or masked as classified information, but Greeepeace concludes 'The Cannikin nuclear test site on Amchitka, the site of the largest underground nuclear test in US. history is leaking long-lived transuranic radioactivity into the Bering Sea via White Alice Creek. Two biological samples taken by Greenpeace researchers from White Alice Creek downgradient from Cannikin revealed the presence of americium-241, a beta decay product of plutonium-241. Americium-241 in the environmental samples indicates the presence of plutonium isotopes in the groundwater-surface water system at Amchitka. One of the two stream samples contained plutonium-239/-240. The plutonium-239 used to trigger the Cannikin fusion explosion (possibly 9-11 pounds of plutonium-239 2) was co-produced with plutonium-240 and plutonium-241 in a nuclear reactor designed to create weaponsgrade plutonium'.

- Proejct Long Shot, 1965
- Milrow 1969
- Cannikin 1971

Operation Crossroads 1946

A series of two U.S. nuclear weapons tests at Bikini in the Pacific led by the U.S. Atomic Energy Commission. The first experiment after the Trinity experiment in July 1945. Information about the Operation is still concealed or masked as classified information:

Miller, Pam: **Nuclear Flashback**: Report of a Greenpeace Scientific Expedition to Amchitka Island, Alaska – Site of the Largest Underground Nuclear Test in US. History. Greenpeace, 1996 - 33 pp.

Nevada Environmental Restoration Project: **Subsurface Completion Report for Amchitka Underground Nuclear Test Sites**: Long Shot, Milrow, and Cannikin, 2006. - 63 pp.

United States Nuclear Tests, July 1945 through September 1992. US. Department of Energy Nevada Operations Office, DOE/NV--209-REV 15, December 2000.

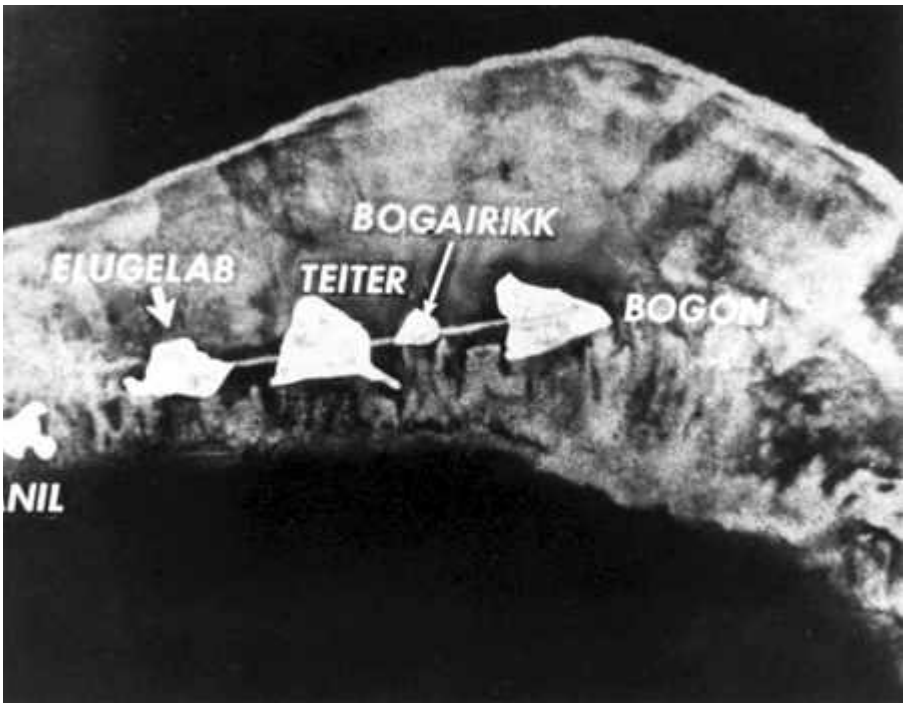
'Letter of Transmittal...
The Joint Chiefs of Staff, Washington, D. C.
Subject: Final Report, JCS Evaluation Board
Gentlemen:
Your Board, appointed to evaluate the Bikini Atoll Atomic Bomb tests, has the honor to transmit to you its final report.
In accordance with our Directive this report is classified as a TOP SECRET. In order that the Joint Chiefs of Staff may make this report public, the Board has prepared a revision from which certain matter has been deleted. Prior to the publication of this revision it will be necessary that classified factual material be deleted by the Joint Chiefs of Staff., states the preface to the Evaluation of the Atomic Bomb as a Military Weapon - The Final Report of the Joints Chiefs of Staff Evaluation Board for Operation Crossroads, 30 June 1947 The purpose of the experiments was to investigate the effect of nuclear weapons on naval ships.[110].
The nuclear weapons tests included

ABLE explode at an altitude of 158 meters the first July
BAKER exploded 27 meters below the water surface on 25th. July.

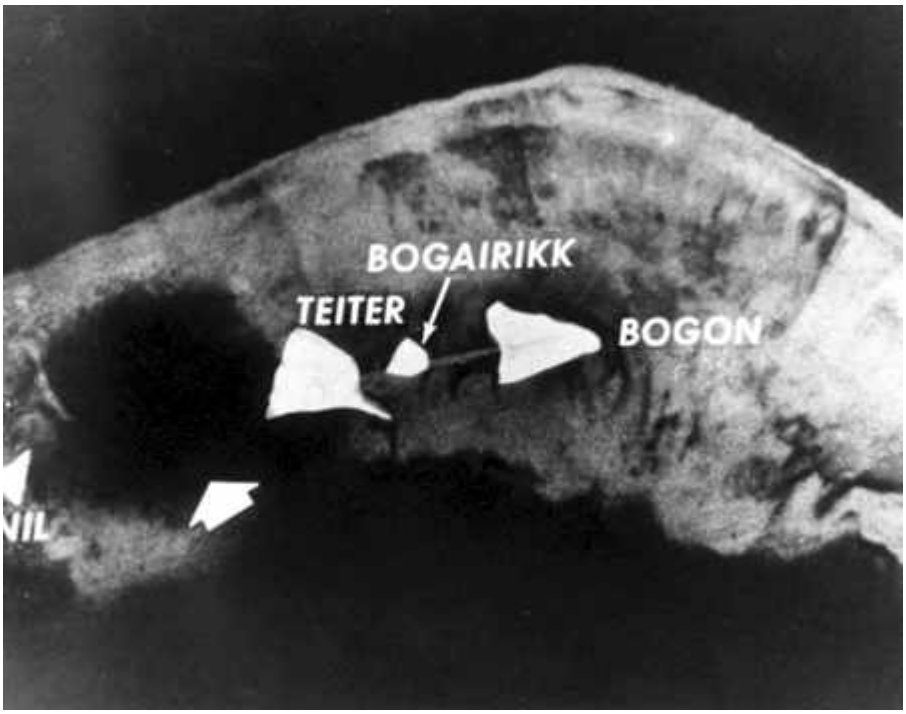
The next U.S. nuclear weapons tests were Operation Sandstone..

110 **First Pictures Atomic Blast!**, 1946/07/08 (1946).
'The dramatic film history of the atom bomb test at Bikini! Pictures of the actual bomb drop! Blasted ships and the terrible destructive force of the world's fourth atom bomb! Universal Newsreel, in cooperation with the Army and Navy, presents the motion picture drama, 'Operation Crossroads.' This film record of the historical event shows in dramatic detail the various phases of the epochal experiment, from takeoff to the awful blast that destroyed or damaged more than half the ships in Bikini Lagoon." scenes of Admiral William H. Blandy commanding Operation Crossroads at Bikini Lagoon, test animals put on ships, sheep is sheared, Secretary of Navy Forrestal speaks on deck of ship (sound distorted), crews leave, Bikini fleet ready, A-bomb loaded on B-29 Dave's Dream, plane takes off, bomb doors open, men put on protective goggles; "The bomb's away! It's falling ... " then explosion, "motion picture spectacle of all time" and another view of the explosion. (complete newsreel)'.
http://www.archive.org/details/1946-07-08_First_Pictures_Atomic_Blast
Mortality of Veteran Participants in the Crossroads Nuclear Test / J. Christopher Johnson, Susan Thaul, William F. Page, and Harriet Crawford, Editors; Committee on the CROSSROADS Nuclear Test, Institute of Medicine. 1996.
United States Nuclear Tests, July 1945 through September 1992.
US. Department of Energy Nevada Operations Office, DOE/NV--209-REV 15, December 2000.
National Park Service : **The Archeology of the Atomic Bomb - A Submerged Cultural Resources Assessment of the Sunken Fleet of Operation Crossroads at Bikini and Kwajalein Atoll Lagoons** (1991). - http://www.nps.gov/history/history/online_books/swcrc/37/contents.htm
Operation Crossroads (Part I) (1946).
http://www.archive.org/details/Operatio1946
Operations Crossroads Underway, 1946/07/01 (1946).
http://www.archive.org/details/1946-07-01_Operations_Crossroads_Underway
US. Army Air Forces: **Special Delivery** (1946) - 'Airplanes and missions of the US. Army Air Forces, emphasizing Operation Crossroads'. - http://www.archive.org/details/SpecialD1946
United States. Joint Task Force One; Shurcliff, William A.: **Bombs at Bikini; the official report of Operation Crossroads** (1947).
http://www.archive.org/details/bombsatbikinioff00unit
United States. Joint Task Force One: **Operation Crossroads, the official pictorial record** (1946).
http://www.archive.org/details/operationcrossro00unit

Operation Ivy 1952



Map of Elugelab before and after the November 1st., 1952



Series of two American hydrogen and nuclear weapons tests in the Pacific in the first part of the Cold War. Information about the Operation is still concealed or masked as classified information.

"The island of Elugelab is missing!" President Eisenhower heard this short report on the Mike shot in Operation Ivy from Gordon Dean, Chairman of the Atomic Energy Commission. Mike was the first full-scale hydrogen explosive device to be tested, yet was only a scientific test of a thermofusion implosion device concept. Mike was not a deliverable weapon.[111]

The island where the device was detonated was vaporized. The hole Mike left was big enough to accommodate 14 Pentagon-size buildings and deep enough to hold 17 story building under water, in a crater one mile in diameter and approximately 175 feet deep. Mike's yield was an incredible 10.4 megatons, signaling the proof-tested expansion of the nuclear explosive technology concepts from nuclear fission to thermofusion. Thermofusion is the same process that occurs in the core of the sun.

This test, however, was not the first test of a liquid thermonuclear explosive. The first test ever conducted into the fusion principle occurred during Operation Greenhouse at Eniwetok in 1951, with the 225 kiloton George test. Another test of hydrogen in the center of a nuclear weapon before Mike was during the Greenhouse Item test at Eniwetok, proving a critical stockpiling yield efficiency concept, called "boosting.'" Mike was followed on November 15, 1952 by the King shot, the largest all-fission device ever tested by the United States. It was a uranium super oralloy Mark 18 prototype implosion core in a Mark 6D casing, with an advanced warhead that enabled it to produce 500 kilotons of equivalent TNT explosive energy.

The tests came after Operation Tumbler-Snapper and before Operation Upshots-Knothole. Archives: National Archives: Records of the Defense Threat Reduction Agency (Record Group 374), 1943-73.

The nuclear weapons tests included

- Mike November 1st., Elugelab Island, Eniwetok 10.4 to 12 megatons - the first hydrogen bomb
- King November 16th., Airburst 2,000 feet North of Runit Island, Eniwetok 500 kilotons

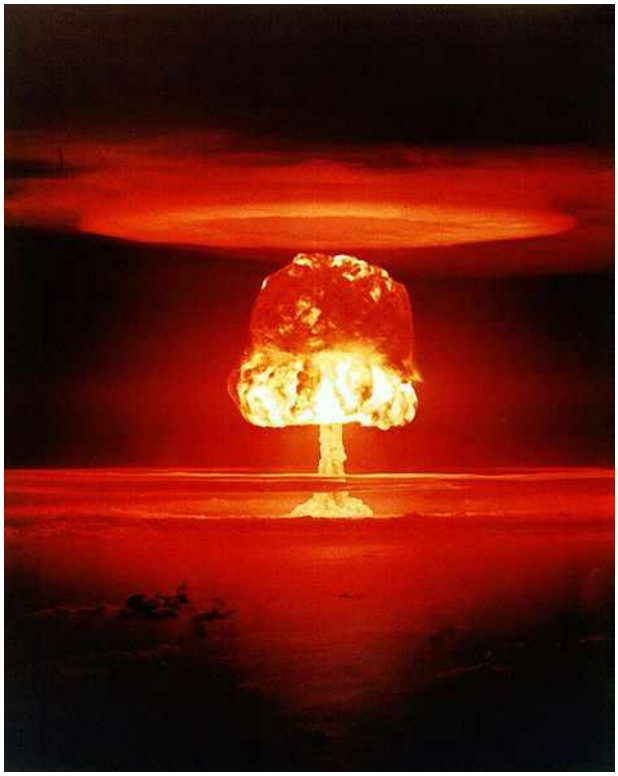
111 **Analysis of Radiation Exposure for Navy Personnel at Operation Ivy**. Science Applications, Inc.. 1983. - 78 pp. - http://www.dtra.mil/documents/ntpr/relatedpub/DNATR8298.pdf

Hacker, Barton C.: **Elements of controversy: the Atomic Energy Commission and radiation safety in nuclear weapons testing, 1947-1974**. University of California Press, 1994 - 614 pp.

Hansen, Chuck: **The Swords of Armageddon : US. Nuclear Weapons Development since 1945**.

United States Air Force Lookout Mountain Laboratory, Air Photographic Charting Service, Hollywood, California: **Operation** IVY (1952). - http://www.archive.org/details/OperationIVY1952

Operation Castle 1954



American hydrogen bomb test at Bikini in the Pacific in the first part of the Cold War with the aim to test aircraft based hydrogen bombs and design effects. Information about the Operation is still concealed as classified information..

'The Bravo detonation in the Castle series was unexpected at 15 megatons, the largest of the U.S. atmospheric test explosions ever'.

The Japanese fishing boat Daigo Fukuryu Maru was heavily contaminated by radioactive fallout from the trial. The nuclear garbage movement after the Bravo thermonuclear test. It is the worst pollution in U.S. nuclear history. The numbers correspond to the estimated total (cumulative) dose contour or contours (rad).[112]

Gamma ray doses are from the time of arrival to 96 hours (4 days) after the detonation, outside on land. Glasstone and Dolan mention this because data from the sea were not collected in this test. The Bravo's fallout and contours to the north of the islands is uncertain and other fallout patterns from the same test attributed to the high levels measured on Rongelap as a "hotspot" of the kind that is measured downwind of the sea in later experiments.

The operation came after Operation Upshots-Knothole and was replaced by Operation Teapot. Archive: National Archives: Records of the Defense Threat Reduction Agency, (Record Group 374), 1943-73.

The nuclear weapons tests included

Bravo, February 28, Bikini, 15 megatons
Romeo, March 26, Bikini, 11 megatons
Koon, April 6, Bikini, 110 kilotons
Union, April 25, Bikini, 6.9 megatons
Yankee, May 4, Bikini, 13.5 megatons
Nectar, May 13, Enewetak, 1.69 megatons

112Source: Samuel Glasstone og Phillip J. Dolan, editors: **The Effects of Nuclear Weapons**, 3. ed. -Washington D C.: DOD og DOE, 1977) pp. 437.

Protests

Emergency Committee of Atomic Scientists

Professional historic American peace group formed in 1946 by the physicists Albert Einstein and Leo Szilard with the purpose to warn politicians and the public about the dangers of development of nuclear weapons and also to promote the peaceful uses of atomic energy.

The Emergency Committee was set up in the wake of Leo Szilard appeal from July 1945 to the then U.S. President Harry S.. Truman, against use of the atomic bomb on moral grounds; an appeal signed by 70 scientists who all worked on the Manhattan Project, where most of them knew not what they were creating at the time.[113] After the war, they created the Federation of Atomic Scientists and the still existing journal Bulletin of the Atomic Scientists, who, with Einstein's words:

'They (the scientists) knew that the democratic determination of this nation's policy on atomic energy must ultimately rest on understanding by its citizens. "America's decision will not be made over a table in the United Nations. Our representatives in New York, in Paris, or in Moscow depend ultimately on decisions made in the village square. To the village square we must carry the facts of atomic energy. From there must come America's voice. '[114]

The organizations protests against atmospheric nuclear weapons tests contributed to the test ban agreement in 1963. Among those active in the organization which operated until 1950 include Hans Bethe, Selig Hecht, Thorfinn Hogness, Philip M. Morse, Linus Pauling, Lily Payson, Joseph H. Schaffner, Michael Straight, Leo Szilard, Harold Urey and Victor F. Weisskopf. Archive: University of Chicago, Special Collections.

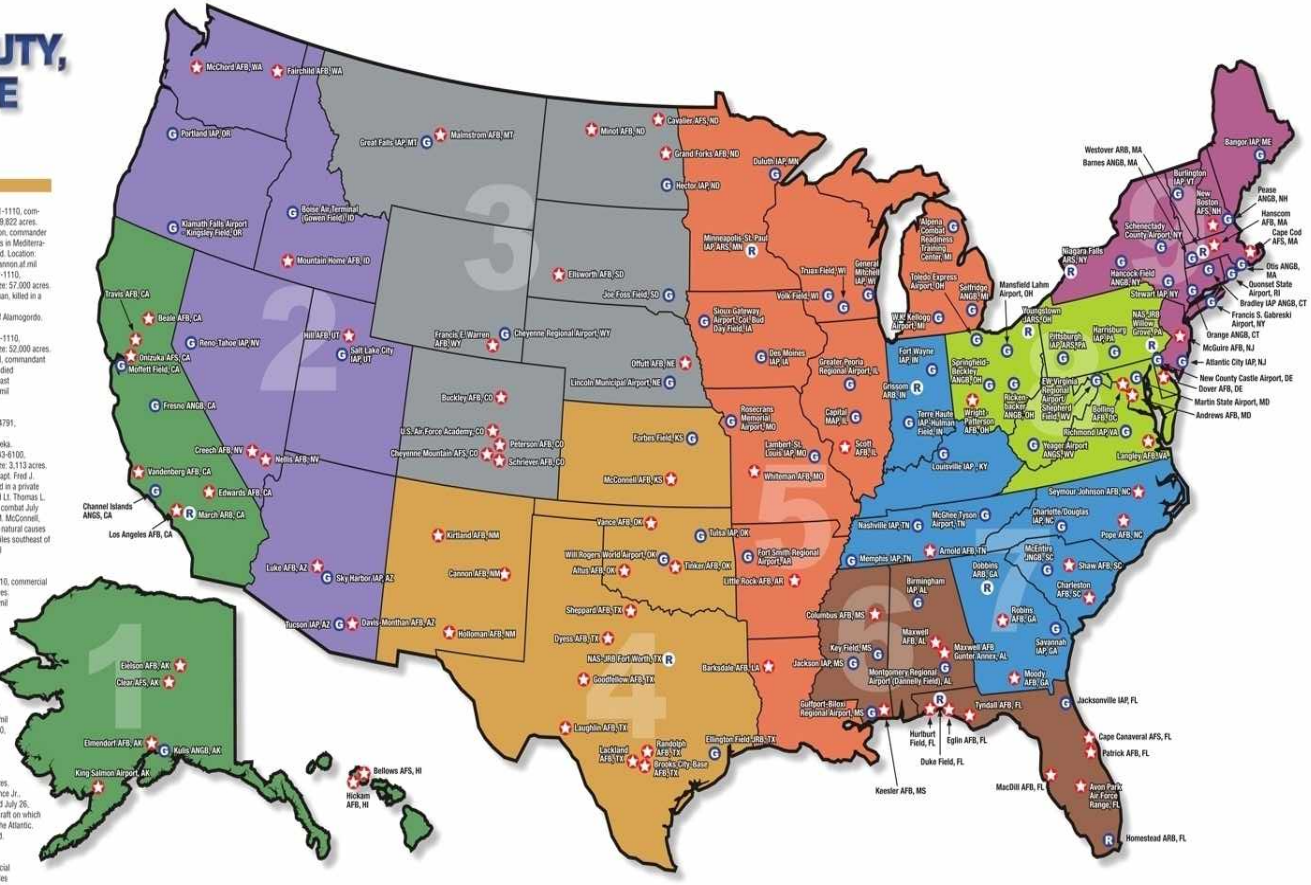
See also: American Association of Scientific Workers ; Association of Manhattan Project Scientists ; Association of Oak Ridge Engineers and Scientists, 1945-1952 ; Association of Oak Ridge Scientists ; Association of Scientists for Atomic Education, 1947 ; Federation of American Scientists ; Independent Citizens' Committee of the Arts, Sciences and Professions ; National Committee of Atomic Scientists ; National Committee on Atomic Information, 1946-1947 ; nuclear pacifism ; UN Atomic Energy Commission ; UN Emergency Committee of the Atomic Scientists ; Union of Concerned Scientists[115] ; World Movement for World Federal Government.

113 **Leo Szilard Papers**, Mandeville Special Collections Library, The UCSD Libraries, University of California, San Diego, 2005. - 81 pp.

114 New York Time Magazine, June 23, 1946 and **A Statement of Purpose by the Emergency Committee of Atomic Scientists**.

115 **The NRC and Nuclear Power Plant Safety in 2010** : A Brighter Spotlight Needed / David Lochbaum. Union of Concerned Scientists. 2011. - 64 pp.

AIR FORCE ACTIVE DUTY, GUARD AND RESERVE FACILITIES



REGION 1

Alaska
Clear AFS, AFSPC, ANG, DSN 317-585-6110 or 6409, commercial (907) 585-6110 or 6409. Location: Anderson.
Eielson AFB, PACAF, DSN 317-377-1110, commercial 907-377-1110. Size: 23,500 acres. Named for Carl Ben Eielson, arctic aviation pioneer who died in November 1929. Location: 26 miles southeast of Fairbanks, ANG: DSN 317-377-8734, commercial 907-377-8734. ANG location: North Pole. www.eielson.af.mil
Elmendorf AFB, PACAF, DSN 317-552-1110, commercial 907 552-1110. Size: 13,441 acres. Named for Capt. Hugh Elmendorf, killed Jan. 13, 1933, during flight testing at Wright Field, Ohio. Location: Anchorage. www.elmendorf.af.mil
King Salmon Airport, PACAF, DSN 317-552-1110, commercial 907-552-1110 through Elmendorf AFB operator.
Kulis ANGB, ANG, DSN 317-626-1176, commercial 907-249-1176. Location: Next to Ted Stevens Anchorage IAP. www.akang.ang.af.mil

California
Beale AFB, ACC, DSN 368-1110, commercial 530-634-3000. Size: 22,944 acres. Named for Brig. Gen. E.F. Beale, surveyor general of California and Nevada before Civil War. Location: 13 miles east of Marysville. www.beale.af.mil
Channel Islands ANGS, ANG, DSN 893-7000, commercial 805-986-8000. Location: Point Mugu.
Edwards AFB, AFMC, DSN 527-1110, commercial 661-277-1110. Size: 301,114 acres. Named for Capt. Glen W. Edwards, killed in YB-49 crash, June 5, 1948. Location: Main base 16 miles east of Rosamond. www.edwards.af.mil
Fresno ANGB, ANG, DSN: 949-9100, commercial 559-454-5100. Location: Fresno.
Los Angeles AFB, AFSPC, Space and Missile Systems Center, DSN 633-1110, commercial 310-653-1110. Size: 229 acres (including new main base Schriever Space Complex; Fort MacArthur Annex; housing areas in San Pedro, 20 miles south). Location: 5 miles south of Los Angeles IAP in El Segundo. www.losangeles.af.mil
March ARB, ANG, AFRC, DSN 447-1110, commercial 951-655-1110. Location: 9 miles southeast of Riverside.
Moffett Field, ANG, DSN 359-9333, commercial 650-603-9333. Location: 2 miles north of Mountain View.
Onizuka AFS, AFSPC, DSN 561-3000, commercial 408-752-3000. Location: Sunnyvale. www.schriever.af.mil/onizuka
Travis AFB, AMC, DSN 837-1110, commercial 707-424-1110. Size: 7,580 acres. Named for Brig. Gen. Robert F. Travis, killed in a B-29 accident Aug. 5, 1950. Location: next to Fairfield. www.travis.af.mil
Vandenberg AFB, AFSPC, DSN 276-1110, commercial 805-606-1110.
Size: 99, 900 acres. Named for Gen. Hoyt S. Vandenberg, Air Force's second chief of staff. Location: 8 miles north-northwest of Lompoc. www.vandenberg.af.mil

Hawaii
Bellows AFS, PACAF, commercial 808-259-8080. Named for 2nd Lt. Franklin B. Bellows, World War I Distinguished Service Cross recipient, killed on reconnaissance mission Sept. 13, 1918. Location: Windward shore of Oahu. www.bellowsafs.com
Hickam AFB, PACAF, DSN 315-449-7110, commercial 808-449-7110. Size: 2,855 acres. Named for Lt. Col. Horace M. Hickam, air pioneer, killed in a crash Nov. 5, 1934. Location: 9 miles west of Honolulu. www2.hickam.af.mil

REGION 2

Washington
Fairchild AFB, AMC, DSN 657-1110, commercial 509-247-1212. Size: 4,551 acres. Named for Gen. Muir S. Fairchild, Air Force vice chief of staff at the time of his death in 1950. Location: 12 miles west-southwest of Spokane. www.fairchild.af.mil
McChord AFB, AMC, DSN 382-1110, commercial 253-982-1110. Size: 4,639 acres. Named for Col. William C. McChord, killed Aug. 18, 1937, during a forced landing in Virginia. Location: 8 miles south of Tacoma. public.mcchord.amc.af.mil

Oregon
Klamath Falls Airport-Kingsley Field, ANG, DSN 830-6198, commercial 541-885-6198. Location: 5 miles southeast of Klamath Falls.
Portland IAP, ANG, DSN 638-4000, commercial 503-335-4000. Location: Portland.

Idaho
Boise Air Terminal (Gowen Field), ANG, DSN 422-5322, commercial 208-422-5322. Location: 6 miles south of Boise at air terminal. www.124wg.ang.af.mil
Mountain Home AFB, ACC, DSN 728-1110; commercial 208-828-1110. Size: 9,112 acres. Location: 10 miles southwest of Mountain Home. www.mountainhome.af.mil

Utah
Hill AFB, AFMC, DSN 777-1110, commercial 801-777-1110. Size: 961,991 acres. Named for Maj. Ployer P. Hill, killed Oct. 30, 1935, on test flight of first B-17. Location: 8 miles south of Ogden. www.hill.af.mil
Salt Lake City IAP, ANG, DSN: 245-2200 commercial 801-245-2200. Location: East side of main airport, 5-mile drive from the Salt Lake IAP terminals.

Nevada
Creech AFB, ACC, DSN 682-1110, commercial 702-652-1110 through Nellis AFB operator. Named for Gen. Wilbur L. "Bill" Creech, father of Thunderbirds, the Air Force's premier air demonstration squadron.
Nellis AFB, ACC, DSN 682-1110, commercial 702-652-1110. Size: 2.9 million-acre restricted range; 15,000 square miles of airspace. Named for 1st Lt. William H. Nellis, P-47 pilot killed in Europe Dec. 27, 1944. Location: 8 miles northeast of Las Vegas. www.nellis.af.mil
Reno-Tahoe IAP, ANG, DSN 830-4500, commercial 775-788-4500.
Location: 5 miles southeast of Reno.

Arizona
Davis-Monthan AFB, ACC, DSN 228-1110, commercial 520-228-1110. Size: 11,000 acres. Named for 1st Lt. Samuel H. Davis, killed Dec. 28, 1921, and 2nd Lt. Oscar Monthan, killed March 27, 1924. Location: Tucson. www.dm.af.mil
Luke AFB, Ariz., AETC, DSN 896-1110, commercial 623-856-1110. Size: 4,200 acres (plus 1.5 million acres at Barry M. Goldwater Range). Named for 2nd Lt. Frank Luke Jr., first American aviator to receive Medal of Honor, killed in action Sept. 29, 1918, in France. Location: 20 miles west-northwest of Phoenix. www.luke.af.mil
Sky Harbor IAP, ANG, DSN 853-9000, commercial 602-302-9000. Location: Phoenix.
Tucson IAP, ANG, DSN 844-6192, commercial 520-295-6192. Location: Tucson.

REGION 3

Montana
Great Falls IAP, ANG, DSN 791-0202, commercial 406-791-0202. Location: 5 miles southwest of Great Falls.
Malmstrom AFB, AFSPC, DSN 632-1110, commercial 406-731-1110. Size: 3,573 acres. Named for Col. Einar A. Malmstrom, killed Aug. 24, 1954, in aircraft accident. Location: 1.5 miles east of Great Falls. www.malmstrom.af.mil

Wyoming
Cheyenne Regional Airport, ANG, DSN 388-6110, commercial 307-772-6110. Location: Cheyenne.
Francis E. Warren AFB, AFSPC, DSN 481-1110, commercial 307-773-1110. Size: 5,866 acres. Named for Francis Emory Warren, Wyoming senator and first state governor. Location: Cheyenne. www.warren.af.mil

Colorado
Buckley AFB, AFSPC, DSN 847-9011, commercial 720-847-9011. Size: 3,831 acres. Named for Lt. John H. Buckley, pilot from Longmont, Colo., killed in France Sept. 27, 1918. Location: 8 miles east of Denver. www.buckley.af.mil
Cheyenne Mountain AFS, AFSPC, DSN 268-1110, commercial 719-474-1110.
Peterson AFB, AFSPC, DSN 834-7011, commercial 719-556-7321. Size: 1,277 acres. Named for 1st Lt. Edward J. Peterson, killed in aircraft crash at base Aug. 8, 1942. Location: east of Colorado Springs. www.peterson.af.mil
Schriever AFB, AFSPC, DSN 560-1110, commercial 719-567-1110. Size: 3,840 acres. Named for retired Gen. Bernard Schriever. Location: 10 miles east of Colorado Springs. www.schriever.af.mil
U.S. Air Force Academy, DSN 333-1110, commercial 719- 333-1110.
Location: Colorado Springs.

Nebraska
Lincoln Municipal Airport, ANG, DSN 279-1110, commercial 402-309-1552. Location: 1 mile northwest of Lincoln.
Offutt AFB, ACC, DSN 271-1110, commercial 402-294-1110. Size: 4,006 acres (including housing area and off-base sites). Named for 1st Lt. Jarvis J. Offutt. pilot who died Aug. 13, 1918. Location: 8 miles south of Omaha. www.offutt.af.mil

North Dakota
Cavalier AFS, AFSPC, DSN 330-3292, commercial 701-993-3292.
Grand Forks AFB, AMC, DSN 362-3000, commercial 701-747-3000. Size: 4,830 acres. Location: 16 miles west of Grand Forks. www.grandforks.amc.af.mil
Hector IAP, ANG, DSN 362-8110, commercial 701-241-7241. Location: Fargo.
Minot AFB, ACC, DSN 453-1110, commercial 701-723-1110. Size: 5,085 acres. Named for city of Minot that donated money to purchase base land. Location: 13 miles north of Minot. www.minot.af.mil

South Dakota
Ellsworth AFB, ACC, DSN 675-1110, commercial 605-385-1000. Size: 7,922 acres (5,411 acres on base). Named for Brig. Gen. Richard E. Ellsworth, killed March 18, 1953, in an RB-36 plane crash in Newfoundland. Location: 12 miles east-northeast of Rapid City. www.ellsworth.af.mil
Joe Foss Field, ANG, DSN 786-7700, commercial 605-988-5700. Location: north of Sioux Falls.

REGION 4

New Mexico
Cannon AFB, AFSOC, DSN 681-1110, commercial 575-784-1110. Size: 69,822 acres. Named for Gen. John K. Cannon, commander of World War II Allied air forces in Mediterranean and Tactical Air Command. Location: 7 miles west of Clovis. www.cannon.af.mil
Holloman AFB, ACC, DSN 572-1110, commercial 505-572-1110. Size: 57,000 acres. Named for Col. George Holloman, killed in a B-17 crash March 19, 1946.
Location: 8 miles southwest of Alamogordo. www.holloman.af.mil
Kirtland AFB, AFMC, DSN 246-1110, commercial 505-846-1110. Size: 52,000 acres. Named for Col. Roy C. Kirtland, commandant of Langley Field in 1930s who died May 2, 1941. Location: southeast Albuquerque. www.kirtland.af.mil

Kansas
Forbes Field, ANG, DSN 720-4791, commercial 785-861-4791.
Location: 2 miles south of Topeka.
McConnell AFB, AMC, DSN 743-6100, commercial 316-759-6100. Size: 3,113 acres. Named for Wichita brothers: Capt. Fred J. McConnell, B-24 pilot who died in a private plane crash Oct. 25, 1945; 2nd Lt. Thomas L. McConnell, B-24 pilot killed in combat July 10, 1943, and 1st Lt. Edwin M. McConnell, World War II pilot who died of natural causes in August 1997. Location: 5 miles southeast of Wichita. www.mcconnell.af.mil

Oklahoma
Altus AFB, AETC, DSN 866-1110, commercial 580-482-8100. Size: 7,746 acres.
Location: Altus. www.altus.af.mil
Tinker AFB, AFMC, DSN 884-1110, commercial 405-732-1110.
Size: 5,041 acres. Named for Maj. Gen. Clarence L. Tinker, who died at sea June 7, 1942, while leading a flight of bombers on strike on Wake Island.
Location: 8 miles southeast of Oklahoma City. www.tinker.af.mil
Tulsa IAP, ANG, DSN 894-7000, commercial 918-833-7000.
Location: Tulsa.
Vance AFB, AETC,
DSN 448-7110, commercial 580-213-5000. Size: 4,555 acres. Named for Lt. Col. Leon R. Vance Jr., Medal of Honor recipient, killed July 26, 1944, when air evacuation aircraft on which he traveled disappeared over the Atlantic. Location: 6 miles south of Enid. https://www.vance.af.mil
Will Rogers World Airport, ANG, DSN 720-5221, commercial 405-686-5221. Location: 7 miles southwest of Oklahoma City.

Texas
Brooks City-Base, AFMC, DSN 240-1110, commercial 210-536-1110. Size: 1,246 acres. Named for Cadet Sidney J. Brooks Jr., killed Nov. 13, 1917, while on his commissioning flight. Location: San Antonio.
www.brooks.af.mil
Dyess AFB, ACC, DSN 461-1110, commercial 325-696-1110. Size: 6,405 acres. Named for Lt. Col. William E. Dyess, fighter pilot killed in crash in December 1943. Location: Abilene. www.dyess.af.mil
Ellington Field JRB, ANG, DSN 454-2337, commercial 281-929-2337. The 147th Reconnaissance Wing, Texas Air National Guard, is the DOD host unit. The 147th RW flies the predator unmanned aerial system. Location: 17 miles southeast of downtown Houston.
Goodfellow AFB, AETC, DSN 477-3231, commercial 325-654-1110. Size: 1,137 acres. Named for 1st Lt. John J. Goodfellow Jr., reconnaissance pilot killed in combat Sept. 14, 1918. Location: San Angelo.
www.goodfellow.af.mil
Lackland AFB, AETC, DSN 473-1110, commercial 210-671-1110. Size: 9,572 acres. Named for Brig. Gen. Frank D. Lackland, early commandant of Kelly Field who died in 1943. Location: 5 miles southwest of downtown San Antonio. www.lackland.af.mil
Laughlin AFB, AETC, DSN 732-1110, commercial 830-298-3511. Size: 5,357 acres. Named for 1st Lt. Jack Thomas Laughlin, a B-17 pilot killed over Java, Indonesia, Jan. 29, 1942. Location: 6 miles east of Del Rio.
www.laughlin.af.mil
NAS-JRB Fort Worth, AFRC, DSN 739-7170.
Location: Fort Worth.
Randolph AFB, AETC, DSN 487-1110, commercial 210-652-1110. Size: 5,044 acres. Named for Capt. William M. Randolph, killed Feb. 17, 1909, on takeoff from Gorman Field, Texas. Location: 17 miles east-northeast of San Antonio. www.randolph.af.mil
Sheppard AFB, AETC, DSN 736-1110, commercial 940-676-1110. Size: 6,158 acres. Named for Sen. Morris E. Sheppard, who died April 9, 1941. Location: 5 miles north of Wichita Falls. www.sheppard.af.mil

REGION 5

Minnesota
Duluth IAP, ANG, DSN 825-7210, commercial 218-788-7210. Location: Duluth.
Minneapolis-St. Paul IAP ARS, ARFC, DSN 783-1000, commercial 612-713-1000.
Location: Minneapolis.
Selfridge ANGB, ANG, DSN 273-4011, commercial 586-239-4011. Location: 3 miles northeast of Mount Clemens.
W.K. Kellogg Airport, ANG, DSN 580-3400, commercial 616-969-3400.
Location: Battle Creek. www.110fw.ang.af.mil

Illinois
Capital MAP, ANG, DSN 892-8219, commercial 217-757-1219. Location: 2 miles northwest of Springfield.
Greater Peoria Regional Airport, ANG, DSN 724-5210, commercial 309-633-5210. Location: 7 miles southwest of Peoria.
Scott AFB, AMC, DSN 576-1110, commercial 618-256-1110. Size: 3,589 acres. Named for Cpl. Frank S. Scott, first enlisted man to die in aircraft accident, Sept. 28, 1912.
Location: 6 miles east-northeast of Belleville. www.scott.af.mil

REGION 6

Mississippi
Columbus AFB, AETC, DSN 742-1110, commercial 662-434-7322. Size: 6,017 acres. Location: 10 miles north-northwest of Columbus. www.columbus.af.mil
Gulfport-Biloxi Regional Airport, ANG, DSN 363-6002, commercial 228-214-6002.
Location: Gulfport.
Jackson IAP, ANG, DSN 828-8350, commercial 601-405-8350.
Location: 7 miles east of Jackson.
Keesler AFB, AETC, DSN 597-1110, commercial 228-377-1110. Size: 3,554 acres. Named for 2nd Lt. Samuel R. Keesler Jr., aerial observer killed in action Oct. 8, 1918, near Verdun, France. Location: Biloxi. www.keesler.af.mil
Key Field, ANG, DSN 778-9000, commercial 601-484-9000. Location: Meridian.

Alabama
Birmingham IAP, ANG, DSN 778-3000, commercial 205-714-2000. Location: Birmingham.
Maxwell AFB, AETC, DSN 493-1110, commercial 334-953-1110. Size: 3,903 acres. Named for 2nd Lt. William C. Maxwell, killed in air accident in the Philippines Aug. 12, 1920.
Location: Montgomery. www.maxwell.af.mil
Maxwell AFB Gunter Annex, AETC,
DSN 596-1110, commercial 334-416-1110.
Montgomery Regional Airport (Dannelly Field), ANG, DSN 358-9200, commercial 334-394-7200. Location: 7 miles southwest of Montgomery. www.almont.ang.af.mil

Florida
Avon Park Air Force Range, ACC, DSN 968-7110/0902, commercial 863-452-4110 or 813-828-2902.
Cape Canaveral AFS, AFSPC, DSN 467-1110, commercial 321-853-1110.
Duke Field, AFRC, AFSOC, DSN 872-1110, commercial 850-883-1110 through Eglin AFB operator.
Eglin AFB, AFMC, DSN 872-1110, commercial 850-882-1110. Size: 463,128 acres. Named for Lt. Col. Frederick I. Eglin, flier killed in aircraft accident Jan. 1, 1937. Location: 7 miles northeast of Fort Walton Beach. www.eglin.af.mil
Homestead ARB, AFRC, DSN 791-7000, commercial 305-224-7000. Location: Homestead.
Hurlburt Field, AFSOC, AFRC, DSN 579-1110, commercial 850-884-1110 through Eglin AFB operator. Size: 6,634 acres. Named for Lt. Donald W. Hurlburt, pilot killed on Eglin AFB reservation Oct. 1, 1943.
Location: 5 miles west of Fort Walton Beach. www.hurlburt.af.mil
Jacksonville IAP, ANG, DSN 641-7100, commercial 904-741-7100. Location: 15 miles northwest of Jacksonville.
MacDill AFB, AMC, DSN 968-1110, commercial 813-828-1110. Size: 5,631 acres. Named for Col. Leslie MacDill, killed in aircraft accident Nov. 8, 1938. Location: Tampa. www.macdill.af.mil
Patrick AFB, AFSPC, DSN 854-1110, commercial 321-494-1110. Size: 2,341 acres. Named for Maj. Gen. Mason M. Patrick, Air Expeditionary Force Air Service chief in World War I; chief of Air Service/Air Corps, 1921-27. Location: 2 miles south of Cocoa Beach. www.patrick.af.mil
Tyndall AFB, AETC, DSN 523-1110, commercial 850-283-1113. Size: 29,102 acres. Named for 1st Lt. Frank B. Tyndall, pilot killed in a P-1 crash July 15, 1930. Location: 12 miles east of Panama City. www.tyndall.af.mil

REGION 7

Indiana
Fort Wayne IAP, ANG, DSN 786-1210, commercial 260-478-3210. Location:
southwest of Fort Wayne.
Grissom ARB, ANG, DSN 388-5211, commercial 765-688-3348. Location: 15 miles north of Kokomo.
Terre Haute IAP-Hulman Field, ANG, DSN 724-1210, commercial 812-877-5210.
Location: 5 miles east of Terre Haute.

Kentucky
Louisville IAP, ANG, DSN 741-4400, commercial 502-364-9400. Location: Louisville.

Tennessee
Arnold AFB, AFMC, DSN 340-1110, commercial 931-454-1110. Size: 39,081 acres. Named for Gen. H.H. "Hap" Arnold, former chief of Army Air Forces. Location: 7 miles southeast of Manchester. www.arnold.af.mil
McGhee Tyson ANGB, ANG, DSN 266-3210, commercial 865-985-3210.
Location: 11 miles south of Knoxville.
Memphis IAP, ANG, DSN 726-7101, commercial 901-541-7101. Location: Memphis.
Nashville IAP, DSN 778-6210, commercial 615-399-5410. Location: 6 miles southeast of Nashville.

Georgia
Dobbins ARB, AFRC, DSN 625-1110, commercial 678-655-5467. Location: 16 miles northwest of Atlanta.
Moody AFB, ACC, DSN 460-1110, commercial 229-257-1110. Size: 6,050 acres. Named for Maj. George P. Moody, killed in aircraft crash May 5, 1941. Location: 10 miles north-northeast of Valdosta. www.moody.af.mil
Robins AFB, AFMC, AFRC, DSN 468-1001, commercial 478-926-1110. Size: 8,723 acres. Named for Brig. Gen. Augustine Warner Robins, former chief of the Air Corps materiel division. Location: 15 miles southeast of Macon. www.robins.af.mil
Savannah IAP, CRTC, ANG, DSN 860-8201; commercial 912-966-8201. Location: 4 miles northwest of Savannah.

North Carolina
Charlotte-Douglas IAP, ANG,
DSN 231-4100, commercial 704-391-4100.
Location: Charlotte.
Pope AFB, AMC, DSN 424-1110, commercial 910-394-1110. Size: 1,984 acres. Named for 1st Lt. Harley H. Pope, flier killed when his JN-4 "Jenny" crashed into the Cape Fear River Jan. 7, 1917. Location: 12 miles north-northwest of Fayetteville. www.pope.af.mil
Seymour Johnson AFB, ACC, DSN 722-1110, commercial 919-722-1110. Size: 3,233 acres. Named for Navy Lt. Seymour A. Johnson of Goldsboro; killed March 5, 1941, in aircraft accident. Location: Goldsboro.
www.seymourjohnson.af.mil

South Carolina
Charleston AFB, AMC, DSN 673-1110, commercial 843-963-1110. Size: 6,486 acres.
Location: North Charleston.
www.charleston.af.mil
McEntire JNGB, DSN 583-8000, commercial 803-647-8000. Location: 12 miles east of Columbia.
Shaw AFB, ACC, DSN 965-1110, commercial 803-895-1110. Size: 15,833 acres (includes Poinsett Air-to-Ground Bombing Range). Named for 1st Lt. Ervin D. Shaw, killed in action over France, July 9, 1918.
Location: 10 miles west-northwest of Sumter. www.shaw.af.mil

REGION 8

Ohio
Mansfield Lahm Airport, ANG, DSN 696-6210, commercial 419-520-6210. Location: 3 miles north of Mansfield.
Rickenbacker ANGB, ANG, DSN 696-4468, commercial 614-492-4357. Location: 5 miles south of Columbus.
Springfield-Beckley ANGB, commercial 937-327-2100. Location: 5 miles south of Springfield.
Toledo Express Airport, ANG, DSN 580-4078, commercial 419-868-4078. Location: 14 miles west of Toledo.
Wright-Patterson AFB, AFMC, DSN 787-1110, commercial 937-257-1110. Size: 8,145 acres. Named for Wilbur and Orville Wright and 1st Lt. Frank S. Patterson, killed in June 19, 1918, aircraft crash. Location: 10 miles east-northeast of Dayton. www.wpafb.af.mil
Youngstown JARS, DSN 346-1000, commercial 330-609-1000. Location: 16 miles north of Youngstown.

Pennsylvania
Harrisburg IAP ARS, ANG, DSN 491-2200, commercial 717-948-2200. Location: 5 miles south of Harrisburg.
Pittsburgh IAP ARS, AFRC: DSN 277-8000, commercial (412) 474-8000. ANG:
DSN 294-7359, commercial (412) 776-7359.
Location: AFRC: 15 miles west of Pittsburgh. ANG: 10 miles west of downtown Pittsburgh.
NAS JRB Willow Grove, AFRC,
DSN 991-1500, commercial 215-443-1500.
Location: Willow Grove, Pa.

Delaware
Dover AFB, AMC, DSN 445-3000, commercial 302-677-3000. Size: About 3,400 acres.
Location: 3 miles southeast of Dover.
www.dover.af.mil
New Castle County Airport, ANG,
DSN 445-7300, commercial 302-323-3300.
Location: 5 miles south of Wilmington.

Maryland
Andrews AFB, AFDW, DSN 858-1110, commercial 301-981-1110. Size: 6,853 acres. Named for Lt. Gen. Frank M. Andrews, killed in aircraft accident May 3, 1943. Location: 11 miles southeast of Washington, D.C.
www.andrews.af.mil
Martin State Airport, ANG, DSN 243-6210, commercial 410-918-6210. Location: 8 miles east of Baltimore.

Virginia
Langley AFB, ACC, DSN 574-1110 or 574-9990, commercial 757-764-1110.
Size: 3,167 acres. Named for Samuel Pierpont Langley, aviation pioneer and scientist who died in 1906. Location: 3 miles north of Hampton. www.langley.af.mil
Richmond IAP, ANG, DSN 864-6210, commercial 804-236-6000. Location: 4 miles southeast of downtown Richmond.

D.C.
Bolling AFB and Air Force District of Washington, DSN 297-4781, commercial 202-767-4781. Size: 604 acres. Named for Col. Raynal C. Bolling, Air Service officer killed during World War I. Location: 3 miles south of the capital. www.bolling.af.mil

West Virginia
Eastern West Virginia Regional Airport/ Shepherd Field, ANG, DSN 242-9210, commercial 304-616-5100. Location: 4 miles south of Martinsburg.
Yeager Airport ANGS, ANG, DSN 366-6000, commercial 304-341-6000. Location: 4 miles northeast of Charleston.

REGION 9

New York
Stewart IAP, ANG, DSN 638-2000, commercial 845-563-2000. Location: Newburgh.
Schenectady County Airport, ANG, DSN 344-2300, commercial 518-344-2300. Location: 2 miles north of Schenectady
Niagara Falls ARS, AFRC, DSN 238-2000, commercial 716-236-2000. Location: 6 miles east of Niagara Falls.
Hancock Field ANGB, ANG, DSN 243-2100, commercial 315-233-2100. Location: 5 miles northeast of Syracuse.
Francis S. Gabreski Airport, ANG, DSN 456-7100, commercial 631-723-7100.
Location: Westhampton Beach.
www.106rqw.ang.af.mil

New Jersey
Atlantic City IAP, ANG, DSN 455-6000, commercial 609-645-6000. Location: 10 miles west of Atlantic City. www.177fw.ang.af.mil
McGuire AFB, AMC, DSN 650-1100, commercial 609-754-1100. Size: 3,598 acres. Named for Maj. Thomas B. McGuire Jr., P-38 pilot and Medal of Honor recipient, killed in action Jan. 7, 1945. Location: 18 miles southeast of Trenton. www.mcguire.af.mil

Vermont
Burlington IAP, ANG, DSN 220-5210, commercial 802-660-5210. Location: 3 miles east of Burlington.

New Hampshire
New Boston AFS, AFSPC, DSN 489-2201, commercial 603-471-2201.
Pease ANGB, ANG, DSN 852-2453, commercial 603-430-2453. Location: Portsmouth.

Maine
Bangor IAP, ANG, DSN 698-7700, commercial 207-990-7700. Location: 4 miles northwest of Bangor.

Massachusetts
Barnes ANGB, ANG, DSN 698-1466, commercial 413-568-9151. Location: Westfield, Mass.
Cape Cod AFS, AFSPC, DSN 557-2244, commercial 508-968-3301.
Hanscom AFB, AFMC, DSN 478-1110, commercial 781-377-1110. Size: 1,005 acres. Named for Laurence G. Hanscom, pioneer of private aviation, killed in an airplane accident in 1941. Location: 17 miles northwest of Boston. www.hanscom.af.mil
Otis ANGB, ANG, DSN 557-1000, commercial 508-968-1000. Location: 7 miles north-northeast of Falmouth.
Westover ARB, AFRC, DSN 589-1110, commercial 413-557-1110. Location: 5 miles northeast of Chicopee.

Rhode Island
Quonset State Airport, ANG, DSN 476-3210, commercial 401-886-1210. Location: 20 miles south of Providence.

Connecticut
Bradley ANGB IAP, ANG, DSN 636-8310, commercial 860-292-2536.
Location: Windsor Locks.
Orange ANGB, ANG, DSN 795-2900, commercial 203-795-2900. Location: Orange.

ABBREVIATIONS

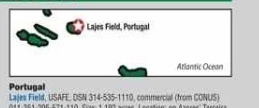
AB = Air Base
ACC = Air Combat Command
AETC = Air Education and Training Command
AFB = Air Force Base
AFRC = Air Force Reserve Command
AFS = Air Force Station
AFSOC Air Force Special Operations Command
AFSPC = Air Force Space Command
AMC = Air Mobility Command
ANG = Air National Guard
ANGB = Air National Guard Base
ANGS = Air National Guard Station
ARB = Air Reserve Base
ARS = Air Reserve Station
CONUS = Continental United States
CRTC = Combat Readiness Training Center
DSN = Defense Switched Network
IAP = International Airport
JARS = Joint Air Reserve Station
JRB = Joint Reserve Base
MAJCOM = Major Command
MAP = Municipal Airport
NAS JRB = Naval Air Station Joint Reserve Base
PACAF = Pacific Air Forces
USAFE = U.S. Air Forces in Europe
USCENTCOM = U.S. Central Command
USSOUTHCOM = U.S. Southern Command

SYMBOLS

Active Duty Base
G Air National Guard Base
R Air Force Reserve Command Base

OVERSEAS FACILITIES

Greenland
Thule AB, AFSPC, DSN 269-3840, commercial 719-474-3840.



Portugal
Lajes Field, USAFE, DSN 314-535-1110, commercial (from CONUS) 011-351-295-571-110. Size: 1,182 acres. Location: on Azores' Terceira Island; 900 miles west of mainland Portugal. www.lajes.af.mil

England
RAF Lakenheath, USAFE, DSN 314-226-1110, commercial (from CONUS) 011-44-1638-52-1110. Size: 2,290 acres. Named for nearby village. Location: 25 miles from Cambridge. www.lakenheath.af.mil
RAF Croughton, USAFE, DSN 314-236-1110, commercial 011-44-1280-70-8000. Named for nearby village. Location: 60 miles northwest of London. www.croughton.af.mil
RAF Fairford, USAFE, DSN 314-242-1110, commercial 011-44-1285-71-4000.
RAF Mildenhall, USAFE, DSN 314-238-1110, commercial (from CONUS) 011-44-1638-54-3000. Size: 1,121 acres. Named for nearby village. Location: 30 miles northeast of Cambridge. www.mildenhall.af.mil

Germany
Ramstein AB, USAFE, DSN 314-480-1110, commercial (from CONUS) 011-49-6371-47-1110. Location: 15 minutes west of Kaiserslautern.
Sembach Annex, USAFE, DSN 314-496-1110, commercial (from CONUS) 011-49-6302-67-1110. Location: 30 minutes east of Ramstein AB.

Spangdahlem AB, USAFE, DSN 314-452-1110, commercial (from CONUS) 011-49-6565-61-1110. Size: 1,575 acres. Location: 8 miles east of Bitburg. www.spangdahlem.af.mil

Italy
Aviano AB, USAFE, DSN 314-632-1110, commercial (from CONUS) 011-39-0434-30-1110 or 1113. Size: 1,331 acres. Location: 50 miles north of Venice. www.aviano.af.mil
Ghedi AB, USAFE, DSN 314-632-7301, commercial 011-39-030-904-2725.

Spain
Morón AB, USAFE, DSN 314-722-1110, commercial 011-34-95-584-8111.

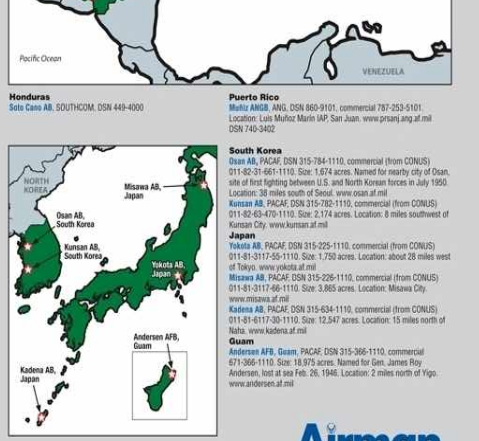
Turkey
Incirlik AB, USAFE, DSN 314-676-1110, commercial (from CONUS) 011-90-322-316-1110. Size: 3,400 acres. Base name means "fig orchard" in Turkish. Location: 6 miles east of Adana. www.incirlik.af.mil
Izmir AFS, USAFE, DSN 314-675-1110, commercial 011-90-232-462-3720.

Iraq
Kirkuk AB, USCENTCOM, DSN 318-444-1110
Al Asad AB, USCENTCOM; no phone number available
Joint Base Balad, USCENTCOM, DSN 318-443-1110
Sather AB, USCENTCOM, no phone number available
Ali Base, USCENTCOM, no phone number available

Afghanistan
Bagram Airfield, USCENTCOM, DSN 318-231-3260
Kyrgyzstan
Manas AB, USCENTCOM, DSN 318-441-1110
*Scheduled to close 1 Aug 2009

Honduras
Soto Cano AB, SOUTHCOM, DSN 449-4000

Puerto Rico
Muñiz ANGB, ANG, DSN 860-9101, commercial 787-253-5101.
Location: Luis Muñoz Marín IAP, San Juan. www.prsanj.ang.af.mil
DSN 740-3402

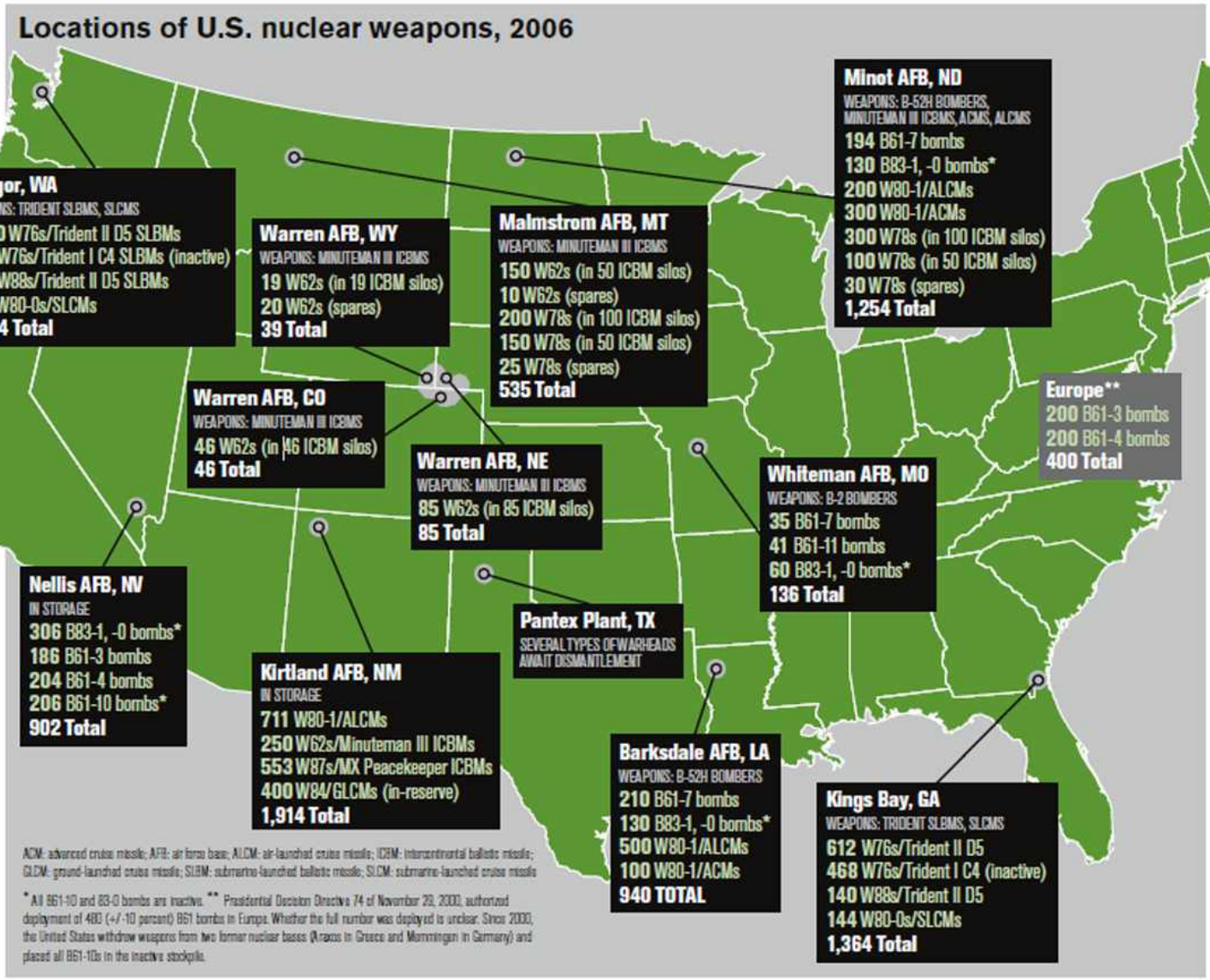


South Korea
Osan AB, PACAF, DSN 315-784-1110, commercial (from CONUS) 011-82-31-661-1110. Size: 1,674 acres. Named for nearby city of Osan, site of first fighting between U.S. and North Korean forces in July 1950. Location: 38 miles south of Seoul. www.osan.af.mil
Kunsan AB, PACAF, DSN 315-782-1110, commercial (from CONUS) 011-82-63-470-1110. Size: 2,174 acres. Location: 8 miles southwest of Kunsan City. www.kunsan.af.mil

Japan
Yokota AB, PACAF, DSN 315-225-1110, commercial (from CONUS) 011-81-3117-55-1110. Size: 1,750 acres. Location: about 28 miles west of Tokyo. www.yokota.af.mil
Misawa AB, PACAF, DSN 315-226-1110, commercial (from CONUS) 011-81-3177-66-1110. Size: 3,865 acres. Location: Misawa City. www.misawa.af.mil
Kadena AB, PACAF, DSN 315-634-1110, commercial (from CONUS) 011-81-6117-30-1110. Size: 12,547 acres. Location: 15 miles north of Naha. www.kadena.af.mil

Guam
Andersen AFB, Guam, PACAF, DSN 315-366-1110, commercial 671-366-1110. Size: 16,975 acres. Named for Gen. James Roy Andersen, lost at sea Feb. 26, 1946. Location: 2 miles north of Yigo. www.andersen.af.mil

Airman



U.S. Nuclear Weapons

Today, the United States has approximately 2,150 operational warheads and 2,850 in stock, called Enduring Stockpile, totaling 5,000. The proposed Finance Act for 2011 emergency response and management stated (Appendix D p. 2) that the planned production complex will be able to support a stock of 3000-3500 warheads, a level of 1500-2000 warheads in the current stock. But it could not give a timetable or strategy for such reductions.[116]

The United States as of Sept. 1 2011 officially had 1,790 deployed strategic nuclear warheads, while Russia had fielded 1,566 long-range weapons, according to details

116Nuclear Security Administration: **Stockpile Stewardship and Management Plan for fiscal 2012**.

from a semiannual information swap mandated under a strategic nuclear arms control treaty between the two countries.

The United States had 822 ICBMs, submarine-launched ballistic missiles and nuclear bombers deployed at the time of the exchange, the State Department said in a fact sheet released last week. Russia wielded 516 such launch-ready delivery vehicles. The count of U.S. bombers and ballistic missile firing platforms totaled 1,043, including fielded and reserve systems. Russia reported holding 871 bombers and missile firing platforms.

The United States as of Sept. 1 2011 possessed 448 launch-ready ICBMs and 324 additional ballistic missiles in reserve, according to details made public on Thursday on the nation's nuclear-weapon delivery systems.
The U.S. fleet of deployed land-based ballistic missiles was comprised solely of Minuteman 3 ICBMs, according to data released by the State Department. The country held 266 more Minuteman 3 missiles in storage with 58 launch units for the reserve weapons. In addition, the nation had 58 Peacekeeper ICBMs in storage with 51 firing units. Separately, the United States possessed six test launch platforms for Minuteman 3 ICBMs and one for the Peacekeeper missiles.
The country had 249 launch-ready Trident 2 submarine-carried ballistic missiles and 161 more of the weapons in storage. Eighty-seven additional Trident 2 launch units were available in reserve.
The nation fielded 11 B-2, 39 B-52G and 75 B-52H nuclear bombers, and it had nine B-2 aircraft and 16 B-52H planes in storage. In addition, it held two B-2 and two B-52H test aircraft (U.S. State Department press release, Dec. 1)[117].

A qualified assessment of the number of current U.S. nuclear weapons is : The U.S. Nuclear Forces, 2011 / Hans M. Kristensen and Robert S. Norris in the Bulletin of the Atomic Scientist 2011 67: 66. According to The Internet and the Bomb: A Research Guide to Policy and Information about Nuclear Weapons, the private nuclear weapons industry includes the following firms:

Aerojet - http://www.aerojet.com/
MX and Minuteman rocket motors.[118] The current US force consists of 450 Minuteman-III missiles in missile silos[119] around F.E. Warren AFB, Wyoming; Malmstrom AFB, Montana; and Minot AFB, North Dakota.

117 **New START Treaty Aggregate Numbers of Strategic Offensive Arms**. December 1, 2011- 2 pp. Bureau of Arms Control, Verification and Compliance, U.S. Department of State, Washington, DC
- http://www.state.gov/documents/organization/178270.pdf

118 **Rocket Fuel in Drinking Water**: New data show widespread nationwide contamination. Environmental Working Group (http://www.ewg.org), 2003. - 41 pp. ' Perchlorate, the explosive main ingredient of rocket and missile fuel, contaminates drinking water supplies, groundwater or soil in hundreds of locations in at least 43 states, according to Environmental Working Group's updated analysis of government data. EWG's analysis of the latest scientific studies, which show harmful health effects from minute doses, argues that a national standard for perchlorate in drinking water should be no higher than one-tenth the level the US. Environmental Protection Agency currently recommends as safe.'

119 **Nuclear Heartland**: A Guide to the One Thousand Missile Silos of the United States. Progressive Foundation, Nukewatch, Edited by Samuel H. Day, Jr., with a preface by Philip Berrigan 1988. - 96 pp.
'Maps and photographs of the 1,000 intercontinental nuclear missiles and 100 launch control centers of the U.S. Strategic Air Command, scattered across seven Midwestern and Great Lakes States.'

Battelle National Security Division - http://www.battelle.org/natsec/natsec.html
Bechtel Hanford, Inc. (A division of Bechtel National, Inc.) - http://www.bhi-erc.com/
Effective October 1, 2007, the US Department of Energy awarded Bechtel partnership LLNS LLC the contract to operate Lawrence Livermore National Laboratory: Bechtel has a presence, through various partnerships, of the bulk of the US nuclear weapons facilities, including Los Alamos National Laboratory (design and pit production), Lawrence Livermore National Laboratory (design), Savannah River Site (nuclear materials), Hanford Site (nuclear materials), Pantex Plant (assembly/disassembly), Y-12 National Security Complex (nuclear materials), and the Nevada Test Site (subcritical testing). Bechtel is also under contract for the new A1B reactor, a nuclear reactor being designed for use by the United States Navy to provide electricity generation and propulsion for the Gerald R. Ford-class aircraft carriers The environmental restoration contractor at Hanford. A major focus of the program is protecting the Columbia River by cleaning contamination in Hanford's 100 Area, an approximate 20-mile stretch of land along the river, where nine nuclear reactors operated from World War II through the late 1980'pp.

Bechtel Nevada - http://www.bechtel.com/nvtest.htm
Operators of the DOE Nevada Test Site.

Boeing - http://www.boeing.com/
Prime contractor on the B-1B, B-52, Minuteman missile and ALCM. On 15 December 1996, announcement was made that an agreement had been reached to merge McDonnell Douglas with Boeing. Earlier in 1996, Boeing had bought the Aerospace & Defense division from Rockwell, the original prime contractor of the B-1B.
Boeing Defense and Space Group
http://www.boeing.com/dsg/def.html

EG&G - http://egginc.com/
A former major DOE contractor that traces its roots to the Manhatttan Project. Its history page recounts its involvement

Fluor Daniel Hanford - http://www.hanford.gov/contrctr/fdh.htm

General Dynamic's Electric Boat division operates a hull fabrication plant here, where large Navy vessels are assembled. The 169-acre shoreline facility is a former Naval Air Station, closed in the 1970'pp. Soon after closure, Electric Boat took over the site, and employed as many as 5,700 people here in the 1980'pp. Current employment is around 1,500. Quonset Point is an assembly site for nuclear submarines. The partially built vessels are barged to Electric Boat's main facility in Groton, Connecticut.
Source: CLUI Land Use Database.

General Dynamics Electric Boat Division[120] - http://www.gdeb.com and Bath Iron Works. Maker of the Trident (Ohio class) submarine.

General Electric Corporation - http://www.ge.com/aircraftengines/index.htm
Makers of aircraft engines for the B-1B, B-2, F-16 and F-117.

Hughes Missile Systems Company - http://www.hughesmissiles.com/
Makers of the Tomahawk SLCM and the ACM. A subsidiary of General Motors. The defense operations of Hughes Electronics (Hughes Aircraft) are to merge with Raytheon and become Raytheon Hughes Systems.

Kaman Sciences Corporation - http://www.kiac.com

120**General Dynamics, Electric Boat Division, Groton, Connecticut**. / National Institute for Occupational Safety and Health. - [Atlanta, Ga.?] : US. Dept. of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health ; [Springfield, Va. : National Technical Information Service, distributor, 1998] - 45 pp.
HETA 87-348-2011 / National Institute for Occupational Safety and Health. - [Atlanta, Ga.?] : US. Dept. of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health ; [Springfield, Va. : National Technical Information Service, distributor, 1990] - 100 pp.

Major DOD nuclear weapons consultant.

Lockheed Martin Corporation - http://www.lmco.com/
Current U.S. arms factory, a part of the U.S. military-industrial complex and the nuclear weapons industrial complex founded in 1926.
Current corporate structure is from 1995. Employees: about 125.000. Turnover 2010 about 300 billion The company has plants in Clarksburg, West Virginia, Fort Worth, Texas, Greenville, South Carolina, Johnstown, Pennsylvania, Marietta, Georgia, Meridian, Mississippi, Palmdale[121], California and San Antonio, Texas.
Lockheed Martin is the world's largest arms factory and. manufactures and sells the Aegis Combat System, the Aegis Ballistic Missile Defense System, the Joint Strike Fighter (F35) F-22, F-16 war planes, C-130J military transport aircraft and Atlas, Titan and Athena rockets, the Trident II (D5) submarine-based ballistic missile produced in collaboration with Alliant Tech Systems. Furthermore produces Lockheed Martin satellites for NASA and the military and has extensive supplies of military information and command systems for the U.S. Star Wars project, such as GPS, Milstar and Milsatcom. Among Lockheed Martin managed companies include Idaho

121**Air Force Plant 42. Palmdale, California. Administrative Record Index**. Prepared and Maintained by: U.S. Department of the Air Force. Aeronautical Systems Center. Wright-Patterson AFB, Ohio. 2007. - 19 pp.- http://www.wpafb.af.mil/asc/environmental/index.asp

National Engineering and Environmental Laboratory, Oak Ridge National Laboratory, Pinellas Park Factory, Florida, Y-12 plant K-25 Site and the Sandia Nuclear Weapons Laboratory.
Lockheed Martin Energy Systems - http://www.ornl.gov/mmes.html
Operators of the Sandia Laboratories, INEEL, Oak Ridge Y-12 and K-25, and ORNL.

Lockheed Marine Missiles and Space - http://www.lmsc.lockheed.com/
Makers of Trident SLBMs for the Navy.

Lockheed "Skunk Works"
http://www.lmsw.external.lmco.com/lmsw/text/index.html
Developers of the U-2, SR-71 and F-117 aircraft.

Mason & Hanger-Silas Mason Company - http://www.mhe.com/
Operators of the Pantex Plant.

McDonnell-Douglas - http://www.mdc.com/
To merge with Boeing. Makers of the F-15E aircraft.

Northrop-Grumman Corporation[122]
http://www.northgrum.com/

Pratt & Whitney - http://www.pwfl.com/
Makers of F-15E and F-16 aircraft engines.

Raytheon - http://www.raytheon.com
Makers of nuclear weapons-related radars and early warning devices (e.g., PAVE PAWS, BMEWS, Cobra Dane, Cobra Judy). On 6 January 1997, Raytheon announced a buyout of Texas Instruments' Defense Systems and Electronics Group. On 16 January 1997, Ratheon announced that it would buy Hughes Electronics Corporation defense operations (Hughes Aircraft) from General Motors.

Rockwell International[123] (B-1B, Minuteman) - http://www.rockwell.com/
Rockwell sold its Aerospace & Defense to Boeing in 1996.

SAIC - http://www.saic.com/
Major DOD and DOE nuclear weapons consultant and contractor.

122**The Limitations of Wellhead Treatment** : Bethpage and Massapequa, Long Island, New York / Lenny Siegel. The Center for Public Environmental Oversight, July, 2011 - 4 pp.
123National Archives: **Records of the Atomic Energy Commission** [AEC] (Record Group 326) 1923-75.

Thiokol - http://www.thiokol.com
Products made by the aerospace divisions of RMI and Thiokol include motors used in Subroc, the Pershing missile, the Peacekeeper missile, Poseidon missile, Minuteman missile, and the Trident I and Trident II missiles. Thiokol produces powerplants for numerous US. military missile systems, including AIM-9 Sidewinder, AGM-88 HARM, AGM-65 Maverick, AGM-69 SRAM, and AIR-2 Genie..

Westinghouse
- http://www.westinghouse.com/
Makers of submarine nuclear reactors and DOE Hanford contractor.

Trident II

Trident[124]

Latin: Name of the U.S. and the British, nuclear submarines and their nuclear missiles..

Nuclear weapons in the U.S. Navy arsenal are deployed through ballistic missiles, submarines and aircraft. The U.S. Trident submarines is planned and built from the fiscal year the 1974. Manufacturers inter alia are the weapons factories Electric Boat Division, General Dynamics and Lockheed Martin Space Systems Co.. The Navy's other nuclear weapons are B61 nuclear bomb. B61 is a thermonuclear bomb thrown from F/A-18 Hornet and the Super Hornet fighter-bomber. According to Margaret Thatcher Foundation's , *Margaret Thatcher's files as Prime Minister, 1981* 'Finally, there is a revealing political discussion of Trident dated 10 Feb 1981. The new Defence Secretary, John Nott, notes his belief that fully two thirds of the Conservative Party and the Cabinet itself were opposed to the purchase of Trident and that "(e)ven the Chiefs of

124 Ainslie, John: Trident : **Britain's weapon of mass destruction**. Scottish CND, 1999. - 32 pp.
The British nuclear deterrent after the cold war / Nicholas K.J. Witney. "Prepared for the United States Air Force." 1995. - 141 pp. - http://www.dtic.mil/dtic/tr/fulltext/u2/a295566.pdf
Campbell, Duncan: **Secret Society I**, BBC 1987.
http://www.archive.org/details/SecretSociety-Part1SecretConstitution
[In this freedom of information tour de force Campbell exposes the secret decision to buy US. Trident nuclear submarines as well as laying bare the cabinet level dirty tricks campaign against CND and its general secretary Bruce Kent. Margaret Thatcher, James Callaghan, the British Atlantic Committee, The ultra-right Coalition for Peace Through Security and the cabinet secretary come in for sharp criticism for keeping key decisions secret from MP'pp.]
CONTRACTS from the United States Department of Defense, herunder.
CONTRACTS from the United States Department of Defense. December 20, 2005.
CONTRACTS from the United States Department of Defense. January 12, 2006.
US. Space Command: **The Military Arm of Corporate Globalization**.
http://www.archive.org/details/PhilosopherSeed-BruceGagnon570
Hoon Geoffrey: **Trident Missile's Costs**. January 18, 2005.

Staff were not unanimous". Whether they favoured a cheaper system, or none at all, is unclear, though comments elsewhere suggest that the real problem for the politicians was uncertainty as to their ability to manage public opinion with unilateralism rising in popularity. The Foreign Secretary, Lord Carrington, responded bluntly to Nott's reflection: "(He) said that he also was in no doubt about the decision. Failure to acquire Trident would have left the French as the only nuclear power in Europe. This would be intolerable."'[125] The first Trident submarine, USS Ohio (SSGN 726), became operational in November 1981.

The submarines contains up to 192 intercontinental (ICBM) with MIRV capability; nuclear warheads of 100 kilotons. The U.S. Trident submarines have one base in Kitsap. Naval Base Kitsap is a naval base located on the Kitsap Peninsula in Washington State. This was created in 2004 by merging the former Naval Station Bremerton with a Navy submarine base in Bangor.[126] In 1973 the Navy selected Bangor base as home port for the first squadron of Ohio-class Trident submarines. February 1, 1977 the base was officially activated.

Naval Base Kitsap includes the Strategic Weapons Facility Pacific, providing maintenance, spare parts and storage for Trident ballistic missiles atomic warheads. This Trident submarine base is the only U.S. nuclear submarine base for the Pacific, while the

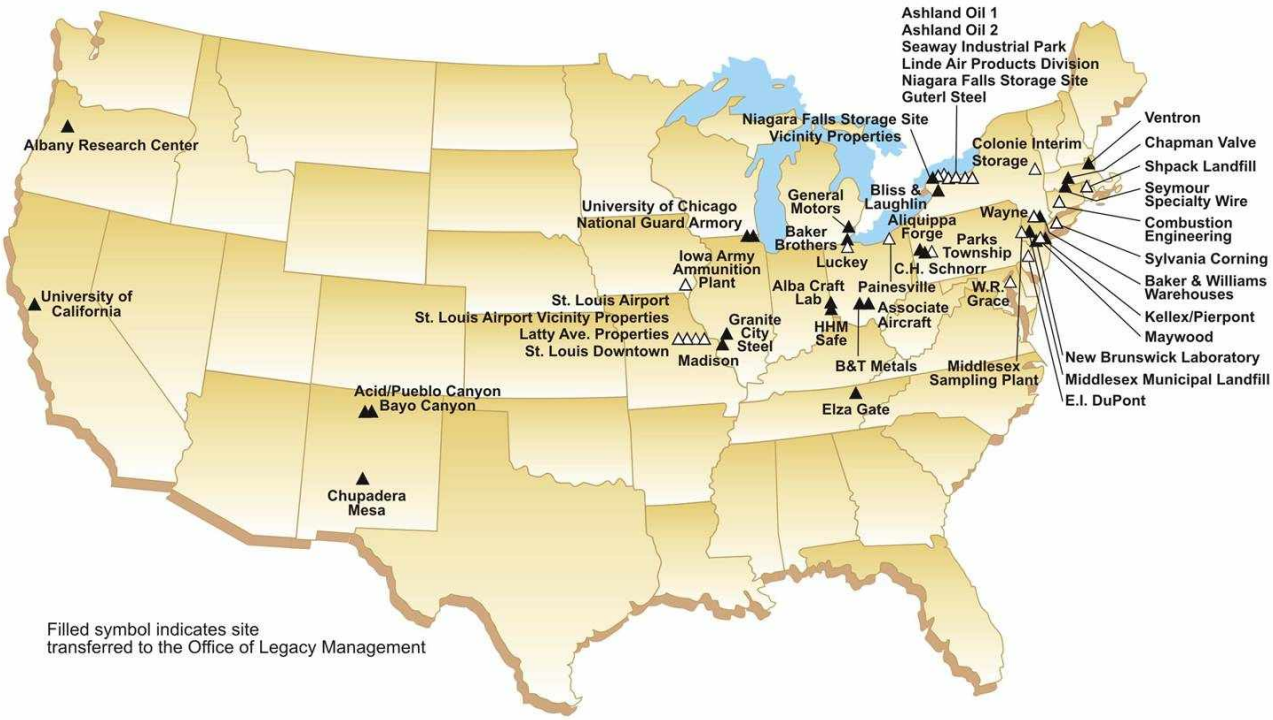
125 Margaret Thatcher Foundation: **Margaret Thatcher's files as Prime Minister, 1981**, 2011.
- http://www.margaretthatcher.org/archive/1981_PREM19.asp

126 **Plan for new Navy wharf at Bangor fires up nuke debate** : Is the nuclear-sub fleet a "Cold War relic" or a modern deterrent? The Pentagon nears a decision on building a $715 million munitions wharf on Hood Canal. / Kyung M. Song, Seattle Times Washington bureau, January 8, 2012.
- http://seattletimes.nwsource.com/html/localnews/2017193326_navywharf09m.html
'Now the Navy wants a $715 million second munitions wharf to accommodate upgrade work on the missiles. The Pentagon is scheduled to issue its final environmental-impact statement early this year, one of the last major hurdles before the four-year construction can begin in July.'

Trident base at Kings Bay, Georgia Naval Submarine Support or Base Kings Bay, covers the Atlantic basin. The U.S. Trident SSGN submarines are multiple tasks, optimized for both tactical attacks and support for special operations.

See also: BAe Systems Submarine Solutions ; Coalition to Stop Trident ; the UK Naval Base at Faslane ; US Naval Submarine Base New London, Connecticut ; US Nuclear Regional Maintenance Department ; TRIDENT II Fire Control Omnibus Contract.; Trident Ploughshares.

American Nuclear Weapons Plants



Formerly Utilized Sites Remedial Action Program Sites

Known historical and current beryllium companies and nuclear weapons plants in the USA. The database includes data from the Energy Employees Occupational Illness Compensation Program, the Formerly Utilized Sites Remedial Action Program, the Formerly Used Defense Sites Program and Science.gov, where much of the descriptions of the companies are. The recorded data can be incomplete due to lack of knowledge, classification or masking of information.[127]

127Cunningham, Larry D.: **Beryllium**.
DOD: **Map Book of Major Military Installations,** 1955-1982.
Atlas/State Data Abstract ,1984-.
- Washington Headquarters Services (DOD) Dc Directorate for Information Operations and Reports.
Samples: http://www.dtic.mil/dtic/tr/fulltext/u2/a279656.pdf , and http://dodreports.com/ada341587
From 1955 to 1982, the Department of Defense (DOD) published the Map Book of Major Military Installations. The 1984 edition was expanded to include selected U.S. Territories and Possessions, and

By the end of FY1999, DOD had identified a total of 23,060 sites on current and former military facilities that require cleanup under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, the Defense Environmental Restoration Program, including a total of 4,885 sites on BRAC facilities that require cleanup. Also the DOE reports that there are a total of 113 sites where the past production of atomic materials used to construct nuclear weapons led to severe contamination in need of environmental remediation.[128]

PDF navigation: "Previous View" (alt-back arrow)

the 1986 edition added selected foreign countries.

DOE: Energy Employees Occupational Illness Compensation Act of 2000; **List of Covered Facilities**, 2001.- 14 pp..See also: **Data collection, processing, validation, and verification** / Deborah L. Martin et al.

U.S. Department of Energy Office of Legacy Management: **Long-Term Surveillance and Maintenance Requirements for Remediated FUSRAP Sites**. 2011. - 146 pp.

- http://www.lm.doe.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=7978&libID=8084

DOE: Report to Congress - **Updated Appendices to the Status of Environmental Management Initiatives to Accelerate the Reduction of Environmental Risks and Challenges Posed by the Legacy of the Cold War.** 2010. - 55 pp.

- http://www.em.doe.gov/pdfs/Final%20signed%20NDAA%20Report%206-21-2010.pdf

Dose Reconstruction Cases by Nuclear Weapons Production Facility as of January 15, 2004.

GAO: **Formerly Used Defense Sites**: The U.S. Army Corps of Engineers Needs to Improve Its Process for Reviewing Completed Cleanup Remedies to Ensure Continued Protection. 2009. - 80 pp.

Report on Residual Radioactive and Beryllium Contamination at Atomic Weapons Employer Facilities and Beryllium Vendor Facilities / Prepared by: National Institute for Occupational Safety and Health, Office of Compensation Analysis and Support, Centers for Disease Control and Prevention, - 8 pp.

United States Environmental Protection Agency: **Solid Waste and Emergency Response** : National Biennial RCRA Hazardous Waste Report (Based on 1991 Data), 1994. - 105 pp. 'This document contains a list of treatment, storage and disposal facilities, as identified by EPA's Biennial Report ... There are 3,845 treatment, storage and disposal facilities on this list.'

128 CRS: **Defense Cleanup and Environmental Programs**: Authorization and Appropriations for FY2001. / David M. Bearden. 2001. - 23 pp.

- http://digital.library.unt.edu/ark:/67531/metacrs1584/m1/1/high_res_d/RL30554_2001Jan17.pdf

•AK **Clear Air Force Station, Ballistic Missile Early Warning System Site II**[129], Anderson vicinity, Atomic Weapons Employer, AWE

•AL **Army Ballistic Missile Agency**[130] Huntsville AWE - The Army Ballistic Missile

129 Historic American Engineering Record: **Clear Air Force Station, Ballistic Missile Early Warning System Site II, One mile west of mile marker 293.5 on Parks Highway, 5 miles southwest of Anderson, Anderson vicinity, AK**. Library of Congress, Prints and Photographs Division - 80 pp.
- http://www.loc.gov/pictures/item/AK0486/

130 **Statement of Maj. Gen. J. B. Medaris Commanding General, United States Army Ordinance Missile Command**.
Astronautics and Space Exploration: Hearings before the Select Committee on Astronautics and

Agency was the agency formed to develop the US Army's first intermediate range ballistic missile. It was established at the Redstone Arsenal on February 1, 1956 and commanded by Major General John B. Medaris (who also was a member of the Guided Missiles and Astronautics Intelligence Committee) with Doctor Wernher von Braun.
In the March, 1958 ABMA was placed under the new Army Ordnance Missile Command along with Redstone Arsenal, the Jet Propulsion Laboratory, White Sands Proving Ground or the White Sands Missile Range and the Army Rocket and Guided Missile Agency. Now the United States Army Aviation and Missile Command.

Space Exploration. Eighty-fifth Congress second session. ON H. R. 11881. April 15,16, 17, 18, 21, 22, 23, 24, 25, 28, 29, 80, May 1, 5, 7, 8 And 12, 1958. Printed for the use of the Select Committee on Astronautics and Space Exploration. US Government Printing Office Washington : 1958. - 1542 pp; especially p 137-182.

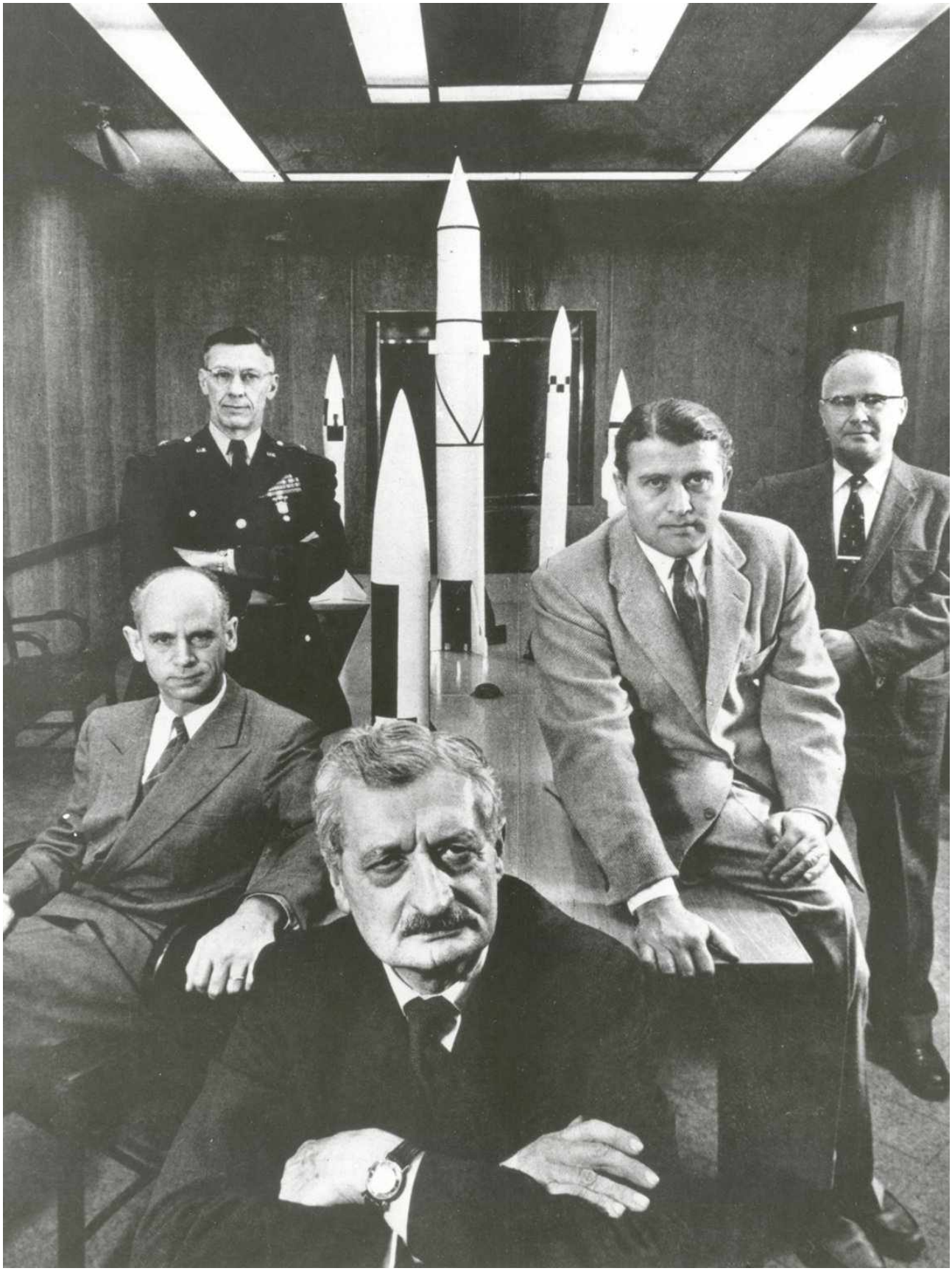
Aeronautics and astronautics; an American chronology of science and technology in the exploration of space, 1915-1960 (1961). - http://www.archive.org/details/aeronauticsastro61unit

A new command : the life of Bruce Medaris, Major General, USA, retired. / Gordon L Harris - Plainfield, N.J. : Logos International, 1976. - 313 pp.

Space and Security: A Reference Handbook. / Peter L. Hays. ABC-CLIO, 2011 - 289 pp

NASA and the Space Industry / Joan Lisa Bromberg. JHU Press, 2000 - 264 pp.

Defense Plant Conversion and Leading Sector: Industrial Development in the Postwar South: The Slow Take-off of the Space Program in New Orleans. / Conrad L. Rein, University of New Orleans. Business and Economic History, Volume 22, No. 2, Winter 1999
- http://www.thebhc.org/publications/BEHprint/v028n2/p0223-p0234.pdf



Officials of the Army Ballistic Missile Agency (1956)Hermann Oberth (forefront) with officials of the Army Ballistic Missile Agency at Huntsville, Alabama in 1956. Left to right: Dr. Ernst Stuhlinger (seated); Major General H.N. Toftoy, Commanding Officer and person responsible for "Project Paperclip," which took scientists and engineers out of Germany after World War II to design rockets for American military use. Many of the scientists later helped to design the Saturn V rocket that took the Apollo 11 astronauts to the Moon. Dr. Eberhard Rees, Deputy Director, Development Operations Division Wernher von Braun, Director, Development Operations Division.- http://www.archive.org/details/GPN-2002-000038

•AL **Propulsion and Structural Test Facility**, the George C. Marshall Space Flight Center Huntsville AWE - The site was built in 1957 by the Army Ballistic Missile Agency and was the primary center responsible for the development of large vehicles and rocket propulsion systems. The Saturn Family of launch vehicles was developed here under the direction of Wernher von Braun.

•AL **Redstone Arsenal**[131] Huntsville AWE - Originally a chemical weapons manufacturing facility for World War II, the arsenal became the focal point of the Army's rocket and space projects, including development of the first U.S. ballistic missiles and

131 US Army: **Comprehensive Energy and Water Master Plan**. Redstone Arsenal. 2009. - 89 pp. - http://www.dtic.mil/dtic/tr/fulltext/u2/a514920.pdf

Archaeological Collections Summary for Redstone Arsenal. Mandatory Center of Expertise for the Curation and Management of Archaeological Collections, 1995. - 71 pp. - http://www.dtic.mil/dtic/tr/fulltext/u2/a363811.pdf

Army Contracting Command-Redstone Arsenal's Management of Undefinitized Contractual Actions Could be Improved. Department of Defense Inspector General, 2011. - 58 pp. - http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA548888&Location=U2&doc=GetTRDoc.pdf

US Army: Lexington facility of Lexington-Bluegrass army depot closure, realignment to Tobyhanna, Letterkenny, Bluegrass facility of Lexington-Bluegrass, Anniston army depots and Redstone arsenal : environmental impact statement, 1991.

space launch vehicles in the 1950s.
The Army Ballistic Missile Agency (ABMA) was established in February of 1956. The Army chose RSA as a suitable location to consolidate its newly formed rocket program due to the large areas of open land, empty buildings and abundant access opportunities to transportation infrastructure. The foundation of the ABMA came from the Guided Missile Development Division of RSA's Ordnance Missile Laboratories. During the 1950s, the Army missile team at RSA pioneered many of the US accomplishments in space exploration.

On October 21, 1959, President Eisenhower ordered components of the military's space program to be transferred to NASA. In July of 1960 a substantial amount of ABMA facilities was leased to NASA to become the George C. Marshall Space Flight Center. RSA lost all space-related missions as a result of this transformation. Today, the aviation and missile experts at RSA research, develop, test, repair, and maintain high technology weapons.
Some of the development projects included the Redstone ballistic missile which was a high-accuracy, liquid-propelled, surface-to-surface missile developed under the direction of Dr. von Braun. The Redstone engine was a modified and improved version of the Air Force's Navaho cruise missile engine of the late forties, the Nike B[132] (or the Nike Hercules) and others. The Surface-to-Surface missiles was the Honest John,[133] which was manufactured by the Douglas Airplane Company of Santa Monica, California, and the Little John, Hawk, MGM-18 Lacrosse developed by the Applied Physics Laboratory at Johns Hopkins University, the Cornell Aeronautical Laboratory and from 1955, the Glenn L. Martin Company was awarded contracts to participate in research and development and production, and Corporal Type III.

132 **Nike Missile Manual Collection.1951-1987** Golden Gate National Recreation Area Park Archives and Records Center. 2004. - 37 pp.
- http://www.nps.gov/goga/historyculture/upload/35286fa-Nike-Missile-Manuals-with-table.pdf
'From Nike Missile Site SF 88L, Fort Barry. Nike missile technical and maintenance manuals from Nike Site 88L, Fort Barry. Includes both Nike-Hercules and Nike-Ajax missiles, as well as manuals for associated equipment and systems.'

133 See also: **Canadian nuclear weapons: the untold story of Canada's Cold War arsenal**. / John Clearwater. - Toronto: Dundurn Press Ltd., 1998 - 309 pp.
U.S. nuclear weapons in Canada. / John Clearwater.
- Toronto: Dundurn Press Ltd., 1999. - 298 pp

•AL **Southern Research Institute** Sylacauga DOE 1955-1958; 1962; 1976 - The Southern Research Institute was involved in several AEC projects. During the period from November 10, 1955 through June 1, 1958, it was licensed to receive source material from National Lead Company of Ohio (Fernald) for research on the properties of uranium-liquid metal fuel elements. The Institute performed hot tensile tests on uranium metal and was authorized to receive 300 pounds of normal uranium from NLO. Records also indicate that it handled test quantities of radioactive metals for NLO in 1976.

•AL **Speedring Experimental & Tool Company**[134] Cullman BE - 1971-2011 - Speedring has performed work using beryllium for Rocky Flats, Sandia National Laboratory, Idaho National Engineering Laboratory and Oak Ridge National Laboratory. There was another Speedring facilities in Detroit, MI.

•AL **Tennessee Valley Authority**[135] or **Uranium Recovery Pilot Plant and Laboratory Muscle Shoals** AWE - 1951-1955 - At its National Fertilizer Development Center, the TVA performed research and development on uranium recovery under formal agreement with the AEC. The work involved the extraction of uranium during the production of fertilizer from leached zone phosphate ore. According to R. H. Bailes[136] 'The preliminary work on the phosphoric acidion exchange process was with acid from the Anaconda Copper Mining Company Plant at Anaconda, Montana. Since this acid contained vanadium as well as uranium, the process which was developed included adsorption of both metals and separation by selective elution. The vanadium was eluted first by reduction with sulfur dioxide,and then the uranium was eluted with dilute sodium chloride solution.

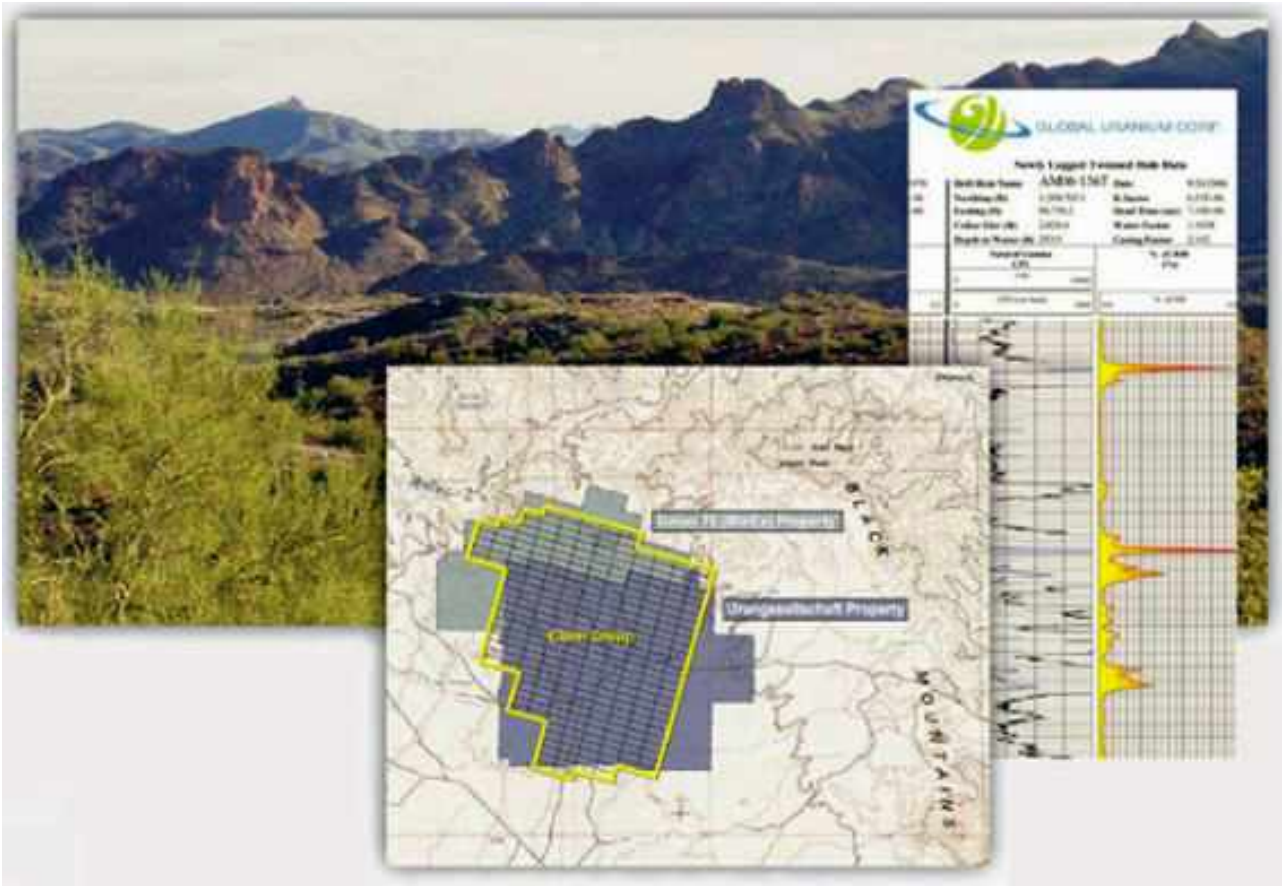
A pilot plant was built at the Pittsburg laboratory, and the process was tested for several months on Anaconda acid. Because of the success of the Pittsburg pilot plant, a larger pilot plant was built in Florida by the U. S. Phosphoric Products Corporation The observation that uranium is strongly complexed by phosphate suggested that alkyl phosphates might exhibit similarly strong complexing action. This study of various alkyl orthophosphoric acids as uranium extractants marked the beginning of the solvent extraction program. Mono- and dibutyl phosphoric acids were shown to be uranium complexers by the University of California Radiation Laboratory and by workers at Hanford. Pilot plants to test this process were built by Mathieson Chemical Company, Pasadena, Texas, U. S. Phosphoric Products Company, Tampa,Florida, and International Mineral and Chemical Company, Barton, Florida. Production plants have since been built by U. S, Phosphoric Products Company, International Minerals and Chemical Company and Virginia-Carolina Chemical Company.'

134 **Source Test Report EPA Test NO.: 71-CI-22: Speedring, Inc. Cullman, Alabama.** Environmental Engineering, Inc. 2324 Southwest 34 Street Gainesville, Florida. - Undated. - 58 pp.

135 **Technical Basis Document: Basis for the Development of an Exposure Matrix for Tennessee Valley Authority, Muscle Shoals, Alabama, Period of Operation: 1951–1955** / Jeri L. Anderson. NIOSH Dose Reconstruction Project. 2004. - 10 pp. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/tva.pdf

136 **Topical Report DOW-162**. / R. H. Bailes. Pittsburg CA, The Dow Chemical Company, 1957. - 37 pp. - http://www.osti.gov/bridge/servlets/purl/4341555-F3jWKW/4341555.pdf

"Part B of the EEOICPA provides federal compensation and medical benefits to workers who have been diagnosed with cancer and whose illness was caused by exposure to radiation while working directly for a designated Atomic Weapons Employer at a covered facility during a covered time period. The covered time period for the TVA's National Fertilizer Development Center is 1951 through 1955. Covered time periods for the Southern Research Institute are 1955 through 1958, 1962, 1976 and the residual radiation periods of 1959 through 1961, 1963 through 1975 and 1977 through October 2009.'



• AZ[137] **Anderson Uranium Property**[138] Yavapai County DOE – 1970-.

137 Arizona State Library, Archives and Public Records, Law and Research Library: **Arizona Memory Project**. - http://azmemory.lib.az.us/index.php

Arizona Water Quality Center, University of Arizona / Arizona State University: **Preliminary Evaluation of Metal Contamination Sources in the Colorado River from Measurement of Lead and Uranium Isotopic Ratios**. / Charles Sanchez and John Chesley 2008. - 25 pp.
- http://www.grandcanyontrust.org/documents/gc_uranium_UApaper.pdf

Arizona Department of Mines and Mineral Resources: **Arizona's Metallic Resources Trends and Opportunities 2007**. / Nyal J. Niemuth. - http://mines.az.gov/Publications/ofr07-24.pdf

Record of Decision Signed January 9, 2012: Public Land Order 7787; **Withdrawal of Public and National Forest System Lands in the Grand Canyon Watershed, Arizona**. Final EIS Released October 26, 2011, Vol I-II, U.S. Department of the Interior. Bureau of Land Management. Arizona Strip District Office. St. George, Utah. 2011. - http://www.blm.gov/az/st/en/prog/mining/timeout/feis.html

including Arizona State Office, Abandoned Mine Land Work Plan Period: FY2007 – FY2013

138 **Mineral Resources of the Anderson Uranium Property**, Yavapai County, Arizona, USA, 43-101 Technical Report Prepared for Global Uranium Corporation. April 30, 2010. - 147 pp.

• AZ **Artillery Creek Uranium Mine**[139] Mohave County. DOE 1957-. - 'The Artillery Peak Property lies within the Date Creek Basin, which is a region well known for significant uranium occurrence. Uranium exploration has been occurring in the Artillery Peak region since the 1950's by a number of exploration and mining entities. Radioactivity was first discovered in the Date Creek Basin area by the U.S. Atomic Energy Commission in 1955 when a regional airborne radiometric survey was flown over the area. The Artillery Peak Property was first acquired by Jacquays Mining and first drilled in 1957.'

139 **Artillery Peak Uranium Exploration Project Mohave County, Arizona, Technical Report**. / Karen Wenrich. 2010. - 133 pp. - http://stockguru.com/lt/AEFI/43-101American_EnergyFields8b.pdf

Universal Uranium Begins Phase I Drill Program At Artillery Peak, September 27, 2007

'Vancouver, British Columbia, September 27, 2007 -- Universal Uranium Ltd. (TSX-V: UUL) is pleased to announce that drilling has commenced on its 100% owned Artillery Peak Property in Mohave County, Arizona. The Phase I drill program will consist of 41 holes totaling approximately 15,700 feet of drilling and has been designed to bring the current historical resource on the property to 43-101 compliance and expand the known mineralization in the area.

Universal Uranium acquired the Artillery Peak property on February 21, 2006. The property consists of 86 lode mining claims totaling 1,777 acres and is located 112 miles northwest of Phoenix, Arizona. '

• AZ **American Smelting and Refining Company**[140] Tucson DOE/BE - American Smelting and Refining Company, now ASARCO, owned the Taylor Springs Site.

• AZ **Cato Sells Uranium-Vanadium Mi-nes**[141] Monument Valley Apache County, Arizona DOE - In 1950, Cato Sells, a Navajo businessman, obtained three tracts (claims) adjacent to the Vanadium Corporation of America's 1943 Monument No.2 lease in northeastern Apache County, Arizona. This lease was originally mined for vanadium and was now also being mined for both uranium and vanadium. Exploration drilling by the Atomic Energy Commission located ore bodies on Cato Sells' tracts.

140 American Smelting and Refining Company (ASARCO) **Bankruptcy Settlement EPA Funded Sites and Communities**. - http://www.epa.gov/compliance/resources/cases/cleanup/cercla/asarco/community.html

141 **The Exploration and Production History of the Cato Sells Uranium-Vanadium Mines, Monument Valley, Apache County**, Arizona. / William L. Chenoweth. Arizona Geological Survey Contributed Report CR-11-F. 2011. - 16 pp.

• AZ **EZ mine**[142] Mohave County

• AZ **Orphan Lode Mine**[143] DOE - Uranium was discovered in the ore and mined from 1953 to 1972. Uranium content in ore shipments was as much as 4.9 percent and approached 80 percent in individual samples. The patented land was acquired by National Park Systems in 1963, but extraction rights were retained by the operator until August 1988.

142 Denison Mines Corp. –**EZ1 and EZ2 Breccia Pipes**. Technical Report NI 43-101. Scott Wilson Roscoe Postle Associates Inc. – June 24, 2009. - 88 p.

143 **The Orphan Lode Mine, Grand Canyon, Arizona** : a case history of a mineralized, collapse-breccia pipe. / William L Chenoweth - [Denver, CO] : U.S. Geological Survey, 1986.

AZ **Ore**[144] **Buying Station at Globe**[145] Globe DOE - 1955-1957 - The ore buying station at Globe purchased uranium ore for the AEC. American Smelting and Refining Company (ASRC) managed and operated the Globe station on behalf of the AEC from July 1955 to January 1956. Lucius Pitkin replaced ASRC as the management and operating contractor for the site in February 1956. The uranium ores processed at the Tuba City mill[146] came largely from sites in Arizona: the Orphan Lode mine within the Grand Canyon National Park, mines in the Cameron area and adjacent areas, mines in the Monument Valley district, and ores purchased by the AEC at the Tuba City ore buying station and at other AEC ore buying stations1, including the Globe ore buying station, Gila County, Arizona.[147] Contractors: American Smelting and Refining Company (1955-1956); and Lucius Pitkin, Inc. (1956-1957).

• AZ **Pinenut Uranium Mine**[148] Mohave County. DOE - The Pinenut Mine site is located on the Kanab Plateau, approximately 40 miles southwest of the town of Fredonia. In 1986, Energy Fuels Nuclear began developing the surface facilities at the Pinenut mine site.

• AZ **Sun Valley Uranium Mine**[149] DOE 1954-1956 - The mine was started in 1954 during a period of intense uranium exploration in the area. An inclined shaft was sunk

144 Bureau of Mines / **Minerals yearbook metals and minerals (except fuels) 1952**. Year 1952, Volume I (1955). United States Government Printing Office, 1955.

145 **Technologically Enhanced Naturally Occurring Radioactive Materials in the Southwestern Copper Belt of Arizona**. U.S. Environmental Protection Agency, Office of Radiation and Indoor Air, Radiation Protection Division, 1999. 124 pp. - http://www.epa.gov/radiation/docs/tenorm/402-r-99-002.pdf

U.S. Historic mining photos by state. - http://www.miningartifacts.org/Mining-Photo-Index.html

146 'Navajo UMTRA entered into Cooperative Agreement with the U.S. Department of Energy (DOE) to assist/participate in the remedial actions activities of four Navajo UMTRA sites pursuant to the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA). These sites are located in Tuba City, AZ; Monument Valley, AZ; Mexican Hat, UT; and Shiprock, NM.'

Source: - http://www.aml.navajo-nsn.gov/UMTRA_Files/UMTRA_Page.html

147 The Alliance: More on mining, 2009.

148 Discussion: **Economic Impact of Uranium Mining in Northern Arizona** / American Clean Energy Resources Trust, 2009. - 48 pp. - http://acertgroup.com/Economic_Impact.pdf

149 **Mineral-resource potential of the Paria Plateau Wilderness Study Area, Coconino County, Arizona**. U.S. Bureau of Mines Mineral Land Assessment. 1982. - 13 pp.

on a Shinarump outcrop to develop a small ore deposit. Several hundred tons of uranium ore averaging 0.28 percent U_3O_8 was shipped before the shaft was filled with mud from a flash flood. Later, a vertical shaft was sunk but there was no further production.

Tailings from a uranium mine and mill, currently undergoing clean-up as part of the Uranium Mill Tailings Remediation Act Project. The site covers approximately 105 acres, and is located on part of the Bennett-Freeze District land, bordering on the Navajo Nation and lands of the Hopi Tribe.The Tuba City mill was built in 1955-56 by Rare Metals Corporation of America and included limited employee housing at the site. The Rare Metals Corporation merged with the El Paso Natural Gas Company in 1962 and operated the mill

Houses abandoned due to extreme radiation levels near the Tuba City Disposal Site.

•AZ Tuba City Landfill Site[150] 1940s-?

•AZ **Tuba City Uranium Mill** DOE 1956-1966 - During its 10 years of operations, the Tuba City mill processed about 800,000 tons of uranium ore.

150 DOE: **2010 Annual Site Inspection and Monitoring Report for Uranium Mill Tailings Radiation Control Act Title I Disposal Sites—Tuba City, Arizona, Disposal Site**. 2011. - 16 pp. - http://www.lm.doe.gov/Tuba/air_tub.pdf

Johnson, R.H., and Wirt, L., 2009, **Geochemical analyses of rock, sediment, and water from the region in and around the Tuba City Landfill, Tuba City, Arizona**: U.S. Geological Survey Open-File Report 2009–1020, 44 pp. - http://pubs.usgs.gov/of/2009/1020/downloads/OF09-1020.pdf

• AZ **US Army Yuma Proving Ground**[151] La Paz County and Yuma County AWE - The Kofa Firing Range, located in the Kofa Region, is the largest artillery range in the United States. A licensed Depleted Uranium (DU) firing area is found within the range. Tests of DU. Metals that have been mined in the area include antimony,

151 **Final range wide environmental impact statement : U.S. Army Yuma Proving Ground. Yuma and La Paz Counties, Arizona**. Prepared for U.S. Army Yuma Proving Ground. 2001. - 191 pp.

beryllium, copper, gold, lead, manganese, mercury, selenium, silver, titanium, uranium, and zinc.

The second stage motor of a Trident 1 C-4 rocket motor was tested at Air Force Research Laboratory Detachment 7 at Edwards Air Force Base July 8. The AFRL testing was part of the Missile Defense Agency's Aging and Surveillance Program and confirmed that the nearly 30-year-old motors remain viable for future MDA missions. (Air Force photo by Ron Fair)

•CA **Air Force Research Laboratory** Edwards AFB AWE - In the late 1940s, during the time of the United States Air Force formation, the facility was selected as a rocket test site. The first test stands were activated in 1952. The Rocket Engine Test Laboratory personnel conducted "test and evaluation" of rocket sled engines as well as rocket engines for the Douglas THOR, and other systems.

•CA **Arthur D. Little Co.**[152] San Francisco AWE - 1948-1956 - Under contract to the Atomic Energy Commission from 1948-1956, A.D. Little researched the separation and recovery of uranium from various ores. Specific work included the recovery of uranium and vanadium from alkaline carbonate leach solutions from domestic ores.

152 DOE: Memorandum/Checklist; Jones to File; Subject: **Elimination Report A.D. Little**; May 21, 1986.- 17 pp. - http://www.lm.doe.gov/Considered_Sites/Arthur_D_Little_Co_-_CA_01/CA_01-1.pdf

•CA **Atomics International**[153] Canoga Park BE - 1955-1966 - The Atomics International Division of North American Aviation is a statutory beryllium vendor under the Energy Employees Occupational Illness Compensation Program. Atomics International worked with beryllium and radioactive materials under contract with the AEC at numerous locations. These locations include, but are not necessarily limited to, Area IV of the Santa Susana Field Laboratory, portions of the Downey facility, the Vanowen Building at the Canoga facility and the De Soto facility.

153 **Radiation Survey of the Downey Facility**, May 7, 2001. - 103 pp.
- http://www.etec.energy.gov/library/D&D_page/RS-00019_(Downey).pdf

•CA **Burris Park Field Station**[154] Kingsburg AWE - Site owned and operated by Univ. of CA conducted experiments on decontamination of soils containing Strontium-90.

•CA **California Research Corp.**[155] Richmond - 1948-1949 - Using small amounts of plutonium and uranium, the California Research Corporation, a subsidiary of Standard Oil of California, performed experiments to investigate the use of continuous chelation as a means of separating plutonium and zirconium from uranium. The California Research Corporation performed the work as a subcontractor to the Kellex Corporation which was under contract to the AEC to investigate waste recovery methods.

154 DOE: **Memorandum/Checklist; Levine to the File**; Subject: Elimination Recommendation; May 7, 1987. - 3 pp.

UC Berkeley Letter, Peterson to Jackson; Subject: Radiation Safety Committee Report; March 4, 1981. Attachment: UC Berkeley Memorandum; Peterson to Radiation Safety Committee; Subject: **Survey of Burris Park Site**; March 2, 1981. 4 pp.

155 **Arms and the physicist** / Herbert Frank York. Springer, 1995 - 294 pp.

Finding Aid for the Willard F. Libby Papers. / Dan Luckenbill. The Regents of the University of California. 2004 - 53 pp.

Sample report: **Development of Radiation Resistant Oils. Report No. 11**. / J. G. Carroll, R. 0. Bolt, S. R. Calish. June 16, 1958. California Research Corporation. Richmond, California.
- http://www.osti.gov/bridge/servlets/purl/4303646-Ux3VLi/4303646.pdf

Karafantis, Layne Rochelle, "**Weapons labs and city growth: Livermore and Albuquerque**, 1945-1975" (2010). UNLV Theses/Dissertations/Professional Papers/Capstones. Paper 228.
- http://digitalcommons.library.unlv.edu/thesesdissertations/228

Women's Foundation of California: Communities Confronting Toxins in the Bay Area. Undated. 8 pp. - http://www.womensfoundca.org/

•CA **Canoga Avenue Facility**[156] Los Angeles County DOE - 1955-1960 - Under an operating contract with the Atomic Energy Commission, North American Aviation performed research and development into the peaceful uses of nuclear energy. This work was previously performed at North American Aviation's Downey Facility, but was moved to Canoga Avenue at the very end of 1955. Principal work performed included design, development and radio chemistry.

156 **Area IV of the Santa Susana Field Laboratory, the Canoga Avenue Facility, the Downey Facility, and the De Soto Avenue Facility (sometimes referred to as Energy Technology Engineering Center [ETEC] or Atomics International) – Occupational External Dose** / Leo G. Faust and Eugene W. Potter. National Institute for Occupational Safety and Health, 2010. - 20 pp.
- http://www.cdc.gov/niosh/ocas/pdfs/tbd/atomicsi6-r2.pdf
Rocketdyne Archives - http://www.rocketdynearchives.com/canoga.html
U.S. Environmental Protection Agency, Region 9: **Site Inspection Report Energy Technology Engineering Center/Area IV. Sind Hills, California** .September 2003. - 96 pp.
- http://epa.gov/Region9/superfund/santasusana/references/ref-21.pdf
National Institute for Occupational Safety and Health: **SEC Petition Evaluation Report Petition SEC-00151**: Canoga Avenue Facility, Los Angeles, CA. / Robert Coblentz, Christopher Miles, Edward Scalsky. 2010. - 98 pp. - http://www.cdc.gov/niosh/ocas/pdfs/sec/canoga/cafer-151-r2.pdf

The North American Aviation Corporation AGM-28 Hound Dog was a supersonic, jet propelled, air-launched cruise missile. 1960-?. Rockwell International's defense and space divisions (including the North American Aviation divisions Autonetics and Rocketdyne) were sold to Boeing in December 1996.

•CA **Ceradyne, Inc.** Costa Mesa BE - 1987; 1990-1996 - Ceradyne sold beryllium-graphite composite materials to the Y-12 plant in Oak Ridge in 1987 and between 1990 and 1996. Pre-Iraq, O'Gara Hess (later bought by Armor Holdings) and Ceradyne were the two major firms in specializing in the armoring business.[157]

•CA **Ceradyne, Inc.** Santa Ana BE- 1977-1988 - Ceradyne provided beryllium parts to the Y-12 plant.

•CA **City Tool & Die Manufacturing** Santa Clara BE - 1985-2001 - City Tool is a precision machine shop that provided services to Sandia National Laboratory, California. The work involved machining beryllium-copper materials.

157 **Spring 2009. Industry Study. Land Combat Systems Industry**. National Defense University,The Industrial College of the Armed Forces,Washington,DC. 2009. Note 13.

•CA **Crocker Laboratory** University of California Davis AWE
•CA **De Soto Avenue Facility**[158] Los Angeles County DOE - 1959-1995 - In 1959, the Atomics International Division of North American Aviation moved to its new facility on De Soto Avenue. AEC/DOE work conducted at this location included engineering design, construction, and nuclear fuel fabrication. The facility also had a radiochemistry laboratory and a gamma irradiation facility. The fuel fabrication facility was used to produce a variety of different fuel elements for test reactors. AEC-sponsored work involving the manufacture of beryllium-containing parts also took place at this site. Fuel fabrication was terminated in 1984, however small scale laboratory research work on gamma irradiation and analysis of radioactive samples continued until 1995. A DOE-owned mass spectrometer at this location was removed from the premises and sent to the Pacific Northwest National Laboratory in 1995. Contractors: The Boeing Company (1996-1998); Rockwell International (1973-1996); North American Rockwell (1967-1973): North American Aviation (1959-1967).

158 **Area IV of the Santa Susana Field Laboratory, the Canoga Avenue Facility, the Downey Facility, and the De Soto Avenue Facility (sometimes referred to as Energy Technology Engineering Center [ETEC] or Atomics International) – Occupational External Dose** / Leo G. Faust and Eugene W. Potter. National Institute for Occupational Safety and Health, 2010. - 20 pp.
- http://www.cdc.gov/niosh/ocas/pdfs/tbd/atomicsi6-r2.pdf

•CA **Dow Chemical Co.**[159] Walnut Creek AWE - 1947-1957 - The Dow Operation involved process studies and experimental investigations on different uranium ores and thorium-bearing ores, including pilot-scale solvent extraction of uranium from phosphoric acid.

•CA **Douglas Airplane Company** Santa Monica DOE - Douglas moved from producing air-to-air rockets and missiles to entire missile systems under the 1956 Nike program and becoming the main contractor of the Skybolt air-launched ballistic missile program and the Thor ballistic missile program. Now: McDonnell Douglas.

159 DOE: Letter; Jones to Wallo; **Final Elimination Reports and Site Summaries**; July 28, 1987. - 1 p. 'Eliminated - Radiation levels below criteria '

Source: Abandoned & Little-Known Airfields: California - Central Los Angeles Area - http://www.airfields-freeman.com/CA/Airfields_CA_LA_C.htm

•CA **Downey Facility**[160] Los Angeles County DOE - 1948-1955 - Under an operating contract with the Atomic Energy Commission, North American Aviation operated a 2 MeV Van De Graaff accelerator at Downey. In addition, the AEC funded a four-watt Water Boiler Neutron Source Reactor at the Downey facility. Start up for the reactor was in April of 1952. This small research reactor was moved to Area IV of the Santa Susana Field Laboratory in 1955. Personnel and operations from Downey moved to the new Canoga Avenue facility in late 1955.

•CA **EDM Exotics**[161] Hayward BE - 1990-1997 - EDM Exotics provided machine shop services to Sandia National Laboratory, California, working with beryllium-copper materials.

160 **Area IV of the Santa Susana Field Laboratory, the Canoga Avenue Facility, the Downey Facility, and the De Soto Avenue Facility (sometimes referred to as Energy Technology Engineering Center [ETEC] or Atomics International) – Occupational External Dose** / Leo G. Faust and Eugene W. Potter. National Institute for Occupational Safety and Health, 2010. - 20 pp.
- http://www.cdc.gov/niosh/ocas/pdfs/tbd/atomicsi6-r2.pdf

161 **Doe Illness Claim Center In Bay Area In March**, Today at Berkeley Lab, Friday, February 14, 2003.
'Current and former U.S. Department of Energy workers and contractors interested in filing claims for medical assistance for illnesses due to radiation, silica or beryllium exposure at work will have an opportunity next month to get their questions answered. Several facilities in this area have been designated by DOE as locations for prospective worker claims -- Berkeley Lab, Lawrence Livermore and Sandia National Laboratories, and Stanford Linear and Accelerator Center. Additionally, 17 beryllium vendor facilities were recently added to the covered facilities list. These include City Tool and Die Manufacturing in Santa Clara, C.L. Hann Industries in San Jose, EDM Exotics in Hayward, Electrofusion and Poltech Precision in Fremont, Hafer Tool in Oakland, Hexcel Products in Berkeley, Jerry Carroll Machining in San Carlos, Pleasanton Tool and Manufacturing, Robin Materials in Mountain View, Ron Witherspoon, Inc., in Campbell, and Tapemation in Scotts Valley.'

•CA Edwards Air Force Base[162] AWE - In 1959, elements of the Power Plant Laboratory at Dayton, Ohio, were relocated to the Edwards Rocket Engine Test Facility also called the Air Force Research Laboratory. Also in 1959, the first tethered, vertical launch tests of the Minuteman I rocket were conducted in underground test silos. Shortly after these tests, the Minuteman I rocket was completed. During the 1960s, the need for continued operations and development of both future space and ballistic missile launch systems was signified by the re-designation of the site as the Air Force Rocket Propulsion Laboratory in 1953. 'The Department of Defense has recently demonstrated a renewed interest in propulsion technology development with the establishment of the National Aerospace Initiative. More recently, the National Aeronautics and Space Administration is undergoing a transformation to realign the organization, focusing on the Vision for Space Exploration. These initiatives provide a clear indication that a very capable ground-test stand at Edwards Air Force Base will be beneficial to support the testing of future access-to-space vehicles. To meet the demand of full integration testing of rocket-powered vehicles, the NASA Dryden Flight Research Center, the Air Force Flight Test Center, and the Air Force Research Laboratory have combined their resources in an effort to restore and upgrade the original X-

162 **NASA: Rehabilitation of the Rocket Vehicle Integration Test Stand at Edwards Air Force Base**. Daniel S. Jones, Ronald J. Ray and Paul Phillips. 2005. - 58 pp.
- http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20050199761_2005201770.pdf

15 Rocket Engine Test Facility to become the new Rocket Vehicle Integration Test Stand.'[163]

•CA **Electro Circuits, Inc.** Pasadena AWE - 1952-1953 - Electro Circuits used uranium metal to conduct tests aimed at determining the usefulness of ultrasonics in the detection of pipe in ingots.

•CA **Electrofusion Corporation** Fremont BE - 1986-2002 - Electrofusion Corporation provided beryllium products to Sandia National Laboratory, California. Electrofusion was acquired by Brush Wellman in 1990 and is currently part of the Brush Wellman Engineered Products Division.

•CA **Energy Technology Engineering Center**[164] Santa Susana DOE- 1955-1988 - The Santa Susana Field Laboratory (SSFL) was located in eastern Ventura County, California, and borders Los Angeles County. The SSFL is divided into four administrative and operational portions based on ownership and operations. Area IV was devoted to nuclear operations. It is Area IV that is covered under EEOICPA as a DOE facility. Coverage includes, but was not necessarily limited to the following operations: The Energy Technology Engineering Center, the Nuclear Development Field Laboratory (NDFL), and the Liquid Metal Engineering Center (LMEC).

163 Rehabilitation of the Rocket Vehicle Integration Test Stand at Edwards Air Force Base p. 7.

164 **Energy Technology Engineering Center – Site Description.** Dose Reconstruction Project for NIOSH, 2006. - 47 pp. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/etec2.pdf

Report on Annual Groundwater Monitoring, 2010. Santa Susana Field Laboratory. Ventura County, California, 2011. - 704 pp.

Site **Inspection Report : Energy Technology Engineering Center/Area IV Sind Hills**, California. 2003. - 96 pp

A nuclear energy R&D facility owned by the Department of Energy, and operated by Rocketdyne/Boeing, involved in applying nuclear technologies related to space flight, defense programs, and liquid metal reactors, in addition to solar energy and remediation technologies. The DOE facility is located on 90 acres within Rocketdyne's 2,700 acre rocket field test facility in the Simi Hills. Source: CLUI Land Use Database.

This also includes the Sodium Reactor Experiment Facility, the Kinetics Experiment Water Boiler Facility, the Water Boiler Neutron source (which is also known as the AE-6/L-85 Facility), the Organic Moderated Reactor, as well as facilities in Area IV associated with the Systems for Nuclear Auxiliary Power (SNAP) Program; the Sodium Graphite Reactor Critical Facility, the Shield Test Experiment/Shield Test Irradiation Reactor Facility, the Advanced Epithermal Thorium Test Facility, the Hot Lab Facility, the Fuel Storage Facility, the Radioactive Measurement Facility, the Radioactive Material Handling Facility, the Van De Graaff Accelerator Facility and the Radiation Instrument Calibration Laboratory. Contractors: The Boeing Company (1996-present); Rockwell International (1973-1996); North American Rockwell (1968-1973); North American Aviation (1955-1967).

The ETEC is now closed and site restoration is underway.

•CA **General Atomics**[165] La Jolla AWE/BE/DOE - BE 1959-1969 - General Atomics was one of a number of private contractors that processed unirradiated scrap for the Atomic Energy Commission in the 1960s. In addition, the Hot Cell Facility was used for numerous post-irradiation examinations of Department fuels, structural materials, reactor dosimetry materials, and instrumentation. The Department-sponsored activities at the General Atomics Hot Cell Facility primarily supported the High Temperature Gas Cooled Reactor and the Reduced Enrichment Research Test Reactor programs. In December 1994, General Atomics notified the Nuclear Regulatory Commission and the State of California Department of Health Services of its intent to cease operations in the Hot Cell Facility. General Atomics was also the operating contractor for the AEC's Experimental Beryllium Oxide Reactor (EBOR). General Atomics manufactured EBOR fuel elements (UO_2-BeO) on site and examined them in the site's hot cell.

165 **SEC Petition Evaluation Report Petition SEC-00064** : General Atomics / Cindy Bloom, Shelby L. Gubin, Kenny Fleming, Robert Vogel, and Robert Hysong. 2006. - 23 pp.
- http://www.cdc.gov/niosh/ocas/pdfs/sec/genatom/genatomer.pdf

•CA **General Electric Vallecitos Nuclear Center**[166] Vallecitos Pleasanton DOE - 1958-1978; 1981-1982 - In 1958, General Electric constructed four hot cells for post-irradiation examination of uranium fuel and irradiated reactor components. The US. Government's involvement (through the Atomic Energy Commission and later, the Department of Energy) was limited to a single hot cell, Hot Cell No. 4. Between 1965 and 1967, Hot Cell No. 4 was decontaminated, equipped with a stainless steel liner to contain plutonium, and dedicated to the study of mixed oxide fuel rods in support of the AEC's fast breeder reactor development programs. In 1978, Hot Cell No. 4 was placed on standby; it was used by Lawrence Livermore National Laboratory for six months in 1981 and 1982.

• CA **Glenn L. Martin Company** Santa Ana AWE - Titan I and II ICBM (Intercontinental Ballistic Missiles) producer. In 1961, the Martin Company merged with the American-Marietta Corporation, a large sand and gravel mining company, forming the Martin Marietta Corporation. Then, in 1995, Martin Marietta merged with aerospace giant Lockheed to form the Lockheed Martin Corporation.

•CA **Hafer Tool** Oakland BE - 1965-1985 - Hafer Tool was a machine shop that provided services to Sandia National Laboratory, California. Some of this work involved the use of beryllium materials.

•CA **C.L. Hann Industries** San Jose BE - 1985-1994; 2000 - C.L. Hann Industries

166 Universal-International Newsreel: **First Private Atom Power Plant Opens**. (1957). - http://www.archive.org/details/FirstPri1957

provided machine shop services to Sandia National Laboratory, California.

•CA **Fairfield Air Force Station**[167], Travis AFC, CA AWE - National Nuclear Weapons Stockpile Site. The Radioactive Burial Site is a fenced back-filled trench that was part of the former Fairfield AFS at Travis AFB. Cleaning materials from the maintenance of the nuclear components were buried in the trench. This is the only soil site on Travis AFB with elevated radioactive readings. The Air Force will excavate the waste materials and contaminated soil and send it to an off-base low level radioactive

167 **Ammunition and Explosives Storage for the Navy (1939-1989) and the Air Force (1946-1989)**, 2008. - 200 pp.
- http://www.denix.osd.mil/cr/upload/af-navy-ammunition-storage-public-rfs_pg1-200_rev.pdf
Burial of radioactive waste in the USAF : USAF Radioisotope Committee. Wright-Pattehson AFB, Ohio, 1972. - 71 pp.
Five-Year Review Report: Fairchild Air Force Base. / CH2M HILL, Spokane, WA. - 2000- 93 pp.
- http://www.epa.gov/superfund/sites/fiveyear/f01-10006.pdf
In October 1953 the Air Depot facility was deactivated, and by 1956 the Wing had begun a conversion that brought B-52 bombers and, later, KC-135 tankers to Fairchild. In September 1991, under Air Force reorganization, the 92nd Bombardment Wing was redesignated the 92nd Wing, emphasizing a dual bombing and refueling role. In June 1992, the 92nd Wing became part of the newly formed Air Combat Command (ACC) and was redesignated the 92nd Bomb Wing. December 1993 marked the beginning of perhaps the largest change and transition in the history of the base as the B-52s began transferring to another unit. The KC-135s remained at Fairchild and were assigned to the Air Mobility Command (AMC). On July 1, 1994, the 92nd Bomb Wing was redesignated the 92nd Air Refueling Wing, and Fairchild AFB was transferred from ACC to AMC, thereby creating the largest air refueling wing in the USAF.

waste repository specifically designed to handle these materials.

•CA **Hexcel Products, Inc.** Berkeley AEC -1964-1965 - Hexcel produced a small number of corrugated beryllium sheet panels for the AEC in the mid-1960s. The finishing process involved vapor blasting and scrubbing of the beryllium panels with steel wool and cleansing powder. Hexcel published the report Beryllium honeycomb in 1965.

•CA **High Energy Rate Forging Facility**[168] Oxnard DOE - 1984-1997 - The Department of Energy purchased this facility in 1984 for the purpose of producing forgings for weapons parts. It consists of 13.75 acres and 7 buildings. The DOE Rocky Flats Plant managed the forging process and produced forgings at this location through 1995. In 1994, DOE decided to close the facility upon completion of its defense-related mission in 1996.

•CA **Hunter Douglas Aluminum Corp.**[169] Riverside DOE - 1959-1963 - In 1959, Hunter Douglas Aluminum extruded approximately 1600 pounds of solid uranium stock for National Lead Company of Ohio (Fernald). In a subsequent subcontract, the company fabricated uranium-zirconium billets for the GE Evendale Plant.

168 EEOICPA CIRCULAR NO. 10-01, October 28, 2009. SUBJECT: **High Energy Rate Forging Facility is a DOE facility.**

'The HERF facility was used to perform forgings in the manufacture of non-nuclear weapons parts under the direction of DOE's Rocky Flats Plant. '

169 **Ex-Workers of Lab to Be Paid for Illnesses**: Los Angeles Hazards: Thousands who were employed at Rocketdyne's Santa Susana facility and got sick are eligible for federal reparations./ Margaret Talev. Los Angeles Times, July 12, **2001**

'About 6,000 Rocketdyne employees or their survivors could be covered by the program. From the 1950s to the 1980s, workers at what is now a division of Boeing Co. performed federal nuclear testing at the Santa Susana lab near Simi Valley and at two sites in the San Fernando Valley.

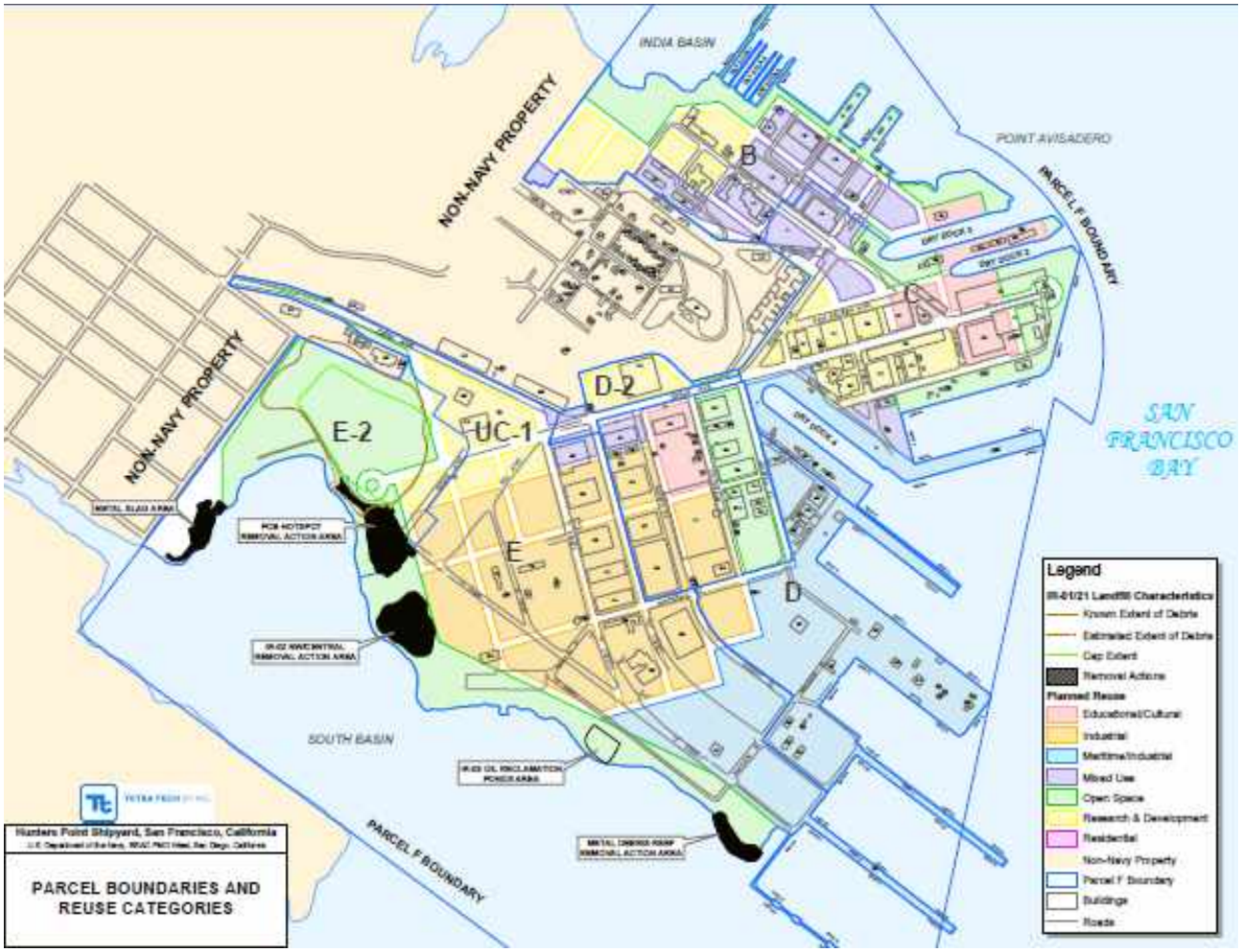
Throughout California, thousands of other workers at 20 labs, some now defunct, could be eligible. Those labs include Electro Circuits Inc. in Pasadena; the Laboratory of Biomedical and Environmental Sciences at UCLA; Ceradyne Inc. in Santa Ana; Hunter Douglas Aluminum Corp. in Riverside; and the Lawrence Livermore National Laboratory in Northern California.

Nationwide, at least 654,000 workers from 317 facilities could be covered. The program goes into effect July 31 and is expected to cost $2 billion in its first five years.'

DOE Letter; Wagoner to Frizzel; Subject **Hunter Douglas Information**; February 17, 1995. - 2 pp.

'DOE studied the..historical records of the former,Hunter Douglas Aluminum Plant,

site, and it determined that it did not have the authority to perform remedial action at the site. This conclusion is dervied from the fact that the facility was licensed to handle nuclear,materials.



•CA **The Hunters Point Naval Shipyard**[170] or the **Treasure Island Naval Station-Hunters Point Annex** AWE 1945-1994 - The Hunters Point Naval Shipyard also called San Francisco Naval Base, was established in 1869 as the first dry dock on the Pacific Coast, in southeastern San Francisco, California, adjacent to San Francisco Bay. In 1940, the Navy obtained ownership of the shipyard for ship building, repair and maintenance activities.

170 T**rouble in Paradise: Postwar History of San Francisco's Hunters Point Neighborhood** : An Honors Thesis in Urban Studies, Stanford University / Submitted by Kelsey Finch. May 19, 2008. - 65 pp. - http://www.stanford.edu/dept/URBS/programs/documents/kfinch_honorsthesis_compressed.pdf

Navy Proposed Plan for Parcel E-2. Hunters Point Naval Shipyard. City and County of San Francisco Board of Supervisors. Land Use and Economic Development Committee Public Hearing. October 24, 2011 / Lara Urizar, Navy Remedial Project Manager. - 32 pp.
- http://www.bracpmo.navy.mil/base_docs/hps/documents/hps_landfill_data/CityOfSanFranciscoBOS_E-2Presentation_24OCT2011.pdf

After World War II, activities shifted from ship repair to submarine servicing and testing. The Navy operated Hunters Point Annex as a shipbuilding and repair facility from 1941 until 1976. Between 1976 and 1986, the Navy leased most of the shipyard to Triple A, a private ship-repair company. The shipyard was an annex of Naval Station Treasure Island until 1974 when the Navy's Engineering Field Activity West assumed the management of it.

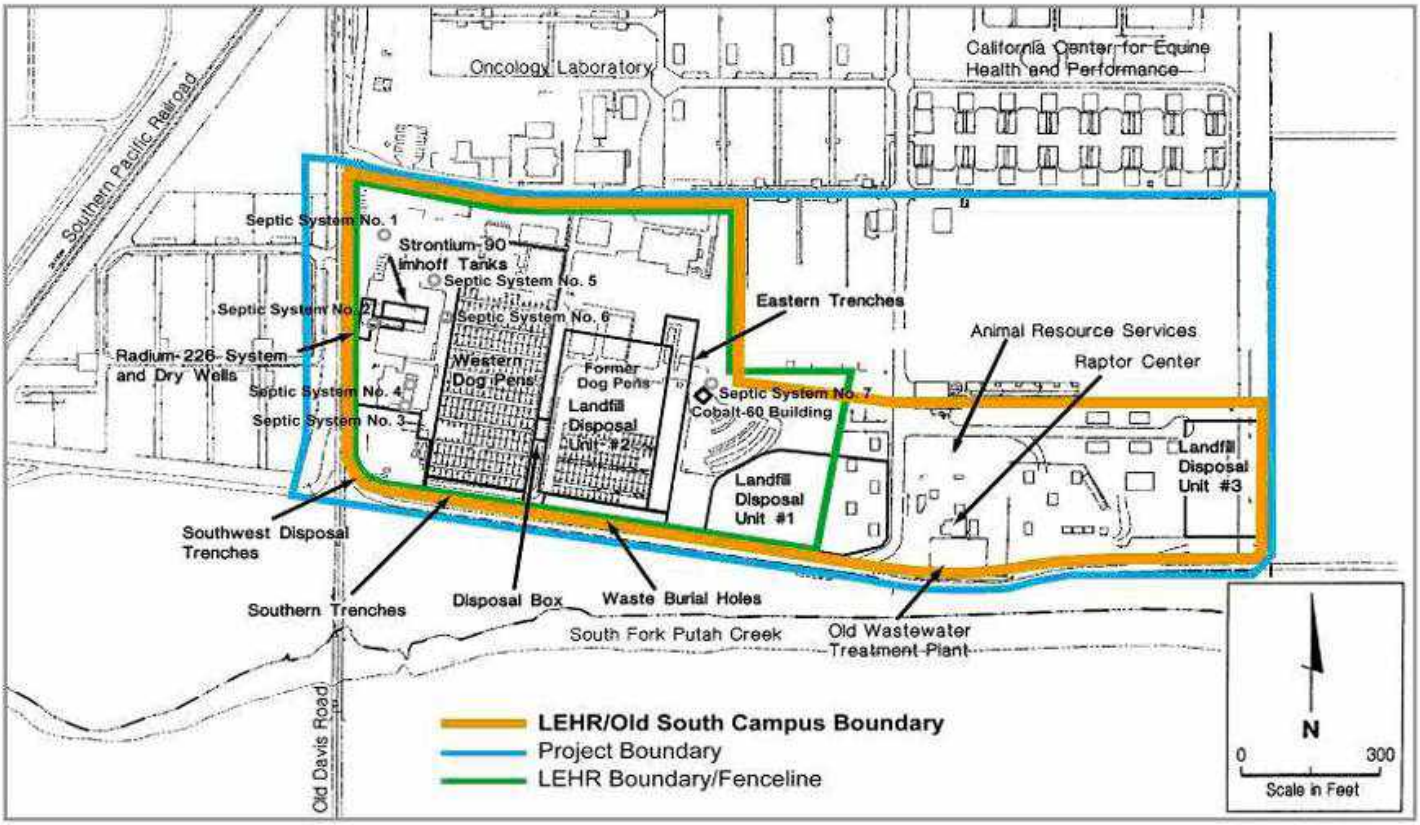
In July of 1945 The Atomic Bomb known as Little Boy was shipped from Hunters Point shipyard and eventually dropped on Japan, effectively ending WWII. The United States National Radiological Defense Laboratory or the Radiological Defense Laboratory at Hunters Point's decontamination center was established in 1946 for ships involved in nuclear weapons testing in the Pacific.

On September 6, 1946, ships present at Bikini Atoll during 'Operation Crossroads,' the testing of a hydrogen bomb, arrived at this naval shipyard. Radioactive paint was scraped from ships into the Bay by shipyard workers. The decontamination project ceased in 1969. On October 5, 1994, the US Navy was sued by a coalition of environmentalist, sports fishing, and public interest groups who alleged that toxic discharges from Hunters Point Naval Shipyard are contaminating the San Francisco Bay. The lawsuit filed against the Navy with the U.S. District Court in San Francisco charges the Navy with 19,000 violations of the Clean Water Act.

•CA **Jerry Carroll Machining, Inc.**[171] San Carlos BE - 1985-1991 - Jerry Carroll

171 **Doe Illness Claim Center In Bay Area In March**, Today at Berkeley Lab, Friday, February 14, 2003.
'Current and former U.S. Department of Energy workers and contractors interested in filing claims for medical assistance for illnesses due to radiation, silica or beryllium exposure at work will have an opportunity next month to get their questions answered. Several facilities in this area have been designated by DOE as locations for prospective worker claims -- Berkeley Lab, Lawrence Livermore and Sandia National Laboratories, and Stanford Linear and Accelerator Center. Additionally, 17 beryllium vendor facilities were recently added to the covered facilities list. These include City Tool and Die Manufacturing in Santa Clara, C.L. Hann Industries in San Jose, EDM Exotics in Hayward, Electrofusion and Poltech Precision in Fremont, Hafer Tool in Oakland, Hexcel Products in Berkeley, Jerry Carroll Machining in San Carlos, Pleasanton Tool and Manufacturing, Robin Materials in Mountain View, Ron

Machining provided machine shop services to Sandia National Laboratory, California, including the machining of beryllium-copper materials.



•CA **Laboratory for Energy-Related Health Research**[172] or **Lehr Old Campus Landfill** Davis DOE - 1958-1989; 1991-. For over 30 years, LEHR was the site of

Witherspoon, Inc., in Campbell, and Tapemation in Scotts Valley.'

172 **DOE Areas Remedial Investigation Report: LEHR Environmental Restoration / Waste Management.** Weiss Associates. - Emeryville, California. 2003. - 1027 pp.
- http://www.lm.doe.gov/LEHR/Remidial_Investigation_Report.pdf

Final Community Relations Plan Laboratory for Energy-Related Health Research Environmental Restoration Davis, California. - Sacramento, California: Dames & Moore, April 1995. - 102 pp.

Phase II Site Characterization Report for the LEHR Environmental Restoration University of California at Davis. Volume I. / Dames & More. 1993. - 376 pp.
- http://www.lm.doe.gov/cercla/documents/lehr_docs/DOC_1.PDF

Laboratory for Energy-Related Health Research Final Release. (US. Department of Energy. [a/k/a Old Campus Landfill (University of California, Davis)]. Public Health Assessment. Energy Section. Federal Facilities Assessment Branch. Division of Health Assessment and Consultation. Agency for Toxic Substances and Disease Registry, 2004. - 167 pp.
- http://www.atsdr.cdc.gov/hac/pha/LEHR061704-CA/LEHR4_26_04.pdf ,
Figures: - http://www.atsdr.cdc.gov/hac/pha/LEHR061704-CA/LEHR4_26_04Figures.pdf

Price tag for UC Davis to clean up its contaminated pet waste site: $6 million to $100 million.
Share / Hudson Sangree. The Sacramento Bee. Monday, Nov. 14, 2011.

DOE Office of Legacy Management: **Site Management and Long-Term Surveillance and Maintenance Plan for the U.S. Department of Energy Laboratory for Energy-Related Health Research Federal Facility, Davis, California**. 2005. - 29 pp.

Derivation of Strontium-90 and Cesium-137 Residual Radioactive Material Guidelines for the Laboratory for Energy-Related Health Research, University of California, Davis / M. Nimmagadda and C Yu. Environmental Assessment and Information Sciences Division, Argonne National Laboratory, 9700 South Cass Avenue, Argonne, Illinois 60439. 1993 - 24 pp.

studies on the long-term health effects of low-level radiation[173] on laboratory animals. Through the support of DOE's predecessor, the AEC, LEHR (also known in the earlier years as the Radiobiology Laboratory) began in 1951 as a research project investigating the biological effects of X-rays. A few years later, the Atomic Energy Commission contracted with LEHR for what became a 33-year study that investigated the health effects of internal exposure to low levels of strontium 90 and radium 226. In a separate but related project, research animals were exposed to cobalt 60 radiation. Research involving the use of small amounts of plutonium 241, thorium 228, and other radioisotopes[174] was also performed. Research at LEHR has focused on: understanding better the effects of exposure to low-level radiation on the skeleton and its blood-forming constituents; investigating the behavior of certain bone-seeking radioactive materials; studying the beagle as an experimental animal model; exploring how low-level radiation triggers and affects the formation of tumors and development of leukemia; and, developing effective ways to use results gathered from animal studies to assess risks to humans. LEHR closed in 1989 and has been in remediation mode since 1991.

Watchdog: Davis South Campus Superfund Oversight Committee, formerly the Environmental Protection Agency Technical Assistance Grant Citizens' Group for the DOE/UCD Lehr Superfund Site on University of California, Davis Campus or Davis South Campus Superfund Oversight Committee

•CA **Laboratory of Biomedical and Environmental Sciences** Los Angeles DOE - 1947-. - The Laboratory of Biomedical and Environmental Sciences (LBES) was established in 1947 on the campus of the University of California, Los Angeles, to provide biomedical and environmental support to nuclear testing activities. Today's programs are in three areas: nuclear medicine, where the study of positron emission tomography (PET) is applied to medical problems; biomolecular and cellular sciences, which involves factors influencing gene expression, particularly with reference to early molecular events in cancer induction; and environmental biology, which focuses on the basic physiology of plants in arid ecosystems.

173 WISE Uranium Project: **Bibliography: Cleanup of Radiation Sites** (last updated 24 Sep. 2011). - http://www.wise-uranium.org/udlit.html#UMT

174 **Nuclear Energy in the Service of Biomedicine**: The U.S. Atomic Energy Commission's Radioisotope Program, 1946–1950 / Angela N. H. Creager. Journal of the History of Biology (2006) 39:649–684.

•CA **Laboratory of Radiobiology and Environmental Health** San Francisco DOE - 1951-1999 - The Laboratory of Radiobiology and Environmental Health (LREH), established by the Atomic Energy Commission in 1951, is an institute for research and training in cell biology. LREH is dedicated to fundamental research and investigation of the ways in which radiation and other energy-related biomedical insults affect cellular processes and lead to detrimental genetic and somatic biomedical effects. Research studies are undertaken to investigate the mechanisms by which perturbation and repair of cellular systems can affect the whole organism, cause cancer in the present generation, and damage future generations. Research focuses specifically on ways in which the organism can cope with such insults. As a research unit in the University of California San Francisco School of Medicine, the laboratory closed in 1999.

•CA **Lawrence Berkeley National Laboratory** Berkeley DOE - 1942-. - The laboratory that eventually became the Lawrence Berkeley National Laboratory was founded in 1931 by Ernest Orlando Lawrence, winner of the 1939 Nobel Prize in physics for his invention of the cyclotron. Once the Manhattan Engineer District (MED) was founded in 1942, the Berkeley Laboratory became part of the MED. As part of the MED, scientists at Berkeley developed the electromagnetic enrichment process that was installed and operated at the Y-12 plant in Oak Ridge from 1943-1947. Scientists at Berkeley also discovered the transuranium elements, which include plutonium, neptunium and americium. Work performed on behalf of LBL which took place in Gilman Hall on the University of California campus is also considered part of LBL.

•CA **Lawrence Livermore National Laboratory**[175] Livermore DOE - 1950-. - The Atomic Energy Commission established the Lawrence Livermore National Laboratory as a facility for nuclear weapons research. The Department of Energy (DOE) owns the Lawrence Livermore National Laboratory Main Site and Site 300; DOE and the University of California jointly operate the sites. The Main Site was initially used as a flight training base and an engine overhaul facility. Transition from naval operations to scientific research began in 1950, when the Atomic Energy Commission (AEC) authorized construction of a materials-testing accelerator site. The AEC established the University of California Radiation Laboratory, Livermore Site (the predecessor of the Lawrence Livermore National Laboratory) as a facility for nuclear weapons research.

175 Karafantis, Layne Rochelle, "**Weapons labs and city growth: Livermore and Albuquerque, 1945-1975**" (2010). UNLV Theses/Dissertations/Professional Papers/Capstones. Paper 228.
- http://digitalcommons.library.unlv.edu/thesesdissertations/228

The DOE purchased Lawrence Livermore National Laboratory's Site 300 from local ranchers in the 1950s for use as a remote high-explosives testing facility.

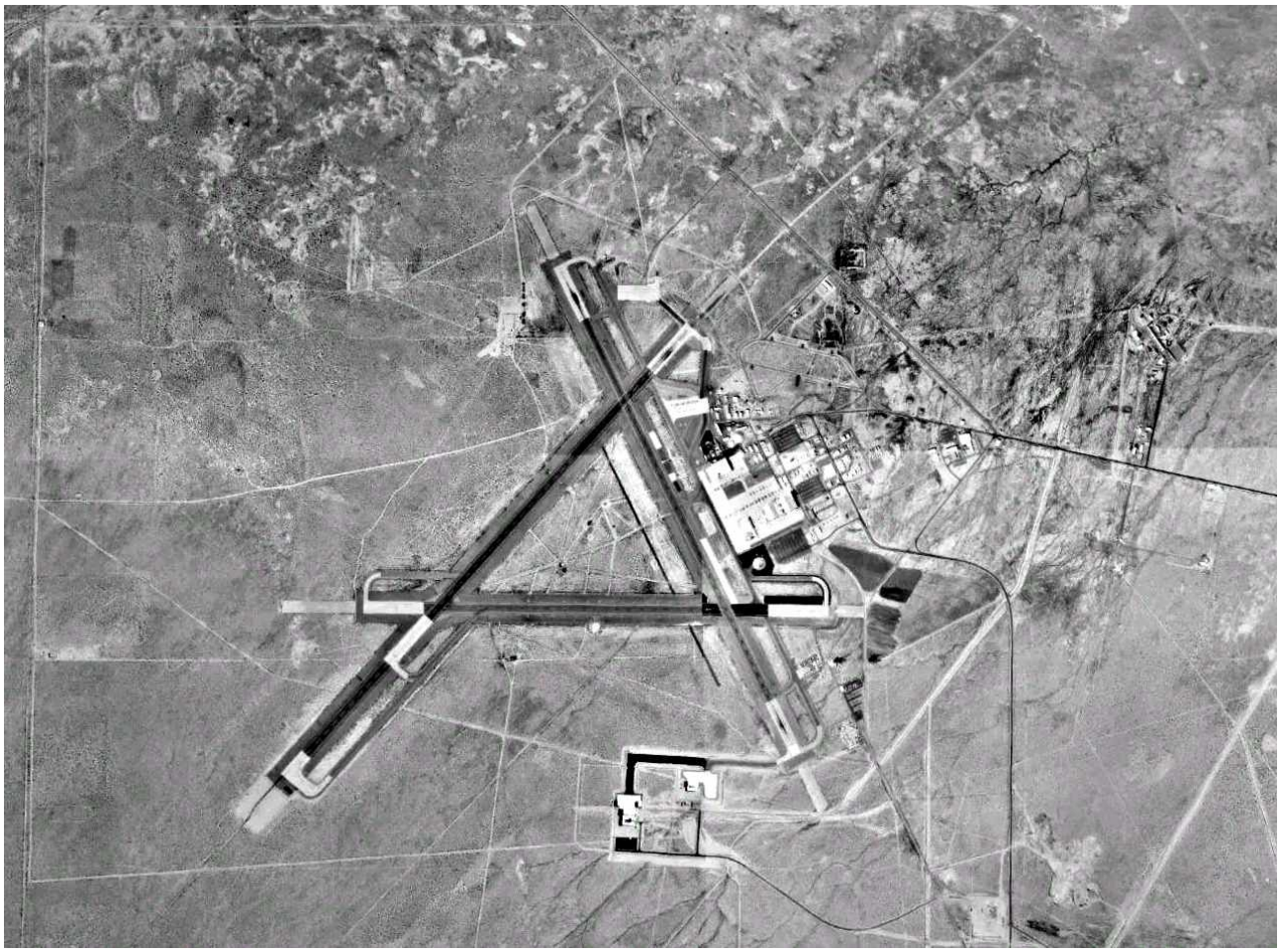
•CA **Lebow Company** Goleta BE - 1977-2002 - The Lebow Company produces ultra-thin metal foils for Sandia National Laboratory, California, some of which contain beryllium.

Mount Laguna Air Force Station is located atop Mount Laguna, with a steep drop into the Anza Borrego desert. It was a DEW (defense early warning) site, watching for incoming missiles, and housed about 170 people until it was downsized in 1981. Now it is a multi-use satellite and radar communications site, operated primarily by the FAA, out of Los Angeles Center. Source: CLUI Land Use Database.

•CA **Mount Laguna Air Force Station**[176] AWE - 1952

176 **Abandoned Mount Laguna Air Force Station and Radar Tower**, 2011. - http://www.flickr.com/photos/slworking/sets/72157605764602337/

Winkler, David F. & Webster, Julie L., **Searching the Skies: The Legacy of the United States Cold War Defense Radar Program**. US Army Construction Engineering Research Laboratories, Champaign, IL 1997. - 202 pp. - http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA331231



•CA **Naval Air Weapons Station China Lake**[177] Kern County AWE - China Lake

177 California State Military Department, The California State Military Museum: Preserving California's Military Heritage:Historic California Posts: **Naval Air Weapons Station, China Lake** (Inyokern Auxiliary Field, Naval Air Facility, Inyokern; Naval Ordnance Test Station, China Lake; Naval Weapons Center, China

NAWS is the Navy's largest research development test and activity site. It was established in 1943 as the Naval Ordnance Test Station. During WWII, non-nuclear explosive components were developed on the installation in support of the Manhattan Project that developed the atomic bomb.
From 1945 to 1948, the General Tire and Rubber Company of California operated the Foothill Plant at Pasadena under a Bureau of Ordnance contract. The Company provided NOTS with manufacturing, engineering, and procurement services.China Lake's participation in the Polaris program included propulsion and launch testing and, more significantly, studies and analyses that were instrumental in defining the final system concept and the nature of the sea-based deterrent.
Major China Lake programs now include RDT&E and support for Sidewinder, Sparrow, and Phoenix air-to-air missiles; fuzes for the Standard Missile and a wide variety of other surface-to-air and air-to-air missiles and free-fall weapons; Harpoon antisurface weapon system; Tomahawk cruise missile; Sidearm and HARM antiradiation-missile programs; parachute systems and subsystems for aircrews and equipment; avionics hardware and software and total-combat-system operational flight programs (OFPs) for most Navy fighter and attack aircraft; and tactical electronic-warfare and countermeasures systems.

• CA **Paul Hardeman, Inc.**[178] Stanton DOE - The company engaged primarily in the design, engineering, construction and installation of missile launching bases and related facilities for the armed forces, and complex facilities of various types for agencies and commissions of the United States Government, and for the aircraft, petroleum, chemical and petro-chemical industries. According to the French homepage Titan Launch facilities / Les installations de lancement des Titan II, 'A contract is made with C. H. Leavell and Peter Kiewit & Sons on 13 June for the construction of shooting pad ($ 17 million). Another is made with B. B. McCormick, Inc. July 30 to work on the railways ($ 479,000) and other adjustments totaling $ 26.8 million with Paul Hardeman[179] and

Lake). - http://www.militarymuseum.org/NAFInyokern.html
American Institute of Aeronautics and Astronautics: Historic Aerospace Site: **Naval Ordnance Test Station, China Lake, California**. Undated, - 12 pp.
- http://www.aiaa.org/Participate/Uploads/06-0296%20china%20lake.pdf

178 **100 Companies and Their Subsidiary Corporations Listed According to Net Value of Military Prime Contract Awards Fiscal Year 1963 (July 1962 - June 1963)**. Undated - 15 pp.
- http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA954761
Securities and Exchange Commission: **News Digest**, September 11, 1962.
- http://www.sec.gov/news/digest/1962/dig091162.pdf
Astronautics and aeronautics (1963). United States. National Aeronautics and Space Administration. Scientific and Technical Information Office; United States. National Aeronautics and Space Administration. Scientific and Technical Information Branch. 1964. - Washington, D.C. : Scientific and Technical Information Branch, National Aeronautics and Space Administration. - 546 pp.
- http://www.archive.org/details/astronauticsaero64unit

179 'To the Allis-Chalmers Manufacturing Company, December 29, 1961:

Morrison-Knudsen. Work on the pad 40 starting August 12 [1963].
According to the Superior Court of Delaware, New Castle United Aircraft Corporation, plaintiff, v. Paul Hardeman, Inc., defendant on October 22, 1964 'The Titan II program included a single prime contract for manufacturing, delivering, installing and validating 57 fixed Propellant Transfer Systems ("PTS") and 9 (later increased to 10) units of mobile propellant transfer equipment at 4 general sites in California, Arizona, Kansas and Arkansas. That contract included 9 (also increased to 10) waste propellant disposal trailers for use with the fixed and mobile PTS facilities. A Propellant Transfer System is the device or means for handling, loading and unloading the propellant used in the Titan II. The propellant consists of fuel and an oxidizer. At the 57 launch facilities, the Propellant Transfer Systems were to be installed in silos, which are large reinforced concrete underground chambers. These were to be constructed under the terms of contracts other than the contract for the Propellant Transfer Systems. The mobile PTS units, including the waste propellant disposal equipment, were to be mounted on trailers and used in conjunction with the fixed propellant transfer facilities for transferring propellant to and from the missile propellant tanks and for disposing of waste propellant.'
•CA **Pleasanton Tool and Manufacturing** Pleasanton BE- 1989-2002 - Pleasanton Tool provides machine shop services to Sandia National Laboratory, California.
•CA **Poltech Precision** Fremont BE - 1999 - Poltech Precision did machining work for Sandia National Laboratory, California.
•CA **Philco-Ford Corporation** or **Ford Aeronutronic** Newport Beach BE - 1967-1972 - The Aeronutronic Division of the Philco-Ford Corporation engaged in research on beryllium manufacturing techniques for the AEC between 1967 and 1972. The overriding goal of the program was to demonstrate the feasibility of shear spinning technology for beryllium production.
•CA **Robin Materials**[180] Mountain View BE - 1985-1997 - Robin Materials provided metal materials to Sandia National Laboratory, California. This material included beryllium-copper.

We refer to your letter of September 18, 1961, with enclosure, and subsequent correspondence, including memorandum of December 14, 1961, submitted in your behalf by Pledger and Edgerton, protesting the award of a subcontract to the carter pump company by the prime contractor, Paul Hardeman, inc., in connection with the Titan II propellant transfer system program of the department of the air force. '
GAO: B-147220, December 29, 1961, 41 COMP. GEN. 424. - http://redbook.gao.gov/5/fl0022297.php

180 **Public Health Chronicles**: Beryllium's Public Relations Problem: Protecting Workers When There Is No Safe Exposure Level / David Michaels, Celeste Monforton. Public Health Reports / January–February 2008 / Volume 123 : 79. - http://www.publichealthreports.org/userfiles/123_1/79-88.pdf

•CA **Ron Witherspoon, Inc.**[181] Campbell BE - 1990-1995 - Ron Witherspoon, Inc. produced beryllium springs for Sandia National Laboratory, California.

•CA **Sandia National Laboratories Livermore** Livermore DOE - Sandia National Laboratory Livermore was established in 1956 to conduct research and development in the interest of national security. The principal emphasis was on development and engineering of the parts of nuclear weapons outside the warhead physics package. The site was selected for its proximity to Lawrence Livermore National Laboratory to facilitate a close working relationship between the two laboratories. Contractors: Lookheed Martin (1995-present); Martin Marietta (1993-1995); AT&T (1951-1993).

181 **DOL-DOE Traveling Resource Center to Assist Current and Former Nuclear Weapons Workers in Bay Area**. - http://www.dol.gov/owcp/energy/regs/compliance/pressreleases/pr20031028.htm
'The Bay Area is home to several facilities designated by DOE as nuclear weapons producers: Lawrence Berkeley National Laboratory; University of California; Lawrence Livermore National Laboratory; Sandia National Laboratories in Livermore; and Stanford Linear and Accelerator Center in addition to the following 12 beryllium vendor facilities. These facilities include: City Tool Die Mfg., Santa Clara; C.L. Hann Industries, San Jose; EDM Exotics, Hayward; Electrofusion, Fremont; Hafer Tool, Oakland; Hexcel Products, Berkeley; Jerry Carroll Machining, San Carlos; Pleasanton Tool and Manufacturing, Poltech Precision, Fremont; Robin Materials, Mountain View; Ron Witherspoon, Inc., Campbell; and Tapemation, Scotts Valley.'

THE INSTRUMENT LAB WAS THE CENTER OF TEST OPERATIONS AT SALTON SEA TEST BASE. DAVE TARBOX, PROJECT ENGINEER, DESIGNED THE BUILDING. SALTON SEA WAS USED BY Z DIVISION AND THEN SANDIA FROM 1946 TO 1961.

•CA **Sandia Laboratory Salton Sea Base**[182] Imperial County DOE - 1946-1961 - The Salton Sea Test Base was used for a variety of activities such as military training and weapons research, development, testing, and evaluation. The base was used by numerous tenant and non-tenant military commands as well as by research divisions of government agencies and private companies working on government projects. The site was established in 1942 as an operational base for seaplanes during World War II. Later, the Atomic Energy Commission renovated and expanded the base for aerodynamic testing of weapons-delivery vehicles. From 1946 to 1961, Sandia National Laboratory operated a testing program at the site. The remoteness of the area was ideal for training and other operations. It is unclear from the documentation whether this testing work involved the use of radioactive materials. (Sandia relocated their test ranges to the Coyote Field in Albuquerque, and to the Tonopah Test Range in Nevada). Over 1,100 missile tests have been performed there.

182 **Nuke lab used Salton Sea base.** Imperial Valley Press Online, October 22, 2005.
- http://articles.ivpressonline.com/2005-10-22/salton-sea_24210272
Official records from the Albuquerque, N.M.-based Sandia National Laboratory confirm the so-called Salton Sea Test Base was used by the laboratory during its nuclear weapons program but that no fissionable material was ever present.

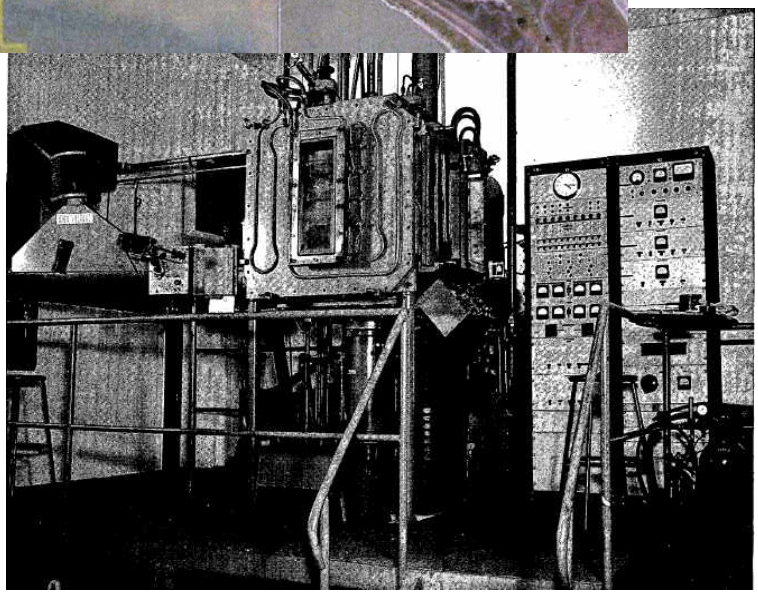
The Navy shared it with Sandia, and continued to use it through the 1970's, though there have been reports of military activities at the site as recently as the Gulf War.

•CA **SF-88 Fort Barry**[183] Marin Headlands AWE 1954-1974 – Formerly Nike Missile

183 **Nike Missile Manual Collection.1951-1987** Golden Gate National Recreation Area Park Archives and Records Center. 2004. - 37 pp.
- http://www.nps.gov/goga/historyculture/upload/35286fa-Nike-Missile-Manuals-with-table.pdf
'From Nike Missile Site SF 88L, Fort Barry.
Nike missile technical and maintenance manuals from Nike Site 88L, Fort Barry. Includes both Nike-Hercules and Nike-Ajax missiles, as well as manuals for associated equipment and systems.'

launch site.

•CA **Stanford Linear Accelerator Center** Palo Alto DOE - 1962-. - The Stanford Linear Accelerator Center (SLAC) is owned and operated by Stanford University under contract with the Department of Energy. The Stanford Linear Accelerator Center was established in 1962 as a research facility for high energy particle physics. The Center's four major experimental facilities are the Linear Accelerator, the Positron Electron Project Storage Ring, the Stanford Positron Electron Asymmetric Ring, and the Stanford Linear Accelerator Center Linear Collider.



•CA **Stauffer Metals, Inc** or **Stauffer Chemical Company**[184]**.** Richmond AWE - 1961 - Stauffer performed electron beam melting tests on uranium metal for the National Lead of Ohio (Fernald). The company had performed similar tests for Hanford.

184 **Electron beam melting of uranium** / H. M. Eikenberry. Technical division, National Lead Company of Ohio. 1963. - 29 pp. - http://www.osti.gov/bridge/servlets/purl/4704067-VhfESH/4704067.pdf

'The electron beam furnace used in these tests was located in the Stauffer Metals Company's beryllium laboratory in Richmond, California. A detailed description of the furnace (Figure 1) and the electron beam process has been given by Smith, Hunt, and Hanks.'

Letter to AEC from JM Fitzpatrick, Stauffer Chemical Company. 1962. - 11 pp. - http://pbadupws.nrc.gov/docs/ML0301/ML030170388.pdf

DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; August 29, 1994. - 3 pp. - http://www.lm.doe.gov/Considered_Sites/Gleason_Works_-_NY_55/

Years later, chemical company lot still a toxic stew. / Ian Stewart. Richmond Confidential, November 9,

•CA **Tapemation** Scotts Valley BE- 1990-1995 - Tapemation is a machine shop that provided services to Sandia National Laboratory, California. Several small jobs involved the precision machining of beryllium-copper materials. 'Tapemation is a small, woman-owned source for large precision machined parts and fabrications for High-Technology requirements. We have supplied components to Aerospace, Aircraft, Electronic, Marine, Petroleum, Space Communication, NASA, U.S. Military Specifications.'

2009. - http://richmondconfidential.org/2009/11/09/years-later-chemical-company-lot-still-a-toxic-stew/

Building 925 represents an important link in the design and development of nuclear weapons storage facilities during the early Cold War period. It is one of only five alert nuclear weapons storage facilities of this type built in the United States. Building 925 is a distinguished contributing element of the Armed Forces Special Weapons Project Q Area at Travis Air Force Base, which has been recommended as a historic district eligible for inclusion in the National Register of Historic Places under criterion c.
Source: Library of Congress.

•CA **Travis Air Force Base**, Building No. 925[185], W Street, Fairfield, Solano AWE - In 1949, the Strategic Air Command (SAC) became the parent major command for Travis AFB, turning it into a major long-range reconnaissance and intercontinental bombing installation for the 9th Bomb Group/9th Bomb Wing. For the next nine years, airlift operations became secondary while Travis served as home for SAC bombers such as the B-29 Superfortress, B-36 Peacemaker, and eventually, the B-52 Stratofortress. United States Army Nike surface-to-air missile sites[186] were constructed during

185 Library of Congress: Historic American Buildings Survey/Historic American Engineering Record: **Travis Air Force Base, Building No. 925, W Street, Fairfield, Solano, CA.**

186 **Pollution an enduring legacy at old missile sites**. / Mead Gruver. Associated Press. October 10, 2009.

'The U.S. Army Corps of Engineers is identifying and cleaning up dozens of former nuclear missile sites in nine states. To date, the corps has spent $116 million at 44 former Atlas and Titan intercontinental ballistic missile — or ICBM — sites and 19 former Nike anti-aircraft missile sites from the early Cold War. The missile sites include 14 in Kansas, 10 in Nebraska, seven in Wyoming, seven in Colorado and two in Oklahoma. California, New Mexico, New York and Texas have one contaminated site each. The problem is a chemical called trichloroethylene, or TCE, which was used to keep missiles clean. The corps has evaluated a total of 395 former ICBM and Nike missile sites since the Formerly Used Defense Sites, or FUDS,

1957-58 as Travis Air Force Base Defense Area
• CA **University of California** Berkeley AWE/DOE
• CA **Utah Construction Company**, **Utah Construction and Mining Company**[187] or **Utah International, Inc.**, San Francisco AWE - Utah Construction was the lead contractor for the US Minuteman Missile hardened silos throughout the United States. From 1974 part of General Electric.

Exterior view of south and east walls of Oxidizer Conditioning Structure (T-28D), looking northwest. This structure was designed to condition nitrogen tetroxide, the oxidizer used in the Titan II's fuel system, to specified temperatures. The taller structure to the rear is the Long-Term Oxidizer Silo (T-28B). Source: Library of Congress.

program began in the early 1980s'.

187 I**ndex of Utah Construction Company/ Utah International Collection 1900-1984**. MS 100. Weber State University. Stewart Library. Special Collections. / Processed by Michael Hunter. 2001. - 122 pp.
Register of Utah Construction Company/ Utah International Collection 1900-1984. MS 100. Weber State University. Stewart Library. Special Collections. / Processed by Sarah Langsdon. 2001. - 97 pp.
- http://library.weber.edu/ucc/regindex/default.cfm

Exterior view of south wall of Oxidizer Conditioning Structure (T-28D), looking north. The taller structure immediately to the rear in the upper left background is the Long-Term Oxidizer Silo (T-28B). Source: Library of Congress.

[LGM-25C Titan II]

• CO **Air Force Plant PJKS, Systems Integration Laboratory, Oxidizer Conditioning Structure**[188] Lakewood vicinity, Jefferson AWE - Fabricator: Kaiser Steel Corporation, Fabricating Division, Montebello, California. Titan missile propellant

systems testing, evaluation, handling, and storage, constructed.1960-1961.

•CO **Climax Uranium Mill**[189] also called the former **Grand Junction, Colorado, Processing Site and Disposal Site** or the **Cheney Disposal Site**[190] Grand Junction[191] DOE – 1951-1970. - The mill processed both vanadium as well as uranium. According to The Energy Net, In the 1950s and 1960s, an estimated 300,000 tons of uranium mill tailings from the Climax mill were used in construction as a sand substitute or for backfill material at various sites throughout the Grand Junction and

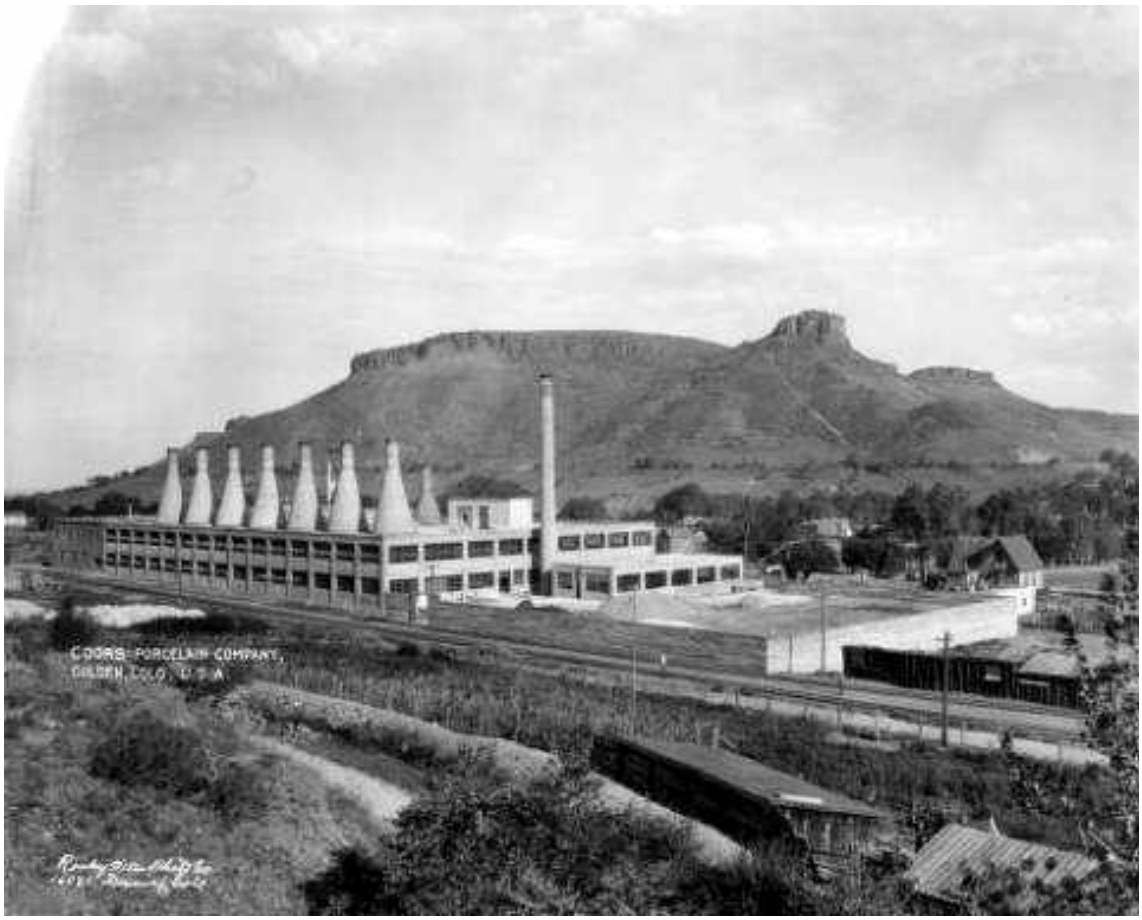
188 **Air Force Plant PJKS, Systems Integration Laboratory** (Air Force Plant PJKS, Systems Integration Laboratory, Building T-28). Waterton Canyon Road and Colorado Highway 121. Lakewood Vicinity. Jefferson County. Colorado. Undated. - 5 pp.
- http://memory.loc.gov/pnp/habshaer/co/co0700/co0782/data/co0782data.pdf.

189 **Inventory of the Climax Uranium Mill records, 1942-1976**. Rocky Mountain Online Archive. 2006.
The Museum of Western Colorado, in Grand Junction, Colorado, transferred the Climax Uranium Mill records to the American Heritage Center in 1991.
- http://ahc.uwyo.edu/usearchives/inventories/html/wyu-ah09832.html#d0e73.
GAO: **Uranium Mill Tailings**: Cleanup Continues, but Future Costs Are Uncertain. 1995. - 52 pp.
- http://www.gao.gov/archive/1996/rc96037.pdf
Nuclear Decommissioning - Grand Junction (Climax Uranium) Mill Site. Energy Information Administration Independent Statistics and Analysis. 2005.
Remedial actions at the former Climax Uranium Company uranium mill site, Grand Junction, Mesa County, Colorado : final environmental impact statement / U.S. Department of Energy. 1986.- 28 pp.

190 Grand Junction, Colorado, Processing Site and Disposal Site. **Fact Sheet**. Undated, 4 pp.

191 See also the Grand Junction, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site.

Mesa County area. Uranium mill tailings were used on private residences, schools, churches, and commercial locations (streets and sidewalks).



•CO **Coors Porcelain** Golden BE - 1947-1975 - Coors Porcelain performed beryllium work for the Atomic Energy Commission. An early AEC document makes reference to Coors Porcelain's involvement in beryllium work during the period from 1947-1948. Coors Porcelain had an earlier contract with the Clinton Engineer Works (now Oak Ridge Reservation), but it is unclear whether beryllium was involved. From 1957 through 1964, the company worked as a subcontractor with Lawrence Livermore National Laboratory on Project Pluto, a project undertaken to determine the feasibility of using heat from reactors as the energy source for ramjet engines. Coors developed fuel elements from beryllium ceramics for the project, which began in 1957 and ended in 1964.

・CO **Glenn L. Martin Company, Titan Missile Test Facilities** Lakewood vicinity, Jefferson AWE including Glenn L. Martin Company, Titan Missile Test Facilities, CaptiveTest Stand D-3 and Glenn L. Martin Company, Titan Missile Test Facilities, Captive Test Stand D-4

•CO **Grand Junction Operations Office**[192] AWE/DOE – 1943-. - In 1943, the Manhattan Engineer District purchased the Grand Junction site and constructed a plant to produce uranium concentrate from "green sludge" delivered from plants at Uravan and Durango Colorado. The purpose of this plant was to provide domestic uranium for the Manhattan Project. The Grand Junction Office of the AEC was the headquarters for the uranium procurement program from 1947-1970. One of the principal functions of the GJO was the receipt, sampling, and analysis of uranium and vanadium concentrates from the 32 ore processing operations in the western US. More than 347 million pounds of uranium oxide and 28 million pounds of vanadium oxide were received during the period from 1948-1971[193].

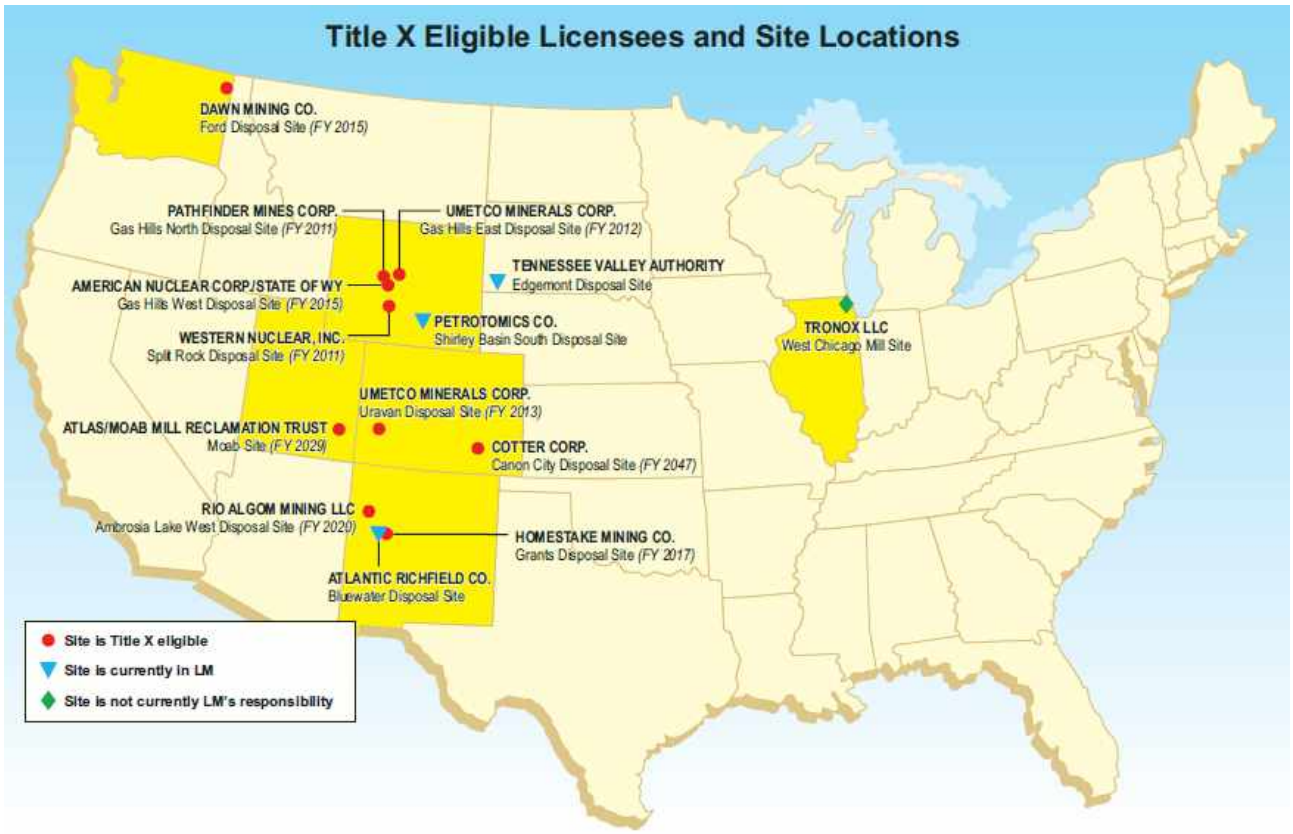
192 HHS Designation of Additional Members of the Special Exposure Cohort under the Energy Employees Occupational Illness Compensation Program Act of 2000: **Designating a Class of Employees from Grand Junction Operations Office Grand Junction, Colorado**, 2011. - 5 pp.

SEC Petition Evaluation Report, Petition SEC-00175, 2011. - 99 pp

Status of Upcoming SEC Petitions / LaVon B. Rutherford, CHP. National Institute for Occupational Safety and Health Division of Compensation Analysis and Support. 2011. - 6 pp.

- http://www.cdc.gov/niosh/ocas/pdfs/abrwh/pres/secstat0811bw.pdf

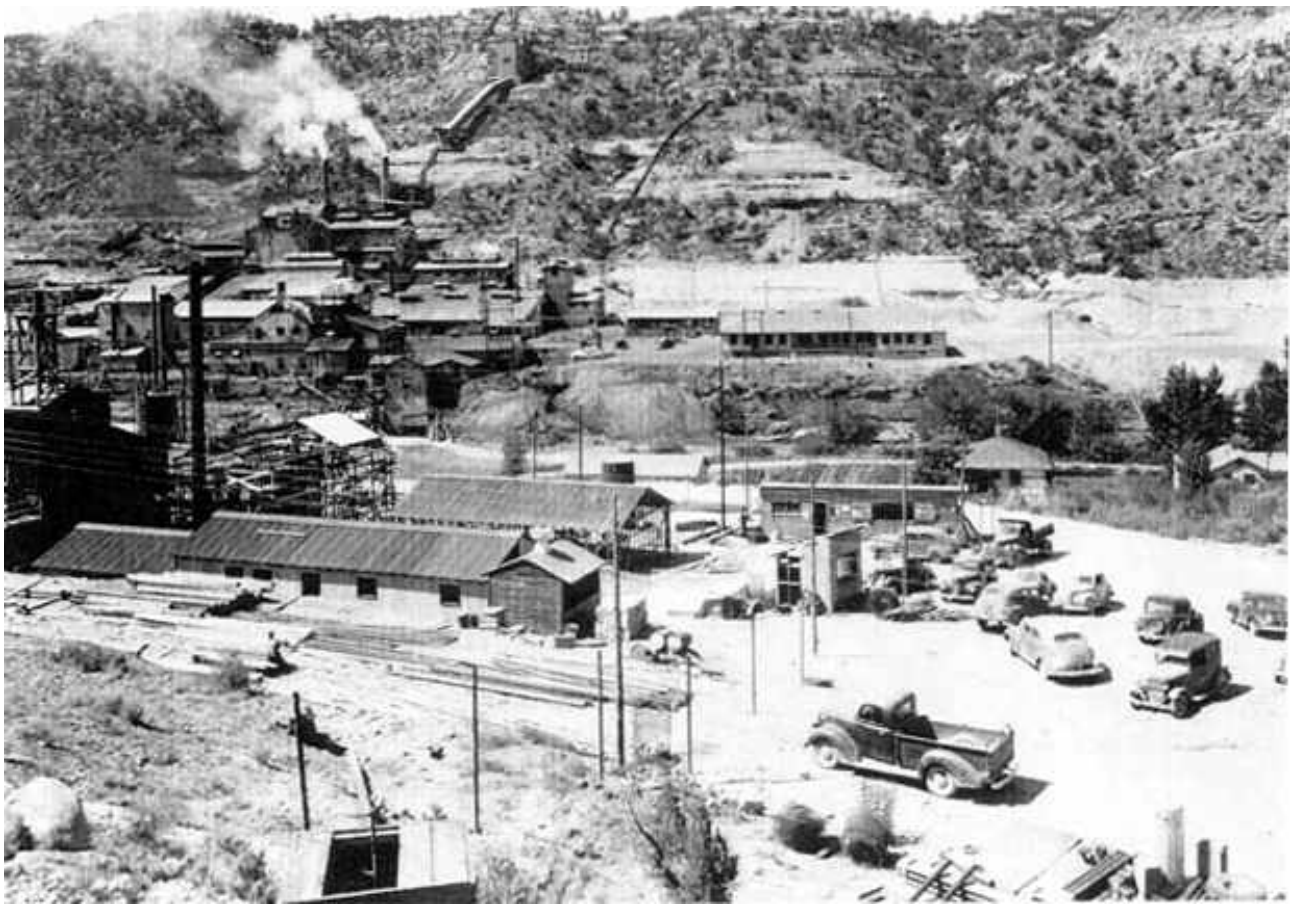
193 **Atomic Age Narrow Gauge** : Uranium and the Rio Grande Southern Railroad / Stephen pp. Hart. Rio Grande Southern Railroad Technical Information Page. Volume 4, No. 2 - January, 2002.



In 1951 the AEC built a concentrate sampling plant and assay laboratory in the Grand Junction compound. This was operated by Ledoux company under a management and operating contract. In addition, the AEC built two ore-testing pilot plants in its compound in Grand Junction. These were, in effect, miniature processing plants in which approximately 30,000 tons of ore from 40 different uranium mines were tested between the years of 1953-1958[194]. Furthermore, the AEC established a sampling and assaying station for the receipt of uranium ores at Grand Junction.

Concentrates produced by mills were delivered in steel drums to Grand Junction where they were received, weighed, sampled, and assayed as the basis for payment to the mills under the terms of their respective contracts. On September 30, 2001 the Department of Energy transferred ownership of the Grand Junction property to the Riverview Technology Corporation. The DOE, however, continues to lease portions of the site. Contractors: Lucius Pitkin Inc. (1956-1971) (ore buying station, sampling, and assaying); National Lead Company (1954-1958) (pilot plant); American Cyanamid Company (1953-1954) (pilot plant); American Smelting and Refining Company (1948-1955) (ore buying station, sampling, and assaying); Ledoux and Company (1948) (concentrate sampling); US. Vanadium Corporation (1943-1946) (uranium processing mill).

194 **Decommissioning of US. Uranium Production Facilities**. Energy Information Administration, Office of Coal, Nuclear, Electric and Alternate Fuels. US. Department of Energy, Washington, DC. 1995. - 71 pp.

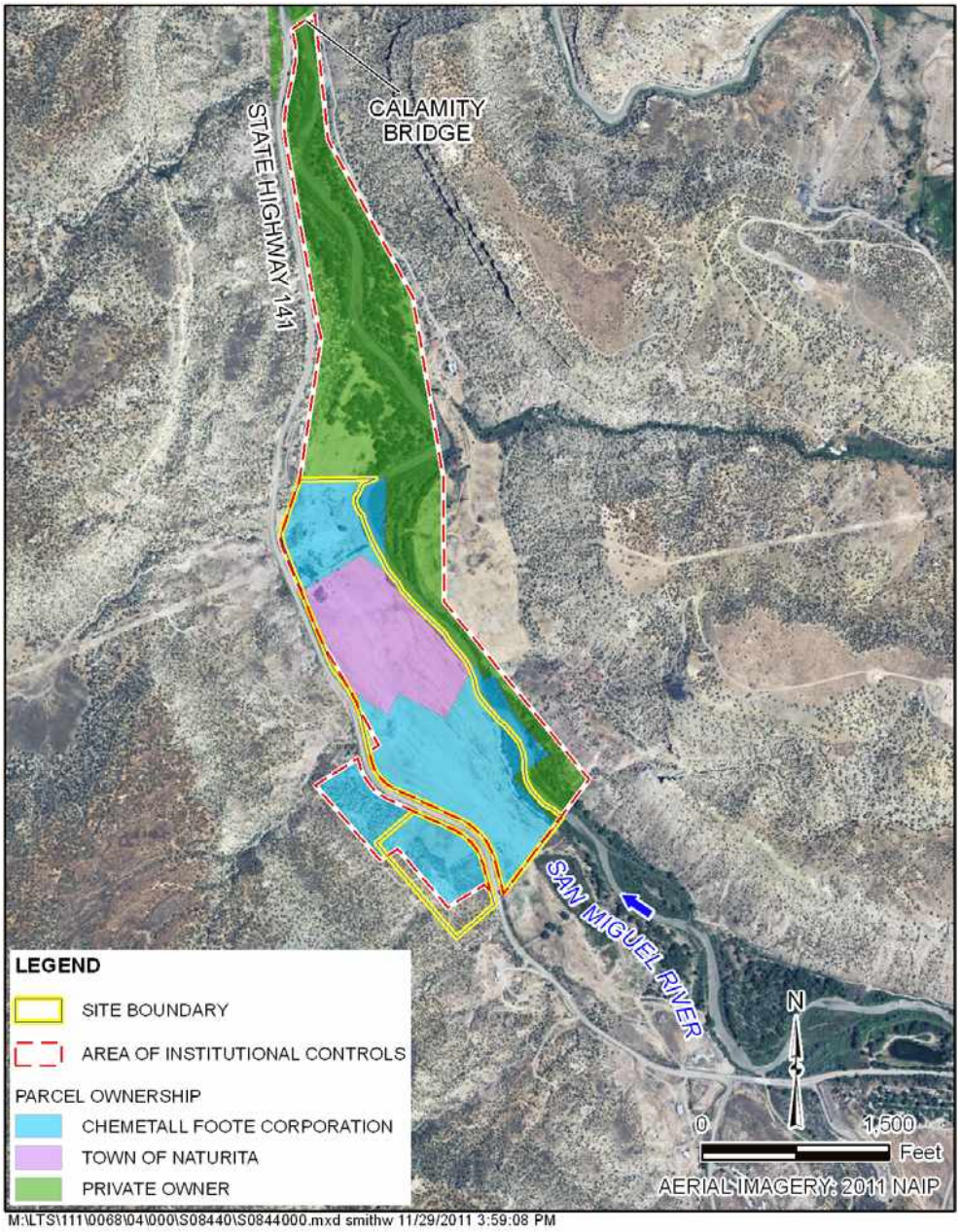


•CO **Green Sludge Plant in Uravan** Uravan AWE/DOE - 1943-1945 - The Manhattan Engineer District (MED) obtained uranium from residues left over from the production of vanadium. The resulting product made at these plants was called "green sludge." It was further processed at Grand Junction. Two plants in Uravan, Colorado, provided the MED with uranium extracted from green sludge. The green sludge plant in Uravan owned by Union Carbide and operated by its subsidiary, the US. Vanadium Company, is not covered under EEOICPA. This listing applies only to the MED-owned plant, which was located on the north side of the San Miguel River. The US. Vanadium Company operated the MED-owned plant under a fixed fee contract during World War II. The plant was shut down in 1945. Contractors: The US. Vanadium Company, a subsidiary of the Union Carbide Corporation (1943-1945).

• CO **Lowry Air Force Base** AWE 1958-1994 - Titan I missiles. The Lowry Air Force Base is a former US Air Force base located in the cities of Aurora and Denver, Colorado. On March 13, 1958, the Air Force Ballistic Committee approved the selection of Lowry to be the first Titan I ICBM base. No doubt the close proximity of the Martin Company's Titan missile production plant in Denver influenced the site selection. Construction of launchers and support facilities began on May 1, 1959.
The Operable Unit 2 or OU 2[195], also known as the landfill zone, is an approximate 74.5 acre parcel in the south-central portion of Lowry. The site is bounded by Alameda Avenue on the south, Westerly Creek Flood Control Dam and associated wetlands to the north, AMLI Apartment Complex to the west, and Westerly Creek to the east. The landfill was historically used for the disposal of base-related waste and associated con-

195 **OU 2 Post-closure Monitoring Report**. Third Quarter 2009 and First Quarter 2010.
- http://www.lowryafbcleanup.com/lowryreference.html

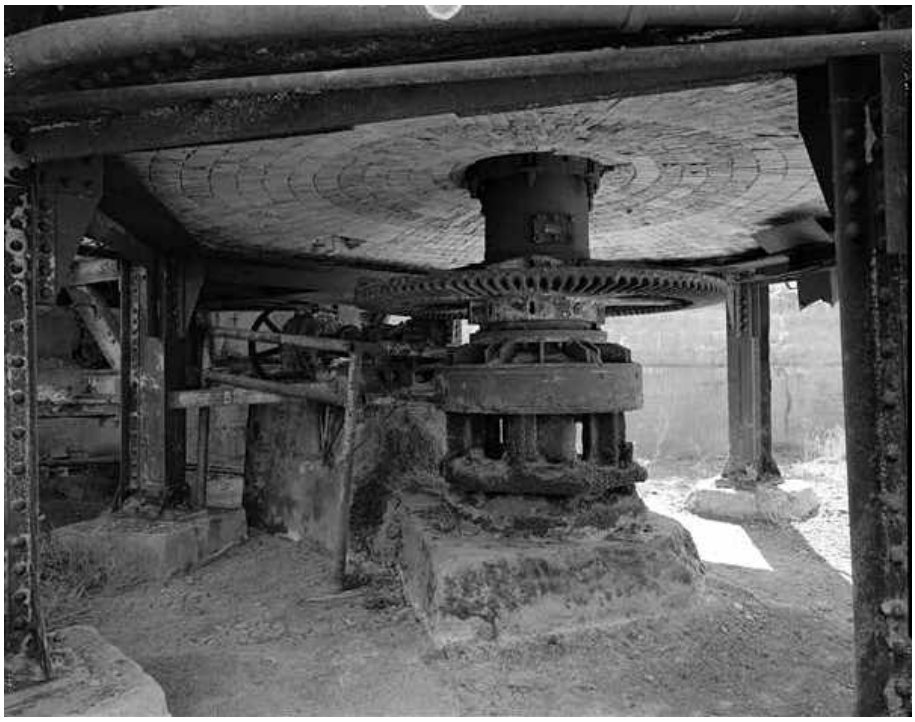
struction debris primarily from training activities conducted at the former Lowry AFB. Disposal occurred from approximately 1948 until 1986.
Deployments of the Titan I were also located at Beale Air Force Base in California, Ellsworth Air Force Base in South Dakota, Larson Air Force Base in Washington, Mountain Home Air Force Base in Idaho and Vandenberg Air Force Base in California.



•CO **Naturita Mill**[196] or the **Vanadium Corporation of America Mill** AWE - The mission of the Naturita mill site was to provide uranium for the United States Govern-

196 DOE: **Data Validation Package for the July and October 2008 Water Sampling at the Naturita Processing and Disposal Sites**,.2009. - 102 pp. - http://www.lm.doe.gov/Naturita/2008_S00708.pdf
DOE: **Fact Sheet. Naturita, Colorado, Processing and Disposal Sites**. Undated. - 4 pp. - http://www.lm.doe.gov/Naturita/Fact_Sheet-naturita.pdf

ment. The source of contamination was the residual tailings[197] that remained after the milling process extracted the uranium. Rare Metals Company built the mill in 1930, but it did not become operational until 1939 when Vanadium Corporation of America acquired it and converted it for vanadium recovery. The mill was shut down at the end of World War II but reopened in 1947.



It produced uranium concentrates that were shipped to the Atomic Energy Commission until the mill was shut down in 1958. From 1961 until 1963, Vanadium Corporation of America operated a uranium upgrader at the site. In 1967, Vanadium Corporation of America merged with Foote Mineral Company, and ownership of the site passed to Foote.

197 **The long term stabilization of uranium mill tailings: Final report of a co-ordinated research project 2000–2004**. - Vienna: IAEA, 2004. - 309 pp.
- http://www-pub.iaea.org/MTCD/publications/PDF/te_1403_web.pdf

•CO **Rocky Flats Plant**[198] Golden DOE - 1951-2006 - Rocky Flats was built in 1951

198 The Rocky Flats Stewardship Council formed in February 2006 to provide ongoing local government and community oversight of the post-closure management of Rocky Flats, the former nuclear weapons plant northwest of Denver.

Environmental Report for the Rocky Flats Plant. / Cirrincione, D.A. Erdmann, N.L. [eds.], 1992. - 358 pp. - http://www.osti.gov/bridge/servlets/purl/10116071-oPrcLc/native/10116071.pdf

A model for a comprehensive assessment of exposure and lifetime cancer incidence risk from plutonium released from the Rocky Flats Plant, 1953-1989. / Rood AS, Grogan HA, Till JE. Health Phys. 2002 Feb;82(2):182-212.

'Episodic releases included two major fires in 1957 and 1969 that breached the building air filtration systems, and suspension of plutonium contaminated soil from the former 903 waste storage area during high winds. Predicted air concentrations included contributions from site releases and resuspension from contaminated soil. Inhalation was the only exposure pathway considered. Environmental measurements suitable for model validation were lacking for the period when major site releases occurred (1953 to 1970). However, environmental media, such as soil and lake sediment, are natural accumulators and provided evidence of past offsite releases. The geometric mean predicted-to-observed (P/O) ratio for soil was 0.93 with a geometric standard deviation of 1.6. The model systematically underpredicted concentrations near the 903 Area because large, nonrespirable particles that deposited close to the source were not included in release estimates.'

Hazardous Waste Ground Water Task Force Ground Water Monitoring Evaluation, US Department Of Energy - Rocky Flats Plant Golden Colorado. 1988. - 161 pp.

Particulate, Colloidal, and Dissolved-Phase Associations of Plutonium, Americium, and Uranium in Water Samples from Well 1587 and Surface-Water Sites SW-51 and SW-53 at the Rocky Flats Plant, Colorado. / R.A. Harnish, D.M. McKnight, J.R Ranville, V.C. Stephens, and W.H. Orem. U.S. Geological Survey : Earth Science Information Services , 1996. - 43 pp. - http://pubs.er.usgs.gov/publication/wri964067

as a plutonium and uranium component manufacturing center. From 1952 to 1989, the site's primary mission was to fabricate the "pit" that contains the heavy metals and serves as the trigger device for nuclear warheads. Rocky Flats was also responsible for recycling plutonium from scrap and plutonium retrieved from retired nuclear warheads. The final products of this recycling included components and assemblies manufactured from uranium, plutonium, beryllium, stainless steel, and other metals. Production activities included metalworking, component fabrication and assembly, chemical recovery and purification of plutonium, and associated quality control functions.

Research and development in the fields of chemistry, physics, metallurgy, materials technology, nuclear safety, and mechanical engineering were also conducted at the site. In 1989, many of the site's nuclear component production functions were suspended after a safety review temporarily shut down plutonium operations. Following an extensive review, which included considerable independent oversight, a few buildings were authorized by the Secretary of Energy to resume limited plutonium operations: to stabilize plutonium oxide and repackage plutonium for safe storage. In 1989, as a result of the environmental contamination caused by production activities at the site.

Rocky Flats was placed on the Superfund National Priorities List. In January 1992, nuclear component production was terminated and the site's primary mission changed

from nuclear weapons production to environmental cleanup and restoration.[199] Contractors: Kaiser-Hill Company (1995-present); EG&G Rocky Flats, Inc. (1989-1995); Rockwell International (1975-1989); Dow Chemical (1951-1975).

•CO **Shattuck Chemical**[200] Denver AWE - 1950s; 1963 - Shattuck Chemical prepared uranium compounds and uranium oxide in the late 1950s. (This was probably done under a Source Materials License issued by the Atomic Energy Commission.) Shattuck also processed refined uranium and produced natural uranium oxides on a commercial basis for the private market, and in 1963, supplied a small quantity of uranium to the Rocky Flats plant. The Shattuck facility was closed in 1984.

•CO **University of Denver Research Institute** Denver AWE/BE - 1963-1965 - The University of Denver Research Institute is listed as a processor of radioactive materials for National Lead of Ohio (Fernald). It appears that the University of Denver handled test quantities of radioactive metal in February 1965. In 1963, a

199Democracy Now! Tuesday 04 May, 2004 (May 4, 2004).

'**Recycling Plutonium:** How the EPA is Disbursing Toxic and Radioactive Waste From the Lowry Landfill to the Sewage System and onto CO Farmlands and Public Parks'. - http://www.archive.org/details/dn2004-0504

200**Neighbors hope to use former Shattuck Chemical land for garden** / Matthew Rodriguez YourHub.com, 01/24/2011. 'Buried in the $33 million cleanup of the radioactive Shattuck Chemical site in Denver, along South Bannock Street, was a $250,000 settlement for ecological restoration'.

Cleanup fund for radioactive Shattuck Chemical site quadruples to $1 million / Mark Jaffe. The Denver Post, 11/23/2009. - http://www.denverpost.com/news/ci_13847754#ixzz1dseGorIz

University of Denver Research Institute researcher (F. Perkins) held an AEC contract for work on intermediate-temperature oxidation of beryllides.

•CO **Titan One Missile Complex 2A**[201] Aurora vicinity, Arapahoe AWE - The Colorado Department of Public Health and Environment (CDPHE), Hazardous Materials and Waste Management Division, provides regulatory oversight of the Formerly Used Defense Sites and Base Realignment and Closure programs in Colorado, with assistance from the US Environmental Protection Agency Region 8 and local governments.

•CO **Uranium Mill in Durango**[202] Durango DOE - 1948-1953 - The AEC purchased

201 **Final five-year review plan former Lowry Bombing and Gunnery Range Arapahoe County, Colorado**. Prepared for: US. Army Corps of Engineers. Omaha District. Omaha, Nebraska / Prepared by: Shaw Environmental, Inc., 2011. - 71 pp.

202 **Collection M 008: Durango (Colo.) Uranium Mill Tailings Removal collection inventory**. Years this material was created: 1960-1990; bulk dates 1978-1989. Quantity: 2.2 linear shelf feet (in 5 document cases), Fort Lewis College Foundation, Center of Southwest Studies account.
- http://swcenter.fortlewis.edu/inventory/Umtra.htm

Related collections at the Center of Southwest Studies:

I 073: **Atomic bomb development records (RG 77) on microfilm** (14 rolls of microfilm). Harrison-Bundy files relating to the development of the atomic bomb, 1942-1946 (M1108, 9 rolls), and correspondence ("Top Secret") of the Manhattan Engineer District, 1942-1946 (M1109, 5 rolls).

DOE: **Durango, Colorado, Disposal Site**.2011. - 12 pp. - http://www.lm.doe.gov/Durango/air_dur.pdf

'Until 2008, DOE listed EPA's Maximum Concentration Limit (MCL) of 0.044 mg/L as groundwater standard for uranium at the Durango disposal site (according to 40 CFR 192 Table 1, Subpart A).

the 147-acre uranium mill site in Durango, Colorado, in 1948 from the Vanadium Corporation of America. The AEC leased the facility back to Vanadium that same year, with an option to purchase the facility in 1953. Between 1948 and 1953, Vanadium operated the mill on behalf of the AEC.

The company exercised its purchase option in 1953, and thereafter, the mill was operated as a privately owned facility. The company shut down and dismantled the mill in March 1963. Contractor: The Vanadium Corporation of America (1948-1953).

•CO **Vanadium Corporation of America** Naturita AWE/DOE

•**CO Vanadium Corporation of America** Uravan[203] Uravan (a contraction of Uranium and vanadium) DOE - The 450-acre Uravan Uranium site began as a radium-recovery plant in 1912. Its owners converted it for vanadium extraction. From the 1940s to 1984, the plant operated as a uranium- and vanadium- processing facility. Operations at the 450-acre site left a large volume of wastes, contaminating air, soil and ground water near the plant and the San Miguel River.

Contaminants included radioactive products such as raffinates, raffinate crystals and mill tailings containing uranium and radium. Other chemicals in the tailings and ground water were heavy metals, such as lead, arsenic, cadmium and vanadium.

•CT **American Chain and Cable Co[204].** Bridgeport AWE - 1944 - American Chain and Cable worked under contract to the Du

203 EPA: **About Uravan Uranium site...** National Priorities List Construction Complete. 2002.

Pont Company to support the manufacture of uranium slugs during the Manhattan Project. In 1944, the company swaged (reduced the diameter) of uranium rods at its Bridgeport facility.

•CT **American Brass Company** Waterbury AWE - Formed in 1899 with the consolidation of Ansonia Brass & Copper Company, Waterbury Brass Company, and Coe Brass Manufacturing Company. Acquired in 1922 by Anaconda Mining Company (of Montana), though it kept its name until it changed to Anaconda American Brass in 1960. The Anaconda Company merged with Atlantic Richfield in 1977, and then became ARCO Metals.

204 National Institute for Occupational Safety and Health: **Site Profiles for Atomic Weapons Employers that Worked Uranium and Thorium Metals Appendix V- American Chain and Cable Company**, 2007. - 8 pp.

•CT **Anaconda Co.**[205] Waterbury AWE - 1942; 1956-1959 - In 1942, the American Brass Company produced the barriers used in the gaseous diffusion process. In the late 1950s, under contract to Nuclear Metals Inc., the company extruded copper-clad uranium billets into tubes at least two separate times for the Savannah River Site. While the original plans called for work on 500 billets, only around 50 were actually processed.

•CT **Bridgeport Brass Co., Havens Lab.**[206] Bridgeport AWE - 1952-1962 - Bridgeport Brass, at the Havens Laboratory in Connecticut and in Adrian, Michigan, worked to improve the process for extruding uranium. Eventually this work was taken over by Reactive Metals, which operated the AEC/DOE extrusion facility in Astabula, Ohio. Bridgeport cut and stored uranium, and may have been involved in the rolling of uranium. Some work of the Havens Laboratory was moved to Seymour, CT, in 1962, to a facility that is now owned by Seymour Specialty Wire. From 1954-1961, the Bridgeport Brass Company performed contract work for the AEC. Operations included production of uranium fuel elements for the Hanford and Savannah River Plant reactors and developmental extrusion work on thorium and depleted natural and slightly enriched uranium. After termination of AEC activities in 1961, most of this plant's functions were transferred to Reactive Metals, Inc. (RMI) in Astabula, Ohio. Bridgeport shipped one large extrusion press to RMI and all other equipment was dismantled and scrapped. Since the time of the AEC work, the former Havens plant building has

205 National Institute for Occupational Safety and Health: **Site Profiles for Atomic Weapons Employers that Worked Uranium and Thorium Metals Appendix G – Anaconda Co.**, 2007. - 7 pp. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/b-6000-apg-r0.pdf

206 **An Exposure Matrix for Bridgeport Brass: Havens Laboratory and Adrian Plant**. / Robert Vogel, Richard J. Traub, Jack J. Fix, Donald E. Bihl. National Institute for Occupational Safety and Health: 2005. - 46 pp. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/bbrass.pdf

DOE: **Preliminary Radiological Survey of the Former Havens Plant of the Bridgeport Brass Company, Bridgeport; Connecticut**; May 1985. - 4 pp.

DOE: **Elimination Report for Bridgeport Brass Company Havens Laboratory (Reactive Metals, Inc.) Kossuth and Pulaski Streets, Bridgeport, Connecticut**; Circa 1987.

apparently undergone extensive remodeling. The building is now owned by the city of Bridgeport, and has been converted to use as Kolbe High School.

•CT **Combustion Engineering** Windsor AWE/DOE - 1965-1972 - Combustion Engineering (CE) sent shipments of uranium to Fernald between 1965 and 1972 for use in the nuclear weapons production process. Combustion Engineering performed substantial work for the Atomic Energy Commission in other years as well, but this work is not covered under EEOICPA because it was either non-nuclear or was not related to weapons production. Starting in the 1940s, this initial work at the site involved non-nuclear components. In 1955, CE began to use highly enriched uranium for its work in supporting the Naval Reactors Program. In the 1960s, CE obtained a license to fabricate fuel elements for power reactors.

•CT **Connecticut Aircraft Nuclear Engine Lab.**[207] (CANEL) Middletown BE/DOE 1958-1966 - The Connecticut Aircraft Nuclear Engine Laboratory (CANEL) worked on an Atomic Energy Commission (AEC) program to develop a nuclear reactor with which to propel aircraft. Specifically, CANEL worked on developing high temperature materials, fuel elements, and liquid metal components and coolants. CANEL consisted of a hot laboratory facility, a nuclear physics laboratory, a fuel element laboratory, a nuclear materials research and development laboratory, and other buildings. The AEC Annual report for 1959 indicates that approximately $4 million in AEC equipment was at CANEL. Plutonium, mixed fission products, and probably uranium were handled at CANEL. A former ORNL employee who had worked at CANEL stated that beryllium metal and oxide in a powdered form were also handled at CANEL. Although President Kennedy canceled the aircraft nuclear propulsion program in 1961, AEC work apparently continued at CANEL until 1965.

•CT **Dorr Corp.** or **Dorr-Oliver Corp.** Stamford DOE - 1954; 1963 - The Dorr Corp. conducted waste handling tests on low-level radioactive material (ammonium diuranate). This work was done as a subcontractor to National Lead of Ohio (Fernald).

•CT **Fenn Machinery Co.** Hartford AWE - 1950 - Fenn conducted swaging tests on uranium rods to determine if the process could be used to produce properly shaped rods for Hanford's production reactors. Two tests, each lasting less than one day, were conducted in June 1950.

207 National Service Center for Environmental Publications (NSCEP): **SEC Petition Evaluation Report Petition SEC-00124: Connecticut Aircraft Nuclear Engine Laboratory**. / James Mahathy. 2008. - 32 pp. - http://www.cdc.gov/niosh/ocas/pdfs/sec/canel/caneler.pdf

•CT **H. D. Doolittle Machlett Laboratories**[208] Springdale BE - 1947-1952 - Beginning in the 1940s, Machlett Laboratories worked with beryllium in its commercial business as a supplier of x-ray and electron vacuum tubes. Machlett produced also a handful of brazed beryllium window assemblies in 1952 under an AEC contract.
•CT **Navy Underwater Warfare Lab** or the **Naval Undersea Warfare Center, Division Newport** New London AWE
•CT **New England Lime Co.** Canaan AWE - 1963 - In 1963, the New England Lime Co. (NELCO) conducted tests on "prill," a magnesium[209]-uranium waste product, to determine the feasibility of recovering these materials for re-use in the nuclear weapons production system. The prill came from the AEC's Fernald facility. Six drums of prill were sent from Fernald to NELCO for the test. The New England Lime Company also provided magnesium and calcium to the Manhattan Engineer District and Atomic Energy Commission from 1944-1956.

•CT **Seymour Specialty Wire**[210] Seymour AWE/DOE - 1962-1964 - From 1962 to

208 Pehrson, E. W. / **Minerals yearbook 1947**. Year 1947 (1949). Gustavson, Samuel A.: Minor metals, pp. 1249-1264: 'Fabricators of beryllium metal and beryllium-aluminum alloys included the Machlett Laboratories of Springdale, Conn., and the Aluminum Corp. of America, Pittsburgh, Pa.'

209 **SUMMARY OF DATA FOR CHEMICAL SELECTION: Magnesium Oxide 1309-48-4**. / Prepared by Technical Resources International, Inc. for NCI to support chemical nominations under contract no. N02-CB-07007 (11/01). http://ntp.niehs.nih.gov/ntp/htdocs/Chem_Background/ExSumPdf/Magnesiumoxide.pdf

210 DOE: **Long-Term Surveillance and Maintenance Requirements for Remediated FUSRAP Sites**. 2011. - 146 pp. - http://www.lm.doe.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=7978&libID=8084

1964, the Bridgeport Brass Company performed contract work at the Seymour site for the Atomic Energy Commission. This work involved developing an extrusion process for natural uranium metal. After 1964, the work was consolidated at the Reactive Metals site in Ohio. Operation of the Seymour site was later taken over by employees and the facility eventually became the Seymour Specialty Wire Company.

• CT **Sharpner's Pond ABM Site** Boston AWE – The Safeguard Anti Ballistic Missile System which was the replacement for the proposed Nike Zeus System. It was activated and deactivated in a matter of months due to the ABM Treaty.
•CT **Sperry Products, Inc.** Danbury AWE - 1952-1953 - In 1952 and 1953, Sperry developed processes for testing and examining uranium plates for the Sylvania Corp., a major AEC contractor.
•CT **Torrington Co.** Torrington AWE - 1951-1953 - The Torrington Company performed small-scale swaging experiments on uranium rods in the early 1950s. Torrington conducted this work for two companies: the Bridgeport Brass Company and American Machine and Foundry.
•CT **United Nuclear Corporation** AWE
• CT **United Nuclear Corporation Naval Products Division** formerly **Douglas United Nuclear, Inc** Montville AWE - The UNC Naval facility was operated by Olin Mathieson Chemical Corporation (April 1956 to May 31, 1961) and United Nuclear Corporation (June 8, 1961 to April 22, 1976) in New Haven, CT. The site had been used by United Nuclear Corporation to fabricate nuclear fuel components for the U.S. Government, and it was decommissioned in 1976.

National Institute for Occupational Safety and Health: **Site Profiles for Atomic Weapons Employers that Worked Uranium and Thorium Metals Appendix CD – Seymour Specialty Wire Company**, 2007. - 20 pp.- http://www.cdc.gov/niosh/ocas/pdfs/tbd/b-6000-apcd-r0.pdf

•DC **National Bureau of Standards**, Van Ness Street Washington AWE

•DC **Naval Research Laboratory**[211] Washington AWE/DOE - Pioneering research by NRL yielded the first separation of uranium isotopes by the liquid thermal diffusion process, invented by NRL's Philip Abelson. This process was one of the three methods used by the Manhattan Project to obtain the enriched uranium necessary to make the first atomic bombs. The uranium separation plant in Oak Ridge, Tennessee, was built in 1944 to the blueprints of NRL's plant.

•DE **Allied Chemical and Dye Corp.** North Claymont AWE - early 1950s-late 1960s; Residual Radiation late 1960s-1977 - Allied Chemical and Dye Company was involved in research and development and small pilot-scale operations on uranium recovery from a phosphoric acid plant.

211 Naval Research Laboratory: **The Little Book of Big Achievements**. 2000.- 28 pp. http://www.nrl.navy.mil/content_images/little_book.pdf

•DE **E.I. Du Pont de Nemours and Company** [212] Wilmington AWE. In the fall of 1942, design work began on the facility in Wilmington while DuPont personnel helped Army officials locate a site. The team chose Hanford, located along the Columbia River in central Washington State, not only for its proximity to hydroelectric power, but also for its sparsely populated, remote location. Having been accused of profiteering after World War I[213], DuPont charged only a $1 fee for its work at Hanford and turned over to the federal government all patent rights that resulted from the work. DuPont also owns the Grasselli Laboratories in Cleveland Ohio and owned the DuPont Explosives Plant Site[214] in the State of Washington..

212 National Archives: **Records of the Atomic Energy Commission** [AEC] (Record Group 326) 1923-75.

213 Du Pont de Nemours (E.I.) and Co., "World War One" Study of the International Armament Industry. **Merchants of Death** / H.C. Engelbrecht and F.C. Hanighen.

'During the World War, Du Pont supplied 40 per cent. of the powder used by the Allies, and after 1917 its orders from the United States government were enormous.'

- http://greatwar.nl/frames/default-merchants.html

Mehrotra, Ajay K., "**Lawyers, Guns & Public Monies**: The U.S. Treasury, World War One, and the Administration of the Modern Fiscal State" (2010); Faculty Publications. Paper 30.)

- http://www.repository.law.indiana.edu/facpub/30

Crozier, William: Ordnance and the world war; a contribution to the history of American preparedness (1920). - 316 pp. - http://www.archive.org/details/ordnanceworldwar00crozrich

Dramatic Legal Fight for $45,000,000 of Du Pont Money. The New York Times, September 16, 1917.

214 Land Use Database - http://archive.clui.org/ludb/site/WA3266

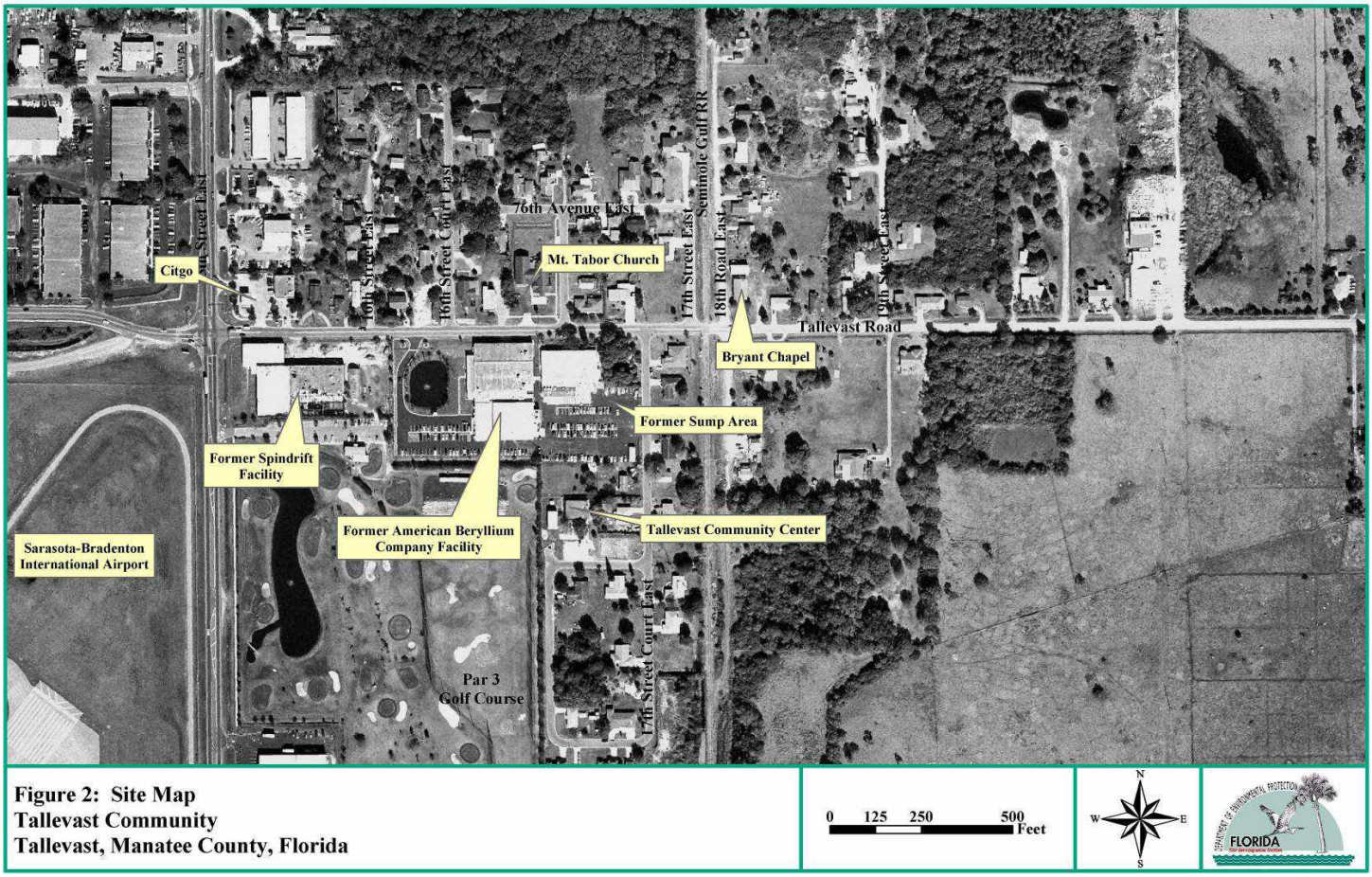


Figure 2: Site Map
Tallevast Community
Tallevast, Manatee County, Florida

• FL **American Beryllium Co.**[215] Sarasota, Florida BE – 1961-1996

215 **Beryllium spike raises fears in Tallevast area:** Some Tallevast residents say they should have been put up in hotels when the last buildings were dismantled Monday at the former American Beryllium Co. / Christopher O'Donnell. HeraldTribune.com . Published: Wednesday, February 9, 2011 at 1:00 a.m.
TALLEVAST - Lockheed Martin assured neighbors there was no risk that hazardous dust would be released when it dismantled buildings at the former American Beryllium Co. on Tallevast Road. But a recent spike in a reading of beryllium in the air has residents fearing for their health and questioning why the company did not temporarily relocate them to hotels as it did when it razed another building at the site in 2008.
Public health assessment former American Beryllium Company Tallevast, Manatee County, Florida. / Prepared by: Florida Department of Health. Division of Environmental Health. Under Cooperative Agreement with the U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry. 2008. - 136 pp.

American Beryllium Company at 1600 Tallevast Rd. in Sarasota, Florida, 1969. The American Beryllium Company manufactured ultra-precision machine parts from beryllium-containing metals at 1600 Tallevast Road. Disposal of solvents, including trichloroethylene, resulted in groundwater contamination. In 1996, the Lockheed Martin Corporation purchased American Beryllium and ceased operations.
Source: Florida Memory

- American Beryllium Company, later part of Loral Corporation, machined parts for Y-12 and Rocky Flats. Loral Metals Technology operated American Beryllium Company (ABC) as a precision machining/metalworking plant from 1961 to 1996.

• FL **Armour Fertilizer Works**[216] Bartow DOE - 1951-1955 - Under contract with the AEC, Armour operated a pilot plant which produced uranium from phosphoric acid.

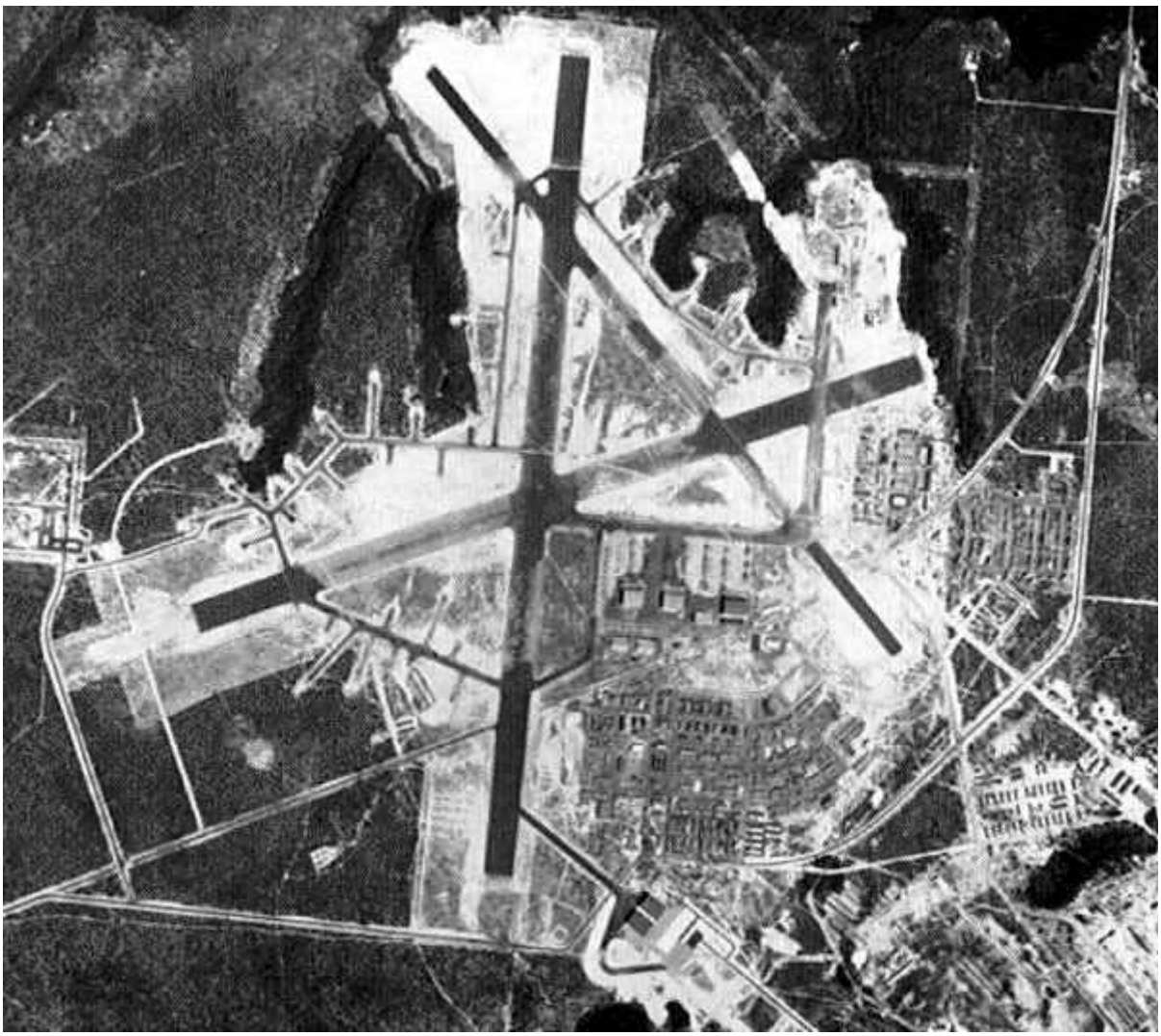
• FL **C.F. Industries, Inc.**[217] Bartow DOE – 1952-1955?- Bonnie Uranium Extraction Plant. All chemical plant equipment and structures had been removed in 1962 by International Minerals and Chemical Corporation and sold.

216 **Preliminary survey of U.S. Steel Corporation - AGRI-Chemical (former Armour Fertilizer Works). Bartow, Florida**. Health and Safety Research Division. Oak Ridge National Laboratory, Oak Ridge, Tennessee, 1980. - 7 pp.

217 DOE: **Formerly utilized sites remedial action program elimination report for CF Industries, Inc. (the former International Minerals and Chemical Corporation) Barton, Florida**. 1985. - 10 pp.

•FL **Cecil Field**[218] or **Naval Air Station Cecil Field** Jacksonville AWE – 1952-1999 - Yellow Water Special (Nuclear) Weapons Storage Facility Magazine. Cecil Field consisted of four separate facilities, the Cecil Field Complex (Cecil Field), the Outlying Field ("OLF") Whitehouse, the Yellow Water Weapons Department and the Pinecastle [Pine Castle] Electronic Warfare Target Area / Warfare Range. The official mission of NAS Cecil Field was to provide facilities, services, and material support for the operation and maintenance of naval weapons, aircrafts, and other units of the operating forces. Some of the tasks required to accomplish this mission included operation of fuel storage facilities, provision of facilities and performance of aircraft maintenance, and maintenance and operation of an engine repair facility and test cells for designated turbojet engines.

218 **Naval Air Station Cecil Field**, undated. - 5 pp.
- http://response.restoration.noaa.gov/book_shelf/227_nascecil.pdf



•FL **Eglin AFB**[219] Valparaiso, Okaloosa County AWE 1958 - Air Proving Ground Command, 1944. Strategic Air Command 1958. According to the Eglin Air Force Base History, 'in early 1946, the First Experimental Guided Missiles Group was activated to develop the techniques for missile launching and handling; establish training programs; and monitor the development of a drone or pilotless aircraft capability to support the Atomic Energy Commission tests, Operation Crossroads, at Eniwetok
On December 1, 1957, the Air Force combined the Air Proving Ground Command and the Air Force Armament Center to form the Air Proving Ground Center. The Center built the highly instrumented Eglin Gulf Test Range and, for the next few years, served as a major missile test center for weapons such as the BOMARC, Matador, GAM-72 "Quail," and GAM-77 "Hound Dog."'

219 **The 6555th Missile and Space Launches Through 1970**. / Mark C. Cleary. 45th Space Wing History Office. 1991. - 139 pp. - http://www.afspacemuseum.org/library/histories/6555.pdf

•FL **Gardinier, Inc.**[220] Tampa DOE - 1951-1954; 1956-1961 - Under contract to the AEC, Gardinier (under the name U. S. Phosphoric Products Corporation Of Florida) operated a pilot plant from 1951 to 1954 which recovered uranium from phosphoric acid. From 1956 to 1961, it produced uranium by recovery of U_3O_8 from phosphoric acid. Maximum production was 60 tons of uranium concentrate per year. The uranium was ultimately used in weapons production.

220 Bureau of Mines / **Minerals yearbook metals and minerals (except fuels) 1955**. Year 1955, Volume I (1958) / Crawford, John E. Uranium, pp. 1213-1242

'As a byproduct of phosphatic fertilizer and chemical production, a small tonnage of uranium was recovered from Florida phosphate rock. The processing units were operated by: Blockson Chemical Co., Joliet, Ill.; International Minerals & Chemical Corp., Bartow, Fla.; and Virginia-Carolina Chemical Corp., Nichols, Fla. The U. S. Phosphoric Products Division, Tennessee Corp., was constructing a unit for obtaining uranium as a byproduct from phosphate at East Tampa, Fla.'

•FL **International Minerals and Chemical Corp.** Mulberry AWE - 1951-1961 - International Minerals and Chemical Corp. produced uranium as a byproduct of the recovery of phosphate chemicals and fertilizers. The 1951, AEC contracted with International Minerals and Chemical Corp. for the recovery of uranium, which was ultimately used for the production of weapons. The original production plant was shut down in 1959. Starting in 1954, the uranium recovery unit was located at the Bonnie Plant. In 1955, it switched to the phosphoric acid process. International Minerals and Chemical Corp. became Central Farmers (now C.F.) Industries; in 1969, C.F. Industries became C.F. Chemicals, Bartow Phosphate Works. The phosphoric process was shut down in 1961.

•FL **Pinellas Plant**[221] Clearwater DOE - General Electric (GE) constructed the Pinellas Plant in 1956 for the production of neutron generators for the nation's nuclear weapons program. The Atomic Energy Commission purchased the Pinellas Plant from GE in 1957 and contracted them to manage and operate the site. GE Neutron Devices (GEND) served in this capacity until June 1992, at which time Lockheed Martin Speciahy Components, Inc., (Specialty Components) (formerly Martin Marietta Specialty Components, Inc.) assumed operation of the plant. The major product lines at the plant included the following: neutron generators and detectors, Radioisotopically-powered Thermoelectric Generators (RTGs), specialty capacitors, vacuum switch tubes, electromagnetic devices, thermal batteries, thermal ambient temperature batteries, frequency control devices, quartz digital accelerometers, Lightning Arrestor Connectors (LACS), ceramics, ferroelectric ceramics, foam support pads, and optoelectronics.

221 **Facts and Sources for EEOICPA Pinellas Plant Claimants**, April 2008. Nuclear Workers of Florida. 162 pp.

Former Workers Say Pinellas Nuclear Plant's Radiation, Chemicals Connected To Cancer . Tampa Bay Online. November 01, 2007.

•FL **University of Florida** Gainesville AWE - 1963-1969 - Documents indicate that the University of Florida handled test quantities of radioactive material under a National Lead of Ohio (Fernald) sub-contract between 1963 and 1969. Upon completion of the project, the material was sent to the Savannah River Site. The University also obtained licenses to handle radioactive material from the Nuclear Regulatory Commission.

• FL **Virginia-Carolina Chemical Corp.**[222] Nichols AWE - 1952-1957 - The Virginia-Carolina Chemical Corporation produced uranium as a byproduct of the recovery of phosphate chemicals and fertilizers. The AEC contracted with the Virginia-Carolina Chemical Corp. for the recovery of the uranium, which was ultimately used in weapons production. The research lasted only about 6 months. The laboratory was dismantled, and all equipment was removed prior to sale of the building in 1965 for use as a warehouse.

• FL **W.R. Grace Co.**, **Agricultural Chemical Div.**[223] Ridgewood AWE - 1954 - For one month in 1954, W.R. Grace performed the pilot plant work on solvent extraction for Armour Fertilizer, which used the solvent process to extract uranium from phosphates.

• GA **Georgia Nuclear Aircraft Laboratory**[224], or **AFP No. 67, Air Force Plant**

222 DOE, Office of Nuclear Energy Office of Remedial Action and Waste Technology, Division of Facility and Site: **Decommissioning Projects: Formerly utilized sites remedial action program elimination report for the former Virginia-Carolina Chemical Corporation Richmond, Virginia**, Undated. - 8 pp.
Formerly utilized MED/AEC sites remedial action program : **Radiological survey of the former Virginia-Carolina Chemical Corporation Uranium Recovery Pilot Plant, Nichols, Florida** / prepared for U.S. Department of Energy, Assistant Secretary for Environment, Office of Environmental Compliance and Overview, Division of Environmental Control Technology, by Oak Ridge National Laboratory ; F. F. Haywood ... [et al.], 1980. - 86 pp - http://www.lib.muohio.edu/multifacet/record/mu3ugb2098143

223 EEOICPA BULLETIN NO.07-13, Issue Date: April 10, 2007, Revised Residual Radioactive Contamination Report– Summary of All Sites : **Facilities Identified by NIOSH with the Potential for Significant Residual Contamination Outside Of the Periods in Which Weapons-Related Production Occurred**.

224 **Section I Dawson Forest Wildlife Management Area (2000-2002) (Formerly the Georgia Nuclear**

67 AWE The laboratory was a United States Air Force test facility located in the Dawson Forest in Dawsonville, Georgia. It was the site of Lockheed's lab for investigating the feasibility of nuclear aircraft. The site was used for irradiating military equipment, as well as the forest to determine the effect of nuclear war, and its effects on wildlife. The area was closed in 1971.

•HI **Kauai Test Facility**[225] Kauai DOE - 1975? - The Kauai Test Facility is situated on the north end of the US. Navy Pacific Missile Range Facility on the west side of the island of Kauai, Hawaii. In 1958, the Pacific Missile Range Facility was established to support the growing demand of the Navy at Bonham. In 1964, the Pacific Missile Range Facility and Bonham was transferred to the Navy, becoming the Pacific Missile Range Facility,

Aircraft Laboratory – GNAL). Georgia Environmental Radiation Surveillance Report 2000 – 2002. 10 pp. - http://www.gaepd.org/Files_PDF/gaenviron/radiation/radrpt2002_dfw.pdf

Dawsonville Georgia Nuclear Aircraft Laboratory 1959 - http://www.youtube.com/watch?v=Bn6N2iV2_os

225 **Pacific Missile Range Facility Intercept Test Support. Environmental Assessment**, 2010. - 312 pp. - http://www.mda.mil/global/documents/pdf/env_pmrf_ITS_EA_OEA_part1.pdf

Barking Sands. A ballistic missile launch from Barking Sands In 1962, the U.S. military conducted the Frigate Bird Test of the Operation Dominic program near PMRF. The military launched an operational ballistic missile with a live warhead from the USS Ethan Allen (SSBN-608), which was situated near PMRF. The nuclear warhead flew toward Christmas Island and detonated in an air burst at 11,000 feet (3,400 m).

The Kauai Test Facility has 25 major buildings. Kauai Test Facility is equipped with resources for assembling, testing, launching, tracking, and recovering instrumented rockets, rocket payloads, and aircraft payloads. The Facility also provides capabilities for receiving, recording, and "quicklook playback" of radio telemetered test data. Additionally, resources are available for optical tracking and photometric coverage of test objects and experiments. The Kauai Test Facility has been in Operation since the mid-1970s, conducting an average of three to four weapon system delivery tests per year. The Department of Energy (DOE) suspected that these tests resulted in contamination of three release sites including the rocket launch pads, a drum storage area, and a photography laboratory.

•IA **Ames Laboratory**[226] Ames DOE- 1942-. - Ames Laboratory is located on the Iowa State University Campus in Ames, Iowa. During the Manhattan Project, researchers at Iowa State perfected a magnesium reduction process, producing pure uranium metal that quickly became the industry standard. Iowa State was one of the first organizations to supply metallic uranium used as fuel for the first self-sustaining chain reaction at the University of Chicago. On May 12, 1943 a fire occurred at the WPA storage

226 National Institute for Occupational Safety and Health: **Site Profile for Ames Laboratory** / Jerome B. Martin, Dillard B. Shipler, Donald E. Bihl, Eva E. Hickey, and Bruce A. Napier, 2011.- 87 pp. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/ames-r2.pdf

shed. The fire burned 32 cans of uranium turnings and sawings. Uranium oxides were also lost in the fire. In 1947, the AEC formally established the Ames Laboratory and directed it to focus on materials research. The Ames Laboratory Neutron Scattering group (ALNS) is part of the Ames Laboratory Condensed Matter Physics group (CMP). The ALNS group works in collaboration with the Oak Ridge National Laboratory's High Flux Isotope Reactor (HFIR) and Center for Neutron Scattering (CNS). Over the years the laboratory broadened its mission to include fundamental research in the physical, chemical, mathematical, engineering, and environmental sciences as well. In 2005, DOE contracted with The University of Iowa College of Public Health to coordinate FWP medical screenings for Ames Laboratory former workers at Iowa State University in Ames, Iowa.

•IA **Bendix Aviation**[227] Davenport AWE - 1960 - On three separate occasions, National Lead of Ohio (Fernald) personnel conducted tests to see how well a Bendix sonic energy cleaning system could clean uranium-contaminated 55 gallon drums.[228]

•IA **Iowa Ordnance Plant** or Burlington Atomic Energy Commission Plant Burling-

227 DOE Letter; Wagoner to Gibbs; **Elimination of the Former Bendix Aviation Corporation Site from Further FUSRAP Consideration**; February 14, 1995. - 2 pp.
- http://www.lm.doe.gov/Considered_Sites/B/Bendix_Aviation_Corp_Pioneer_Div_-_IA_05/IA_05-5.pdf

228 Bendix Aviation founded the company in 1951 in Davenport, Iowa, USA,and sold the facility to Litton Industries in 1982. Northrop Grumman Corporation acquired Litton Industries in 2001 and then in August 2003, divested the Life Support division, based in Davenport, IA, to Cobham plc, Dorset, United Kingdom.
DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; August 29, 1994. - 3 pp.
- http://www.lm.doe.gov/Considered_Sites/Gleason_Works_-_NY_55/

ton DOE - 1949[229]-1974 - The Iowa Ordnance Plant (IOP), also known as the Iowa Army Ammunition Plant (IAAP), is a load, assemble, and pack munitions facility that began production in 1941 and continues to operate as a Government-owned, contractor-operated installation[230]. Between 1947 and 1974, a portion of the IAAP was operated under contract to the Atomic Energy Commission (AEC) for the purpose of supplying the AEC with explosive components for nuclear weapons. 'In 1947, Silas Mason Company entered into a contract with the Ordnance Department to assist in the design and engineering to construct and operate a facility for the purpose of supplying the Atomic Energy Commission (AEC, predecessor to the present day Department of Energy) with explosive components for nuclear weapons[231]. Under contract with the AEC, Silas Mason Company conducted high explosive fabrication, assembly of non-nuclear and nuclear components, retrofits, modifications, surveillance, and disassembly of nuclear weapons. This work was performed adjacent to other areas at the IAAP dedicated to the production and manufacture of routine military munitions. The qualifying "DOE facility" portion of the IAAP extends to those locations of the plant where Silas Mason Company (aka Mason & Hanger – Silas Mason, Co. Inc.) performed operations for the AEC.' The area of the IOP that performed work for the AEC includes the buildings and property/grounds of the IAAP that is identified as Line 1, as well as Yards C, G and L and the Firing Site Area, Burning Field "B" and the storage sites for pits and weapons, including Buildings 73 and 77. Work performed in these areas is covered under the Energy Employees Occupational Illness Compensation Program Act[232]. In 1974, the AEC closed out its activities at the plant and transferred all functions to the Pantex Plant. Contractor: Mason & Hanger-Silas Mason Company (1947-1974). In 1993, off-post contamination of private drinking water wells with explosives was confirmed.[233] According to Wikipedia, In the late 1990s, reporters Dennis J. Carroll and Mike Augspurger wrote a series of stories about health problems experienced by former workers of the Iowa Army Ammunition Plant and its predecessor, the Iowa Ordnance Plant, and their families. The stories helped raise awareness of formerly secret work at the munitions plant carried out by the Atomic Energy Commission. That resulted in the creation of the Burlington Atomic Energy Commission Plant-Former Worker Program

•IA **Titus Metals**[234] Waterloo AWE - 1956 - Titus Metals performed the extrusion of uranium oxide billets into fuel plates for the Argonaut reactor at Argonne National Laboratory on June 29, 1956.

229 **This Circular replaces Circular No. 07-01**, Department of Energy (DOE) facility description of Line 1 (Division B) at the Iowa Ordnance Plant, with one correction. The SEC period of 1947 through 1974 referenced in Circular 07-01 is incorrect. The correct SEC period is March 1949 through 1974.EEOICPA Circular NO. 07-03, May 22, 2007

230 **Explosion damage at the Iowa Ordnance Plant, Burlington, Iowa 04 March 1942.**

231The US. Army Materiel Command: **The Metal Book**. 2007. - 39 pp.

232**Cumulative EEOICPA Compensation Paid -Iowa Ordnance Plant**, 2011. - 1 p.

Centers for Disease Control and Prevention: **Iowa Ordnance Plant**. Federal Register / Vol. 69, No. 205 / Monday, October 25, 2004 / Notices.

SEC Petition Evaluation Report, 2005. - 10 pp.

233Team Iowa: **Iowa Army Ammo Plant - Installation Action Plan**, 2001.- 80 pp.

234 DOE: Memorandum/Checklist; Wallo to the File; Subject: **Elimination of Titus Metals**; November 24, 1987. 3 pp. - http://www.lm.doe.gov/Considered_Sites/T/Titus_Metals_-_IA_04/IA_04-2.pdf

•ID **Argonne National Laboratory** West Scoville DOE - 1946-. - Argonne is one of the US. DOE's largest research centers. It is also the nation's first national laboratory, chartered in 1946. The Laboratory specializes in reactor engineering, reactor physics, chemistry and metallurgy. Early reactor research focused on the production of plutonium from uranium. Argonne is a direct descendant of the University of Chicago's Metallurgical Laboratory, part of the World War II Manhattan Project. Argonne National Laboratories - West was a part of Argonne National Laboratory, operated by the University of Chicago. ANLW was located on the southeastern portion of the Idaho National Engineering and Environmental Laboratory. On February 1, 2005 the Idaho National Engineering and Environmental Laboratory and Argonne National Laboratory - West became the Idaho National Laboraotry (INL).

Nuclear technology lab and test location, and a major radioactive material storage/disposal site. Located on 573,608 acres in southern Idaho, facilities include 52 nuclear reactors, 13 of which are still operable. The Navy's nuclear-powered submarine reactors are disposed of in a pit at INEL, as are radioactive wastes from other government sources. At the Test Area North, uranium-hardened armor for Abrams tanks is manufactured. Non-nuclear defense and energy-related R&D is performed at labs on the site as well, and INEL is a major contributor of waste management technologies. The only two nuclear-powered jet aircraft engines ever made were developed and built at INEL in the late 1950's, and remain on their outdoor test tracks today. The installation, owned by the Department of Energy, employs 7,500 people and is operated by Lockheed Martin. Source: CLUI Land Use Database.

•ID **Idaho National Engineering Laboratory**[235] Scoville DOE - 1949-. - In 1949, the Atomic Energy Commission established the National Reactor Testing Station on the site of a 1940s US Navy bombing and artillery range. Today, this site is known as the Idaho National Laboratory (INL). This was the primary nuclear reactor development laboratory in the United States. Over 100 reactor concepts were conceived and tested here. Between 1953 and 1992, the Idaho Chemical Processing Plant (ICPP) at INL reprocessed spent nuclear fuel from naval propulsion, test, and research reactors to recover enriched uranium for reuse in nuclear weapons production. Other facilities at INL also conducted various nuclear weapons research and development activities. On February 1, 2005 the Idaho National Engineering and Environmental Laboratory and Argonne National Laboratory-West became the Idaho

235 **Citizens Guide to the United States Department of Energy's Idaho National Laboratory**. Fourteenth Edition / Compiled for the Environmental Defense Institute by Chuck Broscious. Environmental Defense Institute, Inc. 2006. - 300 pp.

Heavy Element Radionuclides (Pu, Np, U) and 137 Cs in Soils Collected From the Idaho National Engineering and Environmental Laboratory and Other Sites in Idaho, Montana, and Wyoming / T.M. Beasley, J.M. Kelley, L.A. Bond, Wm. Rivera, Jr., M.J. Liszewski, K.A. Orlandini. Environmental Measurements Laboratory, US. Department of Energy. 1998. - 80 pp.

National Laboratory. The INL mission is to continue as a National Laboratory, developing and demonstrating compelling national security technologies, and delivering excellence in science and technology. Also at this time, the Idaho Completion Project (ICP) was formed to remediate the site, including the disposition of reactor and non-reactor nuclear facilities.

•ID **Morrison Knudsen Corporation**[236] Boise, AWE/DOE - During World War II, M-K built airfields, storage depots, and ships, and it later expanded into foreign construction. It built the locks on the St. Lawrence Seaway, the DEW system, Minuteman missile silos, NASA's Kennedy Space Center, and over 100 major dams. In addition to extensive building contracts in Vietnam, the company procured a substantial amount of business outside of active battle zones. The Distant Early Warning (DEW) Line, a chain of bases and radar installations, was constructed and maintained across northern Canada, as was the "White Alice" communications system in Alaska. In the 1960s MK became a leading builder of missile facilities, including the first U.S. underground Titan missile installation at the Lowry Air Force Base in Colorado. The company sponsored a joint venture for the Aeropropulsion Systems Test Facility, an advanced jet engine center for the U.S. Air Force, which was completed in 1984. The company also was involved in the reconstruction of Kuwait following the 1991 Gulf War. In 1996, the Washington Group acquired Morrison-Knudsen Co. of Boise.

•ID **Northwest Machining and Manufacturing** Meridian BE – 1996-2000

- Northwest Machining provided machine shop services to Sandia National Laboratory, California.

•IL **Allied Chemical Corp.** or **General Chemical Division**[237] Metropolis DOE - 1959-1976 - After World War II, many companies working for the United States Government produced UF_6 feed for uranium enrichment and diffusion plants. The Allied Plant in Metropolis, Illinois, was completed and initial deliveries began sometime in 1959. In 1962, several feed plants were shut down and the privately-owned Allied Chemical Company Plant took over the conversion of U_3O_8 to UF_6. This plant produced approximately five thousand tons of uranium hexafluoride feed for the Paducah Gaseous Diffusion Plant per year. It was shut down in 1964.

•IL **American Machine and Metals, Inc.**[238] East Moline DOE - 1960 - American Machine and Metals demonstrated a process for National Lead of Ohio (Fernald) that

236 **100 Companies and Their Subsidiary Corporations Listed According to Net Value of Military Prime Contract Awards Fiscal Year 1963 (July 1962 - June 1963)**. Undated. - 15 pp.
- http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA954761

237 **Site Profile for Allied Chemical Corporation Plant** / Shelby L. Gubin, Robert Hysong, Cindy W. Bloom, and Joseph pp. Guido. National Institute for Occupational Safety and Health, 2007. - 34 pp.
- http://www.cdc.gov/niosh/ocas/pdfs/tbd/allied-r1.pdf

Advisory board on Radiation and Worker Health. National Institute for Occupational Safety and Health: **Draft Review of the NIOSH Site profile for Allied Chemical Corporation Plant, Metropolis, Illinois** / Prepared by Gregory Hofer and Robert Anigstein. pp. Cohen & Associates. September 2011. - 28 pp

238 DOE: Letter; Wagoner to Emmendorf; Elimination of the American Machine and Metals, Inc. Site from Further FUSRAP Consideration; December 15, 1994. - 1 p.

'DOE's has studied the historical records of the American Machine and Metals, Inc. site and we have concluded that further investigations of the site are not necessary because of the limited scope of the activities performed there.'

DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; August 29, 1994. - 3 pp.
- http://www.lm.doe.gov/Considered_Sites/Gleason_Works_-_NY_55/

involved dehydration of green salt using a centrifuge process.

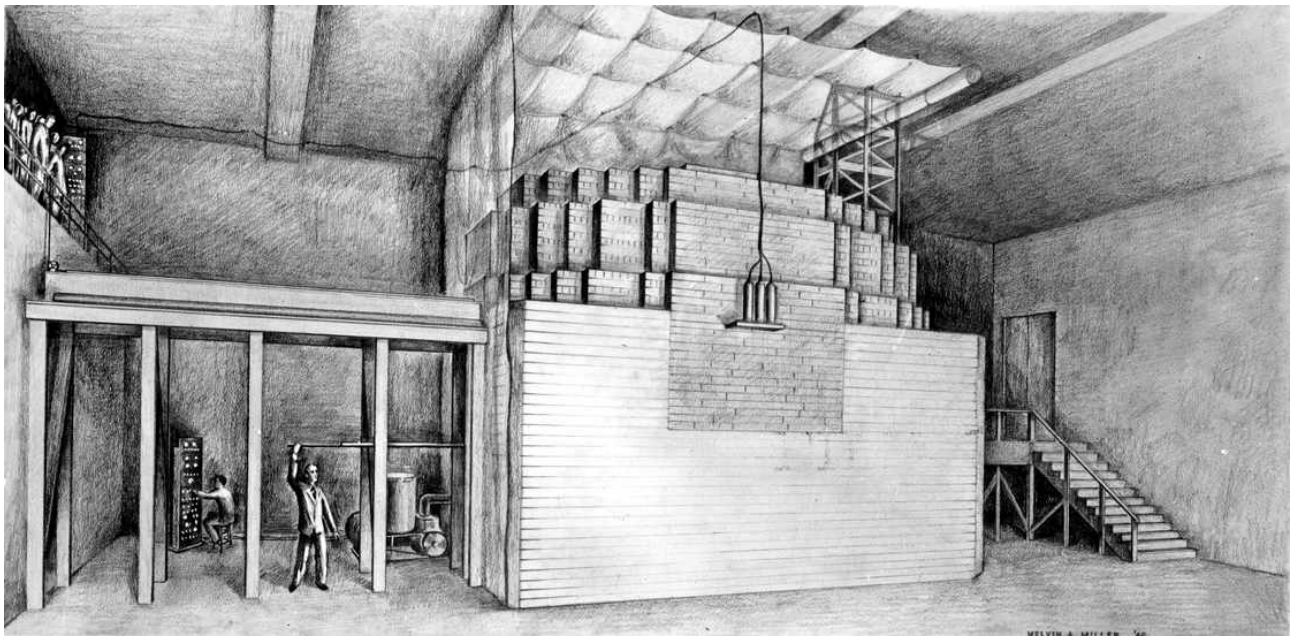
•IL **Argonne National Laboratory**[239] East Argonne AWE/DOE – 1942-. Including The Decontamination and Decommissioning Science Consortium[240].

Reactors[241]:

239 **Argonne National Laboratory – East – Site Description** / ORAU TEAM Dose Reconstruction Project for NIOSH, 2006. - 34 pp. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/anle2a.pdf

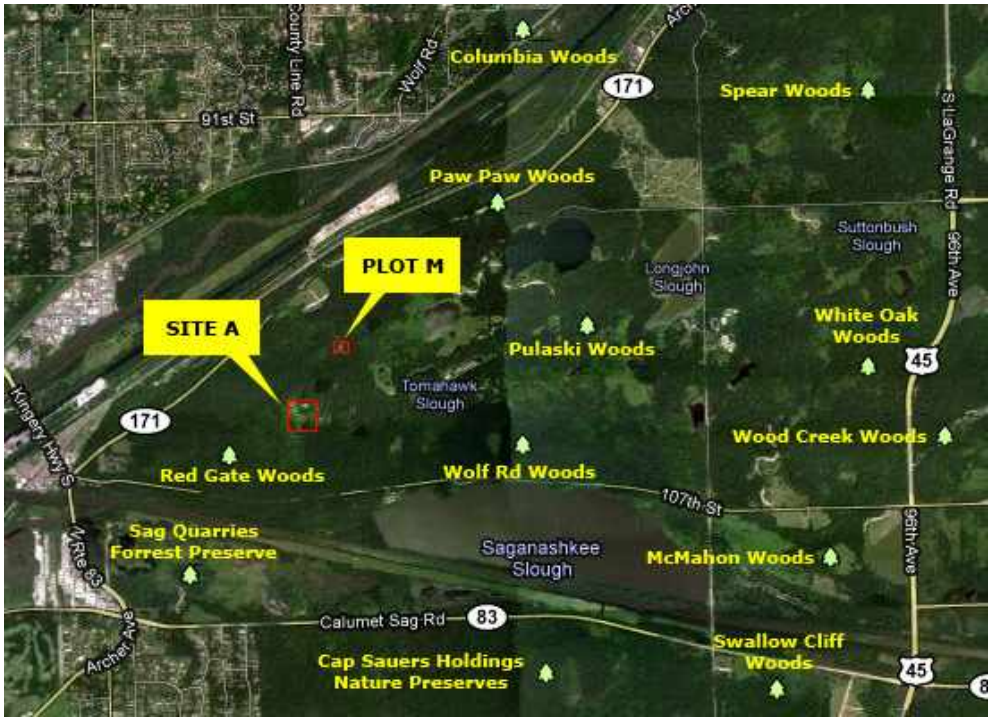
240 The Decontamination and Decommissioning Science Consortium: **April 2009 Status**. - http://www.dd.anl.gov/pdf/DDSC.pdf

241 DOE: **The First Reactor**, 1982. - 52 pp. - http://www.nuclear.energy.gov/pdfFiles/DE00782931.pdf



On December 2, 1942 using a nuclear reactor erected under a section of the West Stands of the University of Chicago's Stagg Field, a group of scientists achieved the first self-sustaining chain reaction and thereby initiated a controlled release of nuclear energy. The reactor consisted of uranium and uranium oxide lumps spaced in a cubic lattice embedded in graphite. In 1943, the reactor was dismantled and reassembled at the Argonne National Laboratory. Photographic copy of drawing

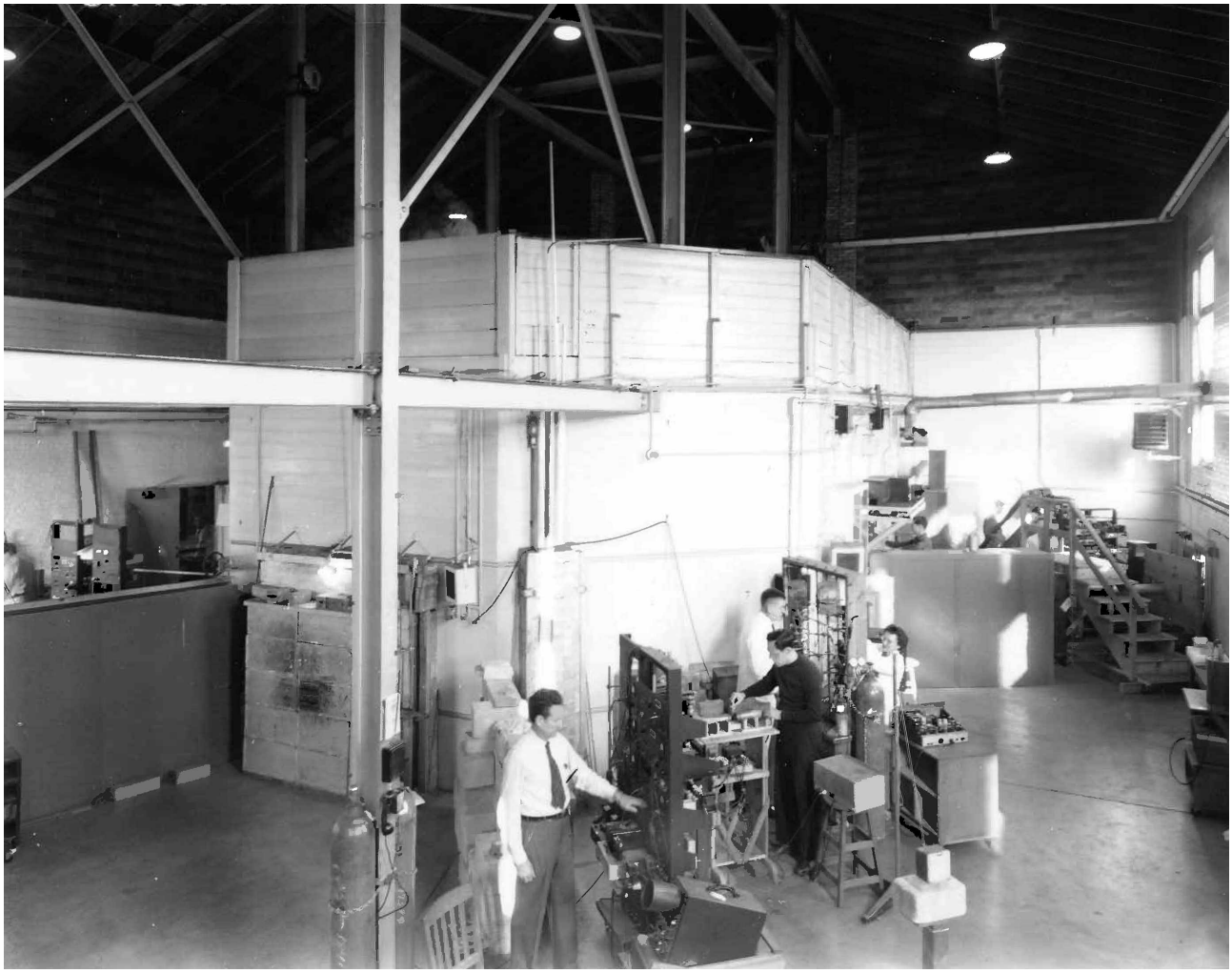
Chicago Pile 1, Early in 1943, CP-1 was dismantled and moved to a less-populated site in the "Argonne Forest" section of the Cook County Forest Preserve in Palos Park. The pile contained 771,000 pounds of graphite, 80,590 pounds of uranium oxide and 12,400 pounds of uranium metal when it went "critical." It cost about $1 million to produce and build. The pile took the form of a flattened ellipsoid which measured 25 feet wide and 20 feet high.



Chicago Pile 2[242] or Site A/Plot M[243] 1943-1954.

In early 1943, Chicago Pile 1 was dismantled at the University of Chicago, moved to the Argonne Forest section of the Palos Hills Forest Preserve, and renamed Chicago Pile 2.

242 DOE: **Site A/Plot M Fact Sheet**. Undated. - 3 pp.
Chicago Pile 2 Burial - http://www.youtube.com/watch?v=BIzfubnDlMc
243 DOE: **2011 Inspection and Annual Site Status Report for the Site A/Plot M, Cook County, Illinois. Decontamination and Decommissioning Program Site**. 2011. - 17 pp.
- http://www.lm.doe.gov/SiteA_PlotM/sam_insp11.pdf



Chicago Pile 3, 1943-1954 - The first heavy water moderated reactor placed at Site A/Plot M.

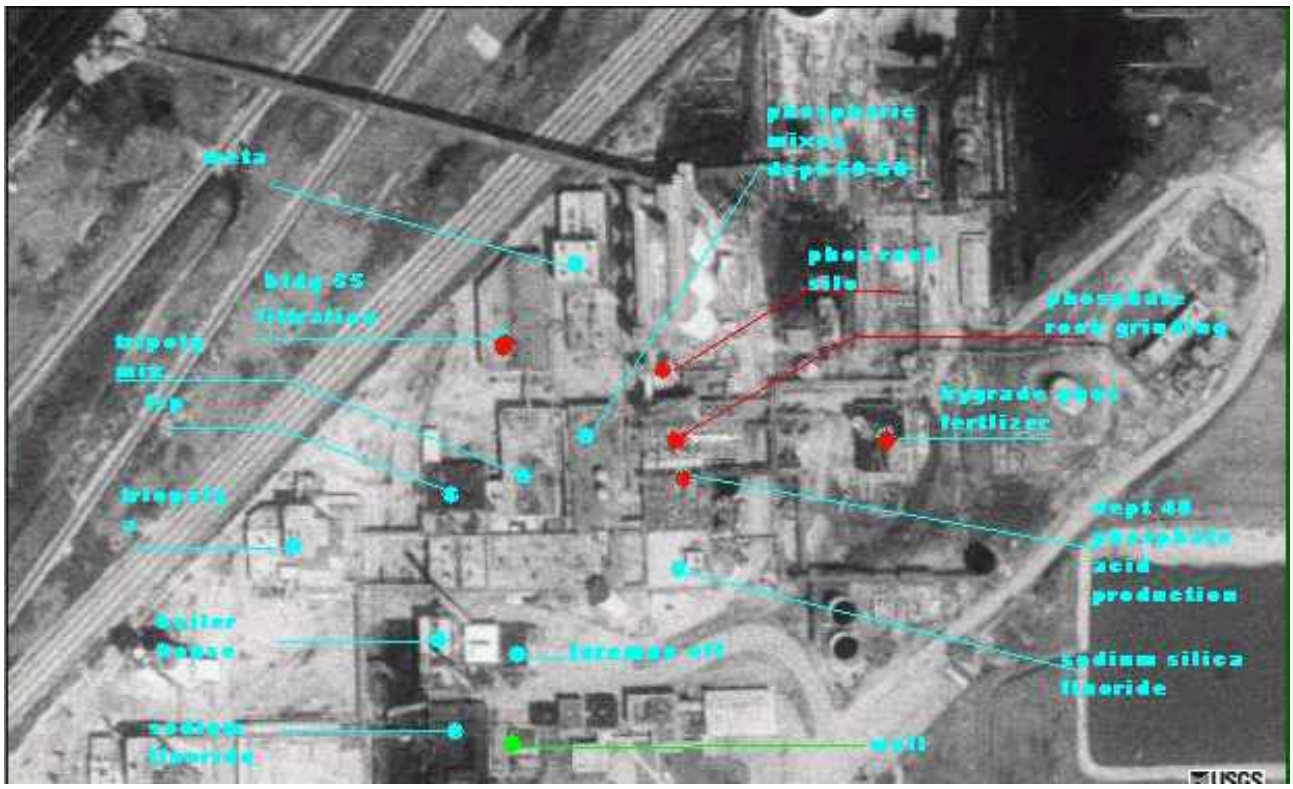
Argonne history: Chicago Pile-3 Demolition November 7, 1955

Chicago Pile 4 or the Experimental Breeder Reactor I (EBR-1, 1951-1964. On December 20, 1951, the EBR-I produced the first usable amounts of electricity created by nuclear means; in July 1963, it was the first reactor to achieve a self-sustaining chain reaction using plutonium instead of uranium as the major component in the fuel. In

addition, the EBR-I was the first reactor to demonstrate the feasibility of using liquid metal at high temperatures as a reactor coolant.
Chicago Pile 5, 1954-1979.

•IL **Armour Research Foundation, Illinois Institute of Technology**[244] Chicago AWE - 1957 - Records indicate that Armour Research Foundation may have tested radioactive materials for National Lead Company of Ohio (Fernald).

244 Aerospace Memorandum; A.Wallow to File; Subject: **Elimination of ARF with an Elimination Summary enclosure**; March 19, 1985. - 11 pp.
- http://www.lm.doe.gov/Considered_Sites/Armour_Research_Foundation_-_IL_17/IL_17-3.pdf



•IL **Blockson Chemical Co.**[245] Joliet[246] AWE - 1951 - 1960 - Blockson Chemical Company operated a plant which produced uranium from phosphoric acid. The AEC contracted with Blockson for the recovery of the uranium, which was ultimately used in weapons production.

245 **Former chemical workers tell of radiation exposure**: U.S. hearings focus on ex-Joliet plant. / Dennis Sullivan. Chicago Tribune. January 26, 2007

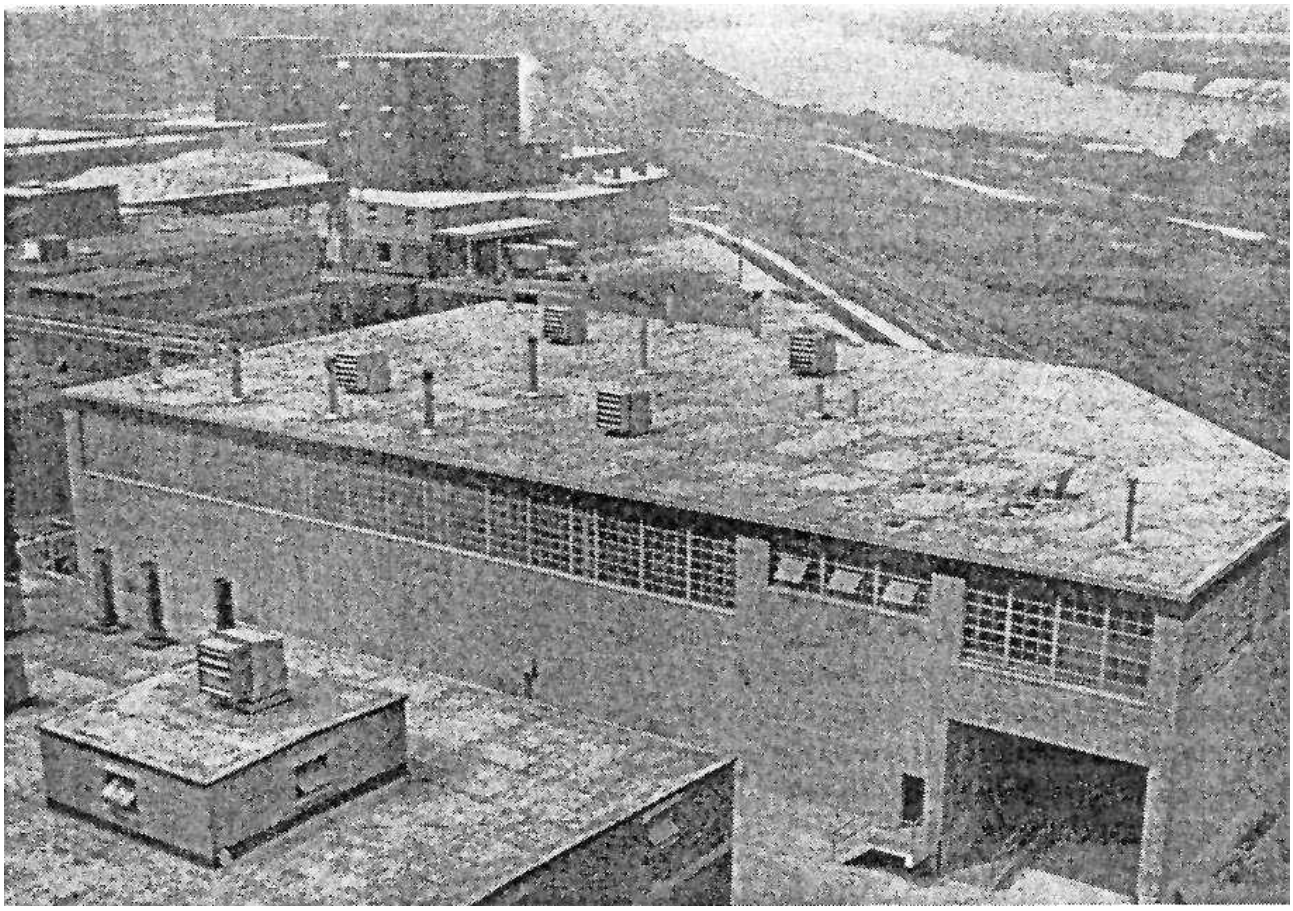
Former Joliet chemical workers still waiting to be paid after exposure to high levels of radiation: Fund created a decade ago to compensate Blockson Chemical employees, survivors / Gerry Smith. Chicargo Tribune, August 02, 2010.

'Among them is Phyllis Keca, 84, whose husband, John, thought he was manufacturing laundry detergents during his 23 years working at Blockson. He wore only a paper mask while handling tanks that, unknown to him, were filled with uranium and radium to be used in the production of nuclear weapons. He was "always sick," his wife said, and would come home covered in dust that she now believes was toxic and contributed to his death in 1996 from colon cancer at age 80.'

DOE: **Radiological Survey of Chemicals Group, Olin Corporation (Formerly Blockson Chemical Company)** Joliet, Illinois. 1978. - 109 pp.
- http://www.lm.doe.gov/Considered_Sites/B/Blockson_Chemical_Co_-_IL_07/IL_07-2.pdf

National Institute for Occupational Safety and Health: **Technical Basis Document for Atomic Energy Operations at Blockson Chemical Company**, Joliet, Illinois. / Tom Tomes, Sam Glover. 2010. 47 pp.
- http://www.cdc.gov/niosh/ocas/pdfs/tbd/bcc-r3.pdf

246 See also the Joliet Army Ammunition Plant - http://www.epa.gov/region5/cleanup/jolietarmy/index.html



The AEC Uranium production work performed by Blockson was conducted in a one-story brick structure known as Building 55. This listing is also intended to cover the AEC-funded laboratory, pilot plant and oxidation process, which also occurred at Blockson, and was related to the work in Building 55.

•IL **C-B Tool Products Co.** Chicago AWE - 1944 - For a six month period in 1944, C-B Tool Products Company had a subcontract with the University of Chicago to provide personnel, facilities, and equipment to produce special machining of parts for special equipment, tools, jigs, and fixtures to the Met Lab from materials provided by the University of Chicago. It is unclear whether the company handled radioactive materials

•IL **Crane Co.** Chicago AWE - 1947-1949 - Crane Co. supplied the Atomic Energy Commission with uranium and thorium in the 1940s (and perhaps in the 1950s) and likely used materials containing uranium in manufacturing and conducted valve development studies for for the AEC and General Electric at Hanford. At the completion of one project in 1949, 1000 pounds of contaminated wastes, including 346 grams of uranium, were shipped from Crane to Oak Ridge. In 1949, Crane also shipped 265 kg of normal uranium to Hanford.

•IL **Dow Chemical Co.**[247] Madison AWE - 1957-1960 - The Dow facility in Madison, Illinois, supplied the AEC with Magnesium-thorium sheets and plates, non radioactive

247 DOE: **Long-Term Surveillance and Maintenance Requirements for Remediated FUSRAP Sites**. 2011. - 146 pp. - http://www.lm.doe.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=7978&libID=8084
DOE: **Madison Site Administrative Record**. 2000. - 2 pp.
National Institute for Occupational Safety and Health: **Site Profiles for Atomic Weapons Employers that Worked Uranium Metals**. / David Allen. 2011. - 55 pp.
- http://www.cdc.gov/niosh/ocas/pdfs/tbd/bat-6000-r1.pdf

equipment, metal products and other services. Dow received a purchase order from Mallinckrodt in March 1960, for research and development on the extrusion of uranium metal and rod. The Department of Energy also has invoices from 1957 and 1958 indicating that the Mallinckrodt Chemical Company Uranium division purchased magnesium-thorium plates and sheets from the Dow Chemical Company in Madison Illinois. Dow sold this facility in 1969 to Consolidated Aluminum, which continued to operate the facility from 1969 through 1986.

•IL **ERA Tool and Engineering Co.**[248] Chicago AWE - 1944 - From February 1944 through June 1944, ERA Tool and Engineering Company contracted with the University of Chicago to supply services and supplies to the Met Lab, specifically to provide necessary personnel, facilities, and equipment required to produce special machining of parts for special equipment, tools, jigs, fixtures, etc. from materials furnished by the University.

•IL **Fansteel Metallurgical Corp.**[249] North Chicago BE - 1944; 1950 - Fansteel Metallurgical Corp. performed beryllium work for the Manhattan Engineer District under Contract No. W-7425 eng-27 for the fabrication of beryllium into sintered shapes and for the manufacture of 600 bricks for delivery to Los Alamos. Fansteel also worked with "approximately 150 pounds of nominal grade beryllium carbide powder" for use in the Nuclear Energy for the Propulsion of Aircraft (NEPA) project. This work is reported to have occurred between April and June of 1950.

248 DOE Letter; Fiore to Esposito; **Transmittal Letter of the Final Survey Report for the Former ERA Tool and Engineering Company**; October 20, 1989. - 1 p.

'The survey report documents the fact that the radiological condition of your facility is in compliance with applicable Department of Energy Guidelines and that no remedial action or further investigaticns are necessary.'

DOE: **Survey Report; Radiological Survey at 4555 West Addison Street; Chicago, Illinois**; M.R. Landis, October 1989. - 38 pp.

- http://www.lm.doe.gov/Considered_Sites/E/Era_Tool_and_Engineering_Co_-_IL_29/IL_29-2.pdf

249 **The Bomb's Chicago Fallout** : US. Says '40s Research Put Thousands at High Risk

By Sam Roe and Jeremy Manier, Chicago Tribune, February 2, 2001

Herbert Anderson was a major figure in the race for the atomic bomb, a pioneering physicist who made history at the University of Chicago in 1942 when he helped create the world's first controlled nuclear chain reaction. But Anderson paid a heavy price for such achievements.

He contracted a rare lung disease from handling beryllium, an extraordinarily toxic metal critical to nuclear weapons production. Before he died, his lungs were so damaged he couldn't breathe without an oxygen tank, and his bones were so brittle he once broke two fingers just by shaking someone's hand.

•IL **Fermi National Accelerator Laboratory**[250] Batavia DOE - 1972-. - Fermi National Accelerator Laboratory, named after Enrico Fermi, was established in 1972 as a research and development facility. Fermi has one of the most powerful particle accelerators in the world and is used to conduct a variety of high-energy physics programs. On November 1, 2006, the DOE announced that the Fermi Research Alliance, LLC (FRA) will manage[251] Fermilab for five years starting January 1, 2007. The FRA is a partnership between URA and the University of Chicago. Based on its performance, the FRA may be entitled to renew this contract without competition for up to 20 years.

250 **The Boundaries of the New Frontier: Rhetoric and Communication at Fermi National Accelerator Laboratory** / Joanna S. Ploeger. Studies in Rhetoric/Communication • Thomas W. Benson, series editor. April 2009. - 200 pp.- http://www.sc.edu/uscpress/books/2009/3808.pdf

251 '(c) The term "Restricted Data" as used in this article means all data concerning the design, manufacture, or utilization of atomic weapons, the production of special nuclear material or the use of special nuclear material in the production of energy, but shall not include data declassified or removed from the Restricted Data category pursuant to section 142 of the Atomic Energy Act of 1954, as amended.'

•IL **Granite City Steel**[252] Granite City AWE/DOE - 1953-1966 - From 1953 through 1966, General Steel Castings / Industries performed quality control work for the AEC. Specifically, it x-rayed uranium ingots and betatron slices to detect metallurgical flaws for Mallinckrodt Chemical Company. This work was performed in a facility located at 1417 State Street, which was part of what was later known as the "South Plant" of Granite City Steel. This listing is intended to cover only the South Plant, identified by the State Street address, and not any other facility that may have been owned by Granite City Steel prior to or after its purchase of the General Steel Industries facility in the early 1970s. For example, this listing does not cover Granite City Steel facilities on Madison or 20th Street.

•IL **Great Lakes Carbon Corp.** Chicago AWE - 1952-1958 - In 1952, the Great Lakes Carbon Corp. studied graphite for the Atomic Energy Commission and in 1958 it did some Transient Reactor Test Facility (TREAT) fuel work for Argonne National Laboratory (ANL). As part of the contract, ANL agreed to decontaminate the facility used. It handled radioactive uranium and radioactive thorium under AEC contract.

•IL **GSA 39th Street Warehouse**[253] Chicago AWE - 1942-1949 - The 39th Street Warehouse was occupied by the Metallurgical Laboratory and Argonne National Laboratory until approximately 1949. Activities in the building included the storage of radioactive materials.

•IL **International Register** Chicago AWE - 1943 - International Register was involved in the development of uranium machining techniques for the Metallurgical Lab and the Manhattan Project.

•IL **Kaiser Aluminum Corp.** Dalton AWE - 1959 - In March 1959, Kaiser performed the extrusion of three CP-5 type fuel elements containing normal uranium oxide for Argonne National Laboratory.

•IL **Lindsay Light and Chemical Co.**[254] or Kerr-McGee Chicago AWE - 1942-1953 - Lindsay Light and Chemical was a commercial processor of monazite sands, which

252 DOE: **Long-Term Surveillance and Maintenance Requirements for Remediated FUSRAP Sites**. 2011. - 146 pp. - http://www.lm.doe.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=7978&libID=8084
National Institute for Occupational Safety and Health: **Site Profiles for Atomic Weapons Employers that Worked Uranium and Thorium Metals - Appendix BB General Steel Industries**, 2007.
- http://www.cdc.gov/niosh/ocas/pdfs/tbd/b-6000-apbb-r0.pdf

253 'A radiological survey indicated that the radiation levels are equal to natural background. Therefore, no remedial action is required, and DOE is eliminating the former GSA 39th Street Warehouse from further consideration under FUSRAP'.
DOE: **Radiological Survey of the Former GSA 39th Street Warehouse 1716 Pershing Road, Chicago, Illinois**. January 1979. - 35 pp.
- http://www.lm.doe.gov/Considered_Sites/G/GSA_39th_Street_Warehouse_-_IL_02/IL_02-1.pdf

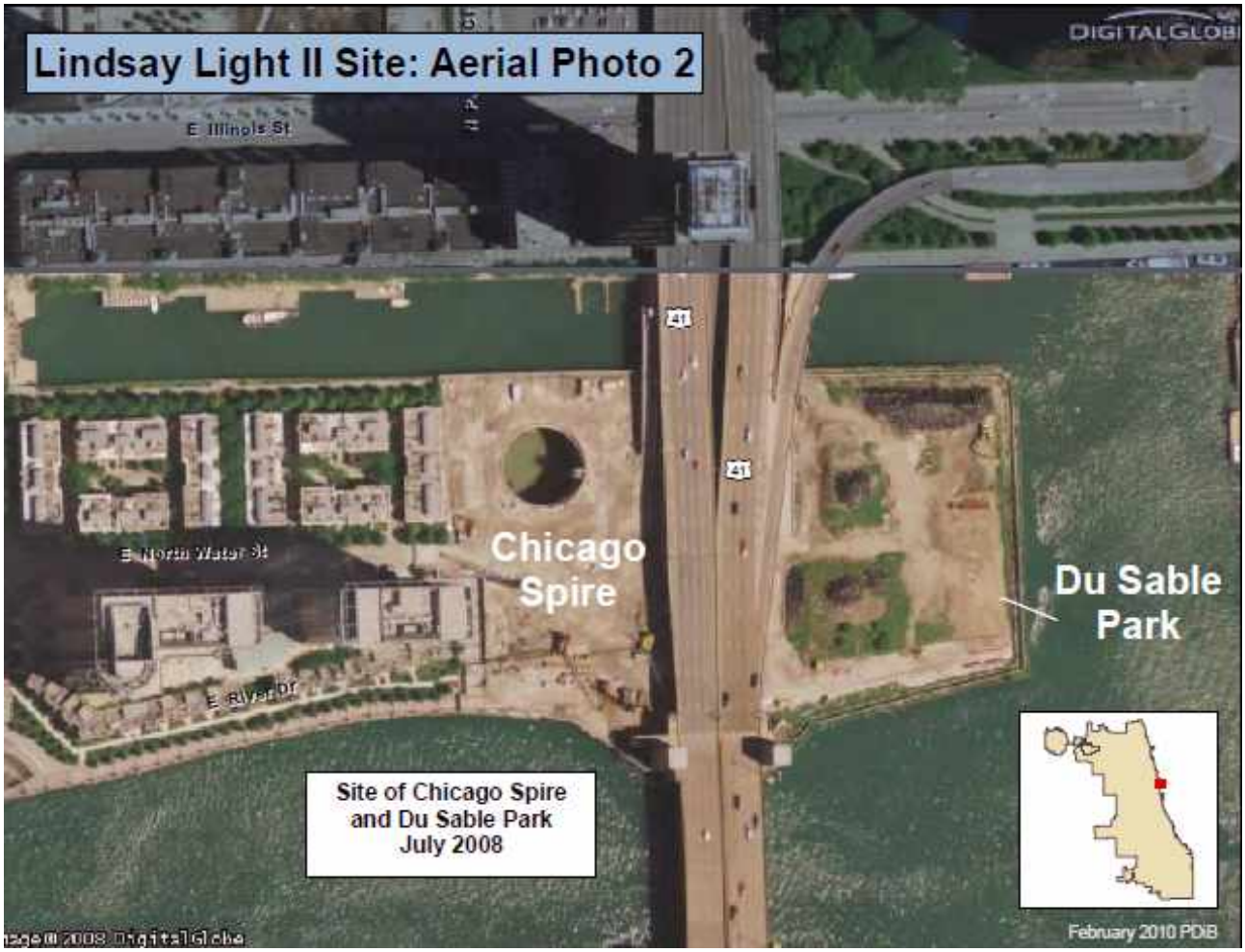
254See also: Lindsay Manufacturing Company, Platte County, Nebraska.

yield several commercially valuable products, including the radioactive metal thorium.[255] The Manhattan Engineer District and later the Atomic Energy Commission purchased thorium from Lindsay. According to the the Lehman Brothers Collection Contemporary Business Archives, Lindsay Chemical merged into American Potash & Chemical Company in 1958.

Kerr-McGee Chemical Corporation bought the merged company in 1967. [256]

255 DOE: Argonne NL Report to the NRC. / Frigerio, Larson and Stowe; Subject: **Thorium Residuals in West Chicago, Illinois**; September 1978. - 32 pp.
- http://www.lm.doe.gov/Considered_Sites/L/Lindsay_Light_and_Chemical_Co_-_IL_10/IL_10-2.pdf

256 U.S. Environmental Protection Agency: Update to the 1994 Community Involvement Plan for Residential Areas and Kress Creek/West Branch DuPage River. Kerr-McGee Superfund Sites Cities of West Chicago and Warrenville, DuPage County, Illinois. February 2009. - 27 pp.
- http://www.epa.gov/region5/cleanup/kerrmcgee/pdfs/kerrmcgee_ci_200902.pdf



The West Chicago factory was closed in 1973, and elevated radioactivity was found in the vicinity in 1978. The area was declared a Superfund hazardous waste site in 1989, and some of it has been converted to parkland, despite its radioactivity.

•IL **Madison Site** (Speculite) Madison AWE/DOE

•IL **Metallurgical Laboratory** Chicago - BE 1942-1946; AWE:1942-1946 - The University of Chicago's Metallurgical Laboratory (Met Lab) was involved in early uranium metallurgical work as part of the Manhattan Project. The first self-sustaining nuclear chain reaction was achieved at the university in a "pile" called the Chicago Pile 1, built by Enrico Fermi and his Met Lab colleagues. The Met Lab is the direct predecessor of Argonne National Laboratory into which all Met Lab functions were transferred in 1946.

•IL **Midwest Manufacturing Co.** later **Maytag Co.** Galesburg East Galesbury AWE - 1944 - A November 7, 1944, document indicates that Midwest Manufacturing worked on the "self-lubricating draw die" which was related to metal fabrication for the Manhattan Project.

•IL **Museum of Science and Industry** Chicago AWE - 1946-1953 - Portions of the East Pavilion of the Museum of Science and Industry were used by employees of the Metallurgical Laboratory and the Argonne National Laboratory.


Payne Dr
E 52ND St
E 52ND St
S Cottage Grove Ave
Chicago North Site
E 53RD St
E 53RD St
S Drexel Ave
Maryland Ave
E 54TH St
0
150
300 FEET


GENERAL RICHARD L. JONES

•IL **National Guard Armory**[257] Chicago AWE/DOE - 1942-1951 - In the 1940s, the Manhattan Project leased the National Guard Armory from the State of Illinois for uranium processing and radioactive material storage, l, resulting in uranium metal and dry uranium oxide contamination. Metallurgical operations were conducted by the University of Chicago, an MED contractor. In 1951, the site was returned to the State of Illinois.
•IL **Podbeliniac Corp.**[258] Chicago AWE - 1957 - In 1957, National Lead Company of Ohio (Fernald) used equipment at the Podbeliniac Corp. to conduct an extraction experiment using uranium in solution.
•IL **Precision Extrusion Co.**[259] Bensenville AWE - 1949-1950; 1956-1959 - Precision Extrusion was involved in several projects for the Atomic Energy Commission and Argonne National Laboratory, including fuel plates for the Argonaut Reactor.[260] From 1949 to 1950, it extruded experimental fuel channel tubes from aluminum and aluminum-lithium alloys.
•IL **Quality Hardware and Machine Co.**[261] Chicago AWE - 1944-1945 - Quality Hardware had a contract to support the University of Chicago. The company canned experimental unbonded uranium slugs for Hanford.
•IL R. **Krasburg and Sons Manufacturing Co.** Chicago AWE - 1944 - In 1944, R. Krasberg entered into a subcontract with the University of Chicago for services and supplies for the Metallurgical Laboratory. The subcontract required Krasberg to provide necessary personnel, facilities and equipment to produce special machining of parts for special equipment, tools, jigs, fixtures, etc., from materials furnished by the University.
•IL **Sciaky Brothers, Inc.**[262] Chicago DOE - 1953 - In 1953, Argonne National Laboratory suggested that Sciaky Brothers was to be used to perform a stitch welding

257 Formerly Utilized MED/AEC Sites Remedial Action Program: **Radiological Survey of The National Guard Armory at Washington Park, 52nd St. & Cottage Grove Ave., Chicago, IL**, 9/19/77 - 10/11/78; Jan. 1983. - 137 pp.

258 DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; August 29, 1994. - 3 pp.
- http://www.lm.doe.gov/Considered_Sites/Gleason_Works_-_NY_55/

259 DOD: Argonne National Laboratory Letter; Lonergan and McKee to J.Novak; Subject: **Extrusion of uranium billets - Including a radiological survey**; August 12, 1958. - 9 pp.
- http://www.lm.doe.gov/Considered_Sites/P/Precision_Extrusion_Co_-_IL_20/IL_20-3.pdf

260 The original Argonaut (Argonne Nuclear Assembly for University Training) was built at Argonne National Laboratory. The Argonaut design was developed by Argonne, and the original Argonaut reactor was built at Argonne and went critical for the first time on February 9, 1957. This 10-kW water cooled and moderated reactor was built to teach reactor theory and nuclear physics to university students and operated at Argonne until 1972, when it was shutdown, dismantled, and shipped to Taiwan to continue its mission of training students.

Argonaut reactor databook : A compilation of experimental and theoretical results of work done with, or related to, the Argonaut Reactor to July 1960. / W J Sturm; U.S. Atomic Energy Commission.; Argonne National Laboratory. Lemont, III. : Argonne National Laboratory, 1961.

261 DOE Report; **FUSRAP Elimination Report for Former Quality Hardware and Machine Company; 5823/5849 North Ravenswood Avenue, Chicago, Illinois**; July 1990. - 6 pp.
- http://www.lm.doe.gov/Considered_Sites/Q/Quality_Hardware_and_Machine_Co_-_IL_11/IL_11-4.pdf

DOE: Survey Report; **Radiological Survey at 5823/5849 Ravenswood Avenue, Chicago**, Illinois; October 1989. - 34 pp.
- http://www.lm.doe.gov/Considered_Sites/Q/Quality_Hardware_and_Machine_Co_-_IL_11/IL_11-3.pdf

262 DOE: Memorandum/Checklist; Young to the File; Subject: **Elimination Recommendation**; November 18, 1987. - 3 pp.
- http://www.lm.doe.gov/Considered_Sites/S/Sciaky_Brothers_Inc_-_IL_0-06/IL_0-06-2.pdf

operation for a uranium cord, zirconium clad specimen EBR irradiation.

•IL **Swenson Evaporator Co.**[263] Harvey AWE - 1951 - Swenson Evaporator was scheduled to perform a raffinate spray drying test for National Lead Company of Ohio (NLO) on March 20, 1951 that was later cancelled.

263 DOE: Memorandum/Checklist; D.Levine to the File; Subject: **Elimination Recommendation**; May 15, 1987. - 4 pp.
- http://www.lm.doe.gov/Considered_Sites/S/Swenson_Evaporator_Co_-_IL_23/IL_23-1.pdf

•IL **Taylor Springs Site**[264] Taylor Springs Hillsborough BE - A significant amount of the slag within the facility is stored in a waste pile that occupies approximately 2.5 acres and a shallow waste pile that occupies approximately 9.1 acres. Contaminants of concern associated with the slag pile are metals, primarily arsenic, beryllium,

264 Map: http://www.epa.gov/region5/cleanup/asarcots/pdfs/asarco-figure-10-22.pdf

EPA: **Sampling Project is Next Step in Cleanup Process: ASARCO Taylor Springs Site. Taylor Springs, Illinois.** October 2011. - 2 pp. - http://www.epa.gov/region5/cleanup/asarcots/pdfs/asarcots-fs-201110.pdf

cadmium, copper, lead, nickel, and zinc.

•IL **University of Chicago** Chicago AWE/DOE - Manhattan Project: **Metallurgical Laboratory**. Now the University of Chicago operates the Fermi National Accelerator Laboratory .

•IL **University of Chicago George Herbert Jones Laboratory Room 405** AWE - As part of the Manhattan Project, University of Chicago chemists began to study the newly manufactured radioactive element, plutonium. Room 405 was the site where, for the first time, a trace quantity of this new element was isolated and measured in September 1942.

•IL **University of Chicago Physics Department** AWE - Manhattan Project.

•IL **W.E. Pratt Manufacturing Co.**[265] Joliet AWE - 1943-1946 - The W.E. Pratt Manufacturing Company performed metal fabrication tasks (machining and grinding) for the University of Chicago Metallurgical Laboratory beginning in the spring of 1943. The purpose of the machining done by Pratt was to speed up delivery of pieces for the experimental pile and to learn all that could be learned about handing uranium metal in turret lathes and automatic screw machines. In 1944, Pratt was

265 DOE: **Survey Report, Radiological Survey at 18 Henderson Street, Joliet, Illinois**, M.R. Landis, October 1989. - 41 pp.
- http://www.lm.doe.gov/Considered_Sites/W/W_E_Pratt_Manufacturing_Co_-_IL_12/IL_12-3.pdf
DOE: Report, **FUSRAP Elimination Report For Former William Pratt Manufacturing Company, 18 Henderson Street**, Joliet, Illinois, July 1990. - 6 pp.
- http://www.lm.doe.gov/Considered_Sites/W/W_E_Pratt_Manufacturing_Co_-_IL_12/IL_12-4.pdf

subcontracted by the University of Chicago to finish "short metal rods" by centerless grinding. This work continued until June 30, 1946. The Manhattan Engineer District History indicates that DuPont placed an order with Pratt to turn and grind unbonded Hanford slugs.

•IL **Wycoff Drawn Steel Co.**[266] or **Wyckoff Drawn Steel Co.** Chicago AWE - 1943 - In 1943, the Metallurgical Laboratory conducted experiments of centerless grinding equipment on uranium. Also there was a Wyckoff Steel Co. in New Jersey.

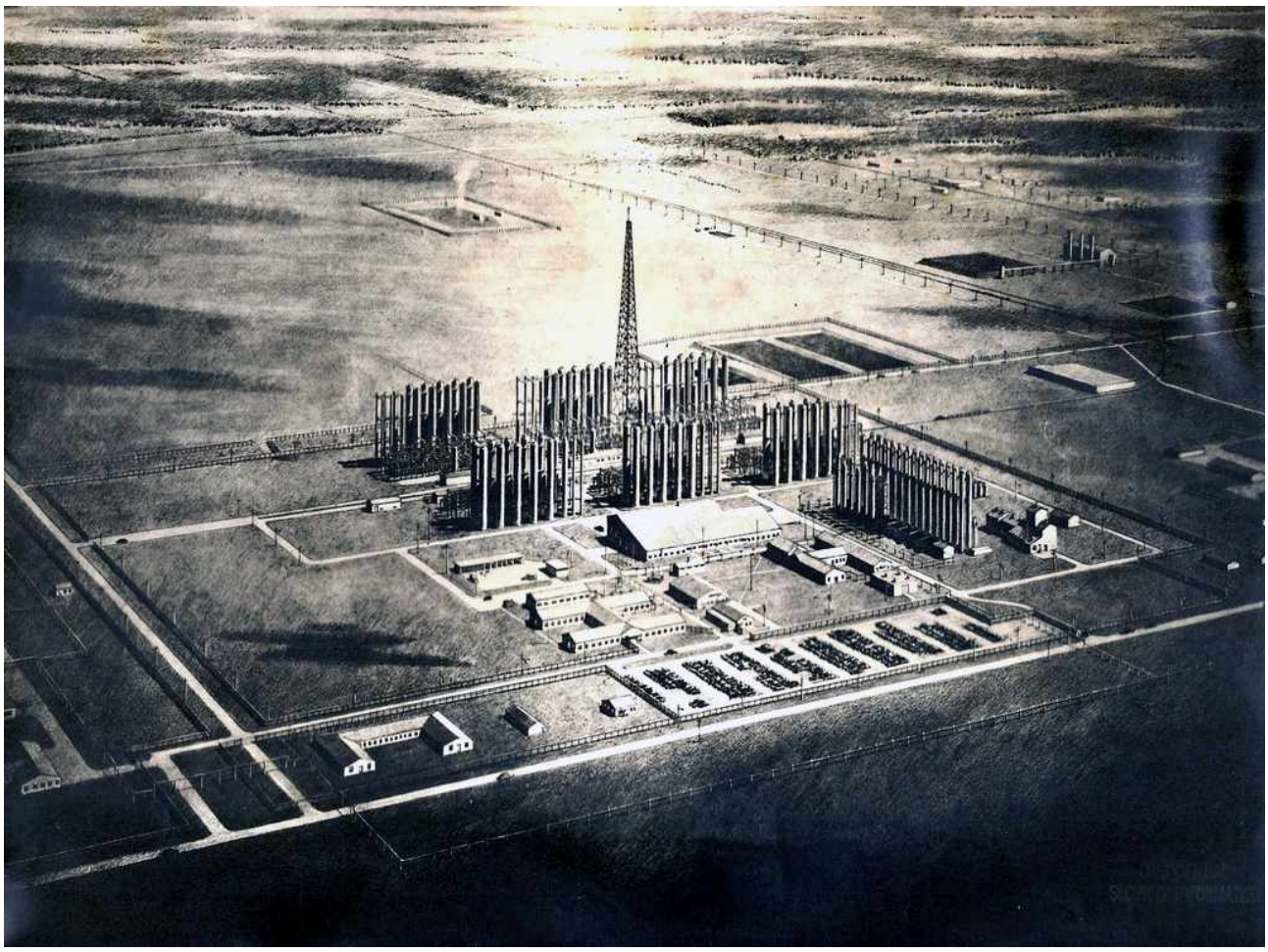
•IN **American Bearing Corp.**[267] Indianapolis AWE 1954-1959; Residual Radiation 1960-1983 - American Bearing Corp. was selected to participate in the machining of a sample lot of four hollow extrusion uranium billets from ingots for National Lead of Ohio (Fernald). Subsequently, National Lead used the Special Products Area of American Bearing to process uranium materials in the late 1950s. In May 1959, National Lead Industries (NLI), Nuclear Division was formed in Albany (Colonie), NY, and this work was moved to this NLI facility.

266 **Energy Worker's Compensation Program**, the U.S. Department of Labor, Office of Public Affairs, 2001.
WASHINGTON - The U.S. Department of Labor is notifying all current and former workers of 22 atomic weapons employers in or near Chicago, Ill., about benefits that may be available to them under the Energy Employees Occupational Illness Compensation Program Act administered by the department's Division of Energy Employees Occupational Illness Compensation. Employees of the following sites may be eligible: GSA 39th Street Warehouse, Quality Hardware and Machine Co., Sciaky Brothers Inc., Great Lakes Carbon Corp., Crane Co., Armour Research Foundation, Lindsay Light and Chemical Co., Precision Extrusion Co., W.E. Pratt Manufacturing Co., C-B Tool Products Co., ERA Tool and Engineering Co., International Register, Museum of Science and Industry, Podbeliniac Corp, R. Krasburg and Sons Manufacturing Co., Wyckoff Drawn Steel Co., National Guard Armory, Fansteel Metallurgical Corp., Kaiser Aluminum Corp., American Machine and Metals Inc., Midwest Manufacturing Co. and Swenson Evaporator Co.- http://conference.iml.org/page.cfm?key=4678&parent=2657&section=11

267 DOE: Letter; Wagoner to Goldsmith; Subject: **American Bearing Corp. Information**; January 13, 1995. - 1 p.
'DOE studied the historical-records of the former American Searing Corp. site, and it determined that it did~ not have the authority to to perform remediation at the site. This conclusion is derived from the fact,that' the facility was licensed to handle nuclear materials.'
- http://www.lm.doe.gov/Considered_Sites/American_Bearing_Corp_-_IN_09/IN_09-2.pdf

•IN **Dakota County NIKE Missile Site**[268] AWE - The NIKE missile site was built in 1959. It was one of four bases constructed during the Cold War era to defend the Twin Cities from possible enemy aircraft attacks. A waste-water treatment plant formerly operated by the U.S. Army is considered part of the missile site. The NIKE site closed in 1972.

268 Health Consultation: **Nike MSP 40 Integrated Fire Control** (A/k/a Former Nike Integrated Fire Control) Farmington, Dakota County, Minnesota. U.S. Department of Health and Human Services. Agency for Toxic Substances and Disease Registry. Division of Health Assessment and Consultation. April 27, 1998. - 9 pp. Atlanta, Georgia. - http://www.health.state.mn.us/divs/eh/hazardous/sites/dakota/nike0498.pdf



•IN **Dana Heavy Water Plant** or **Wabash River Ordnance Works**[269] Newport AWE - 1943-1957 - Most of the heavy water for the US. nuclear weapons programs was made at two sites: the Dana Heavy Water Plant and the Savannah River Heavy Water Plant.[270] The Dana Heavy Water Plant was designed and built by the Girdler Corporation[271] (under direction from E.I. du Pont de Nemours and Company) and operated by E.I. du Pont de Nemours and Company.

269 DOE: Memorandum/Checklist; Jones to the File; Subject: **Elimination Report - Wabash River**; October 15, 1985. - 3 99.
- http://www.lm.doe.gov/Considered_Sites/W/Wabash_River_Ordnance_Works_-_IN_03/IN_03-1.pdf
'Eliminated - Facility owned by the Army - No indication of radioactive materials handled '
U.S. Army BRAC 2005: **Environmental Condition of Property Report Newport Chemical Depot – Indiana**. Volume I. October 2008. - 164 pp.
- http://www.hqda.army.mil/acsimweb/brac/EA_DOCS/EA_final/NECD_ECP_VolumeI-Final.pdf
270 **Savannah River Site Cold War Historic Property Documentation. Narrative and Photography 400/d area – heavy water production**, Aiken County, South Carolina / Report prepared by: New South Associates, Mary Beth Reed and Mark T. Swanson. 2008. - 236 pp.
- http://nationalregister.sc.gov/SurveyReports/HC02002.pdf
Heavy Water for the Savannah River Site. / J. W. (Bill) Morris, William P. Bebbington, Robert G. Garvin, Mal C. Schroder, and W. C. Scotten. WSRC-MS-2000-00061. - 8 pp.
- http://www.c-n-t-a.com/srs50_files/011morris.pdf
271 The Girdler Corporation, formerly The Helium Company of Louisville, had a Research and Development Laboratory, Gas Processes Division in Louisville, Kentucky in 1950.
- http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADB201764

The plant operated until May 1957, and remained on standby until July 1959. The site used a combination of hydrogen sulfide-water chemical exchange, water distillation, and electrolysis processes to make heavy water. In April 1961, the U.S. Army converted the former Dana Heavy Water Production Plant in Newport, to produce the nerve agent VX as a deterrent to other countries using chemical weapons against American soldiers and their allies. The VX plant produced approximately 4, 400 tons of VX during operations between 1961 and 1968. In 1997 the U.S. Congress ratified the Chemical Weapons Convention requiring destruction of chemical weapons stockpiles and non-stockpile chemical material, including the one in Newport. Destruction of the former production facility was completed in 2006.

•IN **General Electric Plant** [272]Shelbyville AWE - 1956 - In 1956, this facility handled thorium metal under subcontract to National Lead of Ohio (Fernald).

272 DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; August 29, 1994. - 3 pp.
- http://www.lm.doe.gov/Considered_Sites/Gleason_Works_-_NY_55/

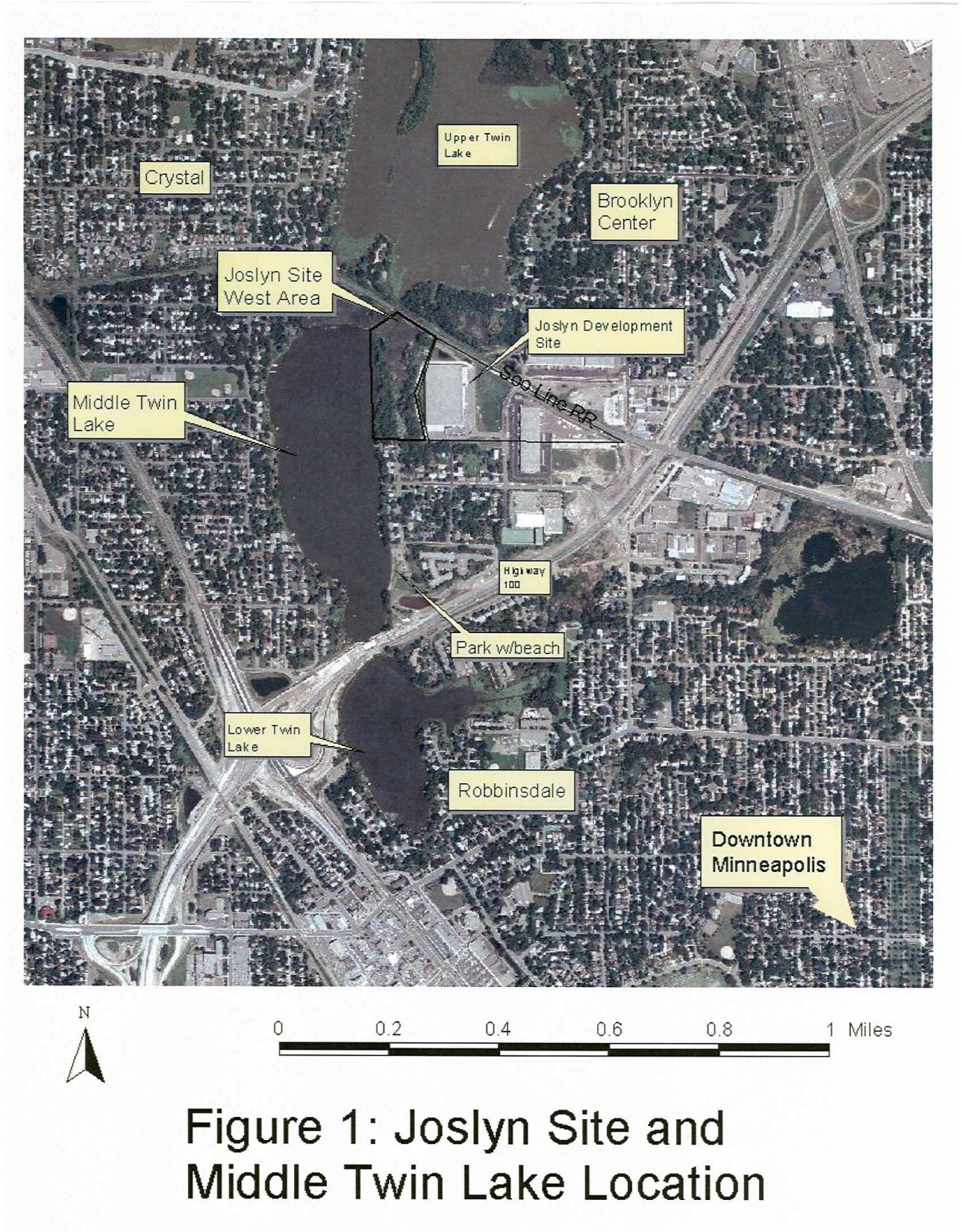


Figure 1: Joslyn Site and Middle Twin Lake Location

•IN **Joslyn Manufacturing and Supply Co.**[273] Ft. Wayne AWE - 1944-1952 - Joslyn

273 **Health Consultation: Middle Twin Lake fish tissue study. Joslyn manufacturing and supply company site city of Brooklyn Center, Hennepin County, Minnesota** / Prepared by: The Minnesota De-

rolled uranium rods from billets for use by the MED and the AEC in weapons production. The grounds, buildings, and some equipment used during the uranium operations are presently being utilized by Joslyn. The furnaces were removed at the conclusion of the AEC contract. The equipment used in cutting, grinding, straightening, and threading is gone, and new concrete floors now cover these areas. The uranium billet storage area is presently [1980] used as a roll shop, and the 36-cm rolling mill is still in operation. The 46-cm mill was sold to AMEX Speciality Metal Corporation, Coldwater, Michigan, and the 23-cm mill was brokered through the T. B. Hudson Company and was believed to have been shipped to Sonora, Mexico. 'From 1928 to 1981 Joslyn Manufacturing Company owned and operated a steel mill at 2302 and 2400 Taylor Street (formerly known as 1701 McKinley Avenue) in Fort Wayne, Indiana (collectively "the site")[274]. [DE 28-1 at 1; DE 28-2 at 11-13]. Plaintiffs--the site's current owners--claim that Defendants, Joslyn Manufacturing Company and its parent company and/or successors, contaminated the site's soil and groundwater with chlorinated solvents, metals, and other contaminants during the course of the steel mill's operation. Seeking to recover for cleanup costs that they have incurred or expect to incur, Plaintiffs seek contribution under the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. § 9607(a) ("CERCLA" or "Superfund"), and under Indiana's Environmental Legal Action statute, Ind. Code §§ 13-30-9-1 et seq. ("ELA"). [DE 1 at 5, 6]. Plaintiffs also seek a declaratory judgment pursuant to 28 U.S.C. § 2201 and Federal Rule of Civil Procedure 57, declaring that Defendants "are and will be liable for future costs, expenses, damages and attorneys' fees which are necessary to address and respond to the hazardous substances that continue to exist at or near the Site." [DE 1 at 7].'

partment of Health Under Cooperative Agreement with the Agency for Toxic Substances and Disease Registry U.S. Department of Health and Human Services. 2006. - 31 pp.

- http://www.health.state.mn.us/divs/eh/hazardous/sites/hennepin/joslynhc706.pdf

DOE: Report (ORNL); **Preliminary Survey of Joslyn Stainless Steel Company, Fort Wayne, Indiana**; March 1980. - 10 pp.

- http://www.lm.doe.gov/Considered_Sites/J/Joslyn_Stainless_Steel_Co_-_IN_01/IN_01-2.pdf

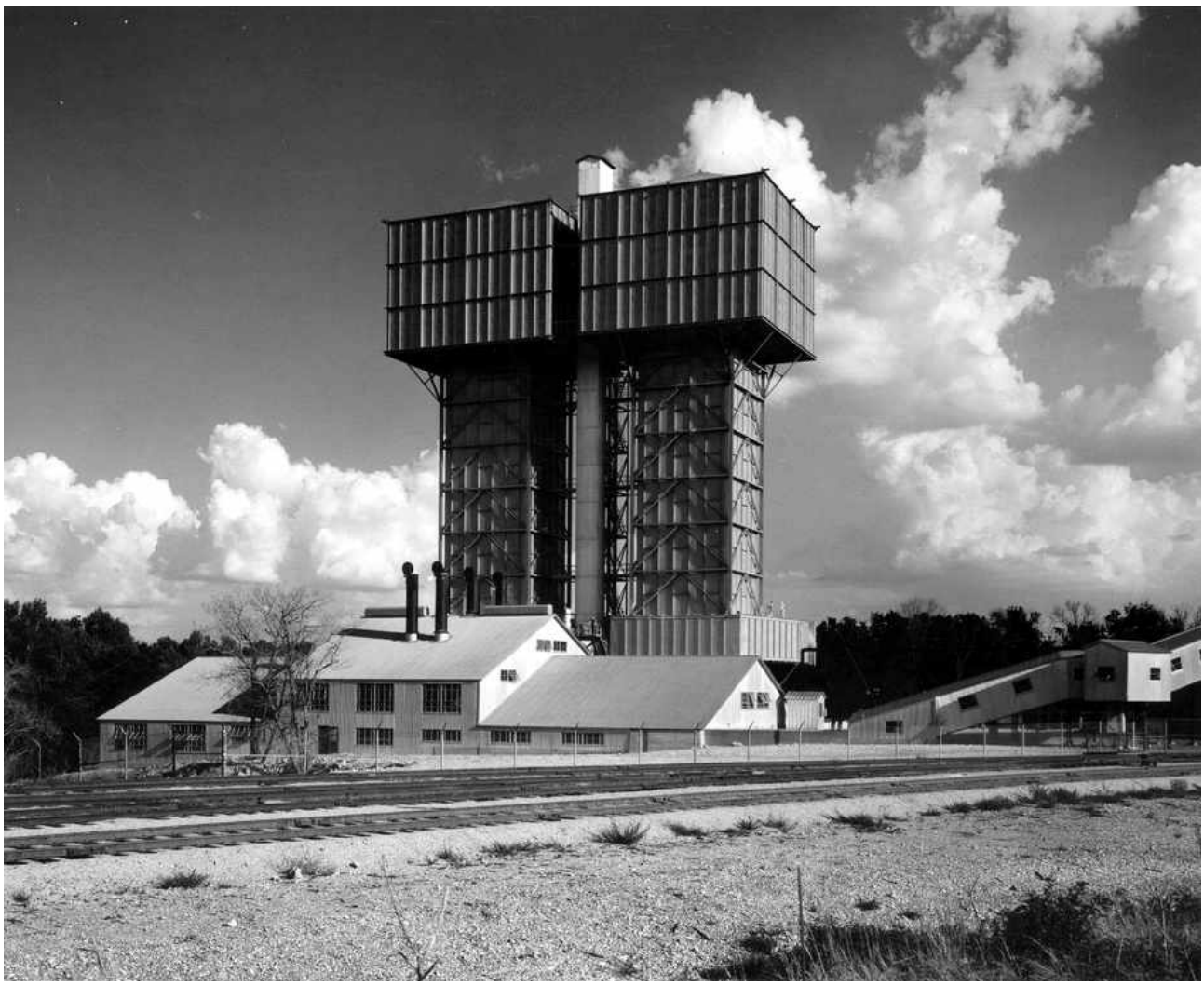
274 Valbruna Slater Steel Corp. and Fort Wayne steel corp., plaintiffs, v. Joslyn Manufacturing co., et al., defendants.

- http://in.findacase.com/research/wfrmDocViewer.aspx/xq/fac.20110411_0000349.NIN.htm/qx

•IN **Purdue University Van der Graaf Lab.**[275] Lafayette AWE - 1942-1946 - Purdue was involved in nuclear physics research during the Manhattan Project.
•IN **Wash-Rite** Indianapolis DOE 19553-1954 - Conducted washing test to decontaminate gloves and recover uranium.
• KS **Fort Leavenworth Nike Battery** Kansas City AWE

275 DOE: Letter; Wagoner to Riehle; Subject: **Purdue University Van Der Graaf Laboratory Information**; December 20, 1994. - 1 p.
'DOE's has studied the historical records of the former Purdue University Van der.Graaf Laboratory site and we have concluded that further investigations of the site are not necessary because of,the limited scope of the activities performed there.'
- http://www.lm.doe.gov/Considered_Sites/P/Purdue_University_Van_Der_Graaf_Laboratory_-_IN_02/IN_02-2.pdf
Prime Lab: A Dedicated AMS Facility at Purdue University / David Elmore, F. A. Rickey, P. C. Simms, M. E. Lipschutzi, K A. Mueller and T. E. Miller. Department of Physics, Purdue University, West Lafayette, Indiana. Radiocarbon, Vol. 34, No. 3, 1992, p. 447-451.

•KS **Kansas City Plant** Kansas City DOE – 1949-. The Kansas City Plant (KCP) is situated on approximately 141 acres of the 300-acre Bannister Federal complex located within the city limits, 12 miles south of downtown Kansas City, Missouri. The plant shares the site with nine other Federal agencies. The KCP is a major operational facility engaged in the production of non-nuclear weapons components for the Department of Energy (DOE) nuclear weapons program. The principal mission of Allied Signal Federal Manufacturing and Technologies/Kansas City (ASFM&T/KC), the integrating contractor, is to serve DOE by producing and procuring non-nuclear electric, electronic, electromechanical, mechanical, plastic, and non-fissionable metal components for the DOE nuclear weapons program.



Source: Kansas Historical Society

•KS **Spencer Chemical Co.**, **/ Jayhawks Works**[276] Pittsburg DOE 1958-1961 - Spencer Chemical Company / Jayhawk Works, formerly known as the Jayhawk Works Site, was originally used as an ordnance plant during World War II. During 1948, the U.S. Government converted the facility into Spencer Chemical Company, Kansas, which was a 1,600 acre site located in the southeastern corner of Kansas. Spencer Chemical Company manufactured ammonia, nitric acid, ammonium nitrate, polyethylene, nylon, urea, methanol, and other similar products. Spencer had been operating as a Uranium Oxide Pilot Plant since December 1, 1957. Since December 1957, Spencer was licensed by U.S. Atomic Energy Commission (AEC) to possess enriched uranium and thorium. The AEC licenses allowed Spencer Chemical Company to receive UF_6 and to process it into enriched uranium oxides and uranium carbides in the physical form of fused ceramic pellets and finely divided powder.

•KY **Knoxville Iron Co**.[277] Knoxville DOE - Provided goods and/or services to the Fernald facility as subcontractor

276 National Institute for Occupational Safety and Health: **SEC Petition Evaluation Report Petition SEC-00089**: / Joe Guido, 2008. - 39 pp. - http://www.cdc.gov/niosh/ocas/pdfs/sec/spencjhawk/spencerer.pdf

277 DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; August 29, 1994. - 3 pp.
- http://www.lm.doe.gov/Considered_Sites/Gleason_Works_-_NY_55/

• KY **Maxey Flats Nuclear Disposal Site**[278] Hillsboro DOE 1963-1977 - The Commonwealth of Kentucky, under authorities granted by the U.S. Government, licensed private operators, Nuclear Engineering Company, Inc., to dispose of low-level radioactive wastes from military ships and facilities, hospitals, universities, and corporations in landfill facilities on the property. An estimated five million cubic feet of material were disposed of at the site. Some highly radioactive wastes were included with the lower-level radioactive wastes. Approximately 533,000 pounds of source material consisting of uranium and thorium or ores containing them; 2.5 megacuries of by-product materials; and 950 pounds of special nuclear material including plutonium and enriched uranium were buried in an area known as the Restricted Area.

278 DOE: Maxey Flats Nuclear Disposal Site **Fact Sheet**. Undated. - 3 pp.

•KY **Paducah Gaseous Diffusion Plant**[279] Paducah DOE - 1951-1998 - The Department of Energy's Paducah Gaseous Diffusion Plant opened in 1952 to enrich uranium for nuclear weapons. During the plant's Cold War history, more than one million tons of uranium was processed. Construction of the Paducah plant began in 1951 in response to the increased demand for highly-enriched uranium resulting from nuclear weapons production. Initial operations began in 1952 and full Operation was reached by 1955. In addition to producing enriched uranium for weapons production, the plant also supplied enriched uranium for the Navy and for commercial fuel. The Paducah Plant also acted as the uranium hexafluoride feed point for all gaseous diffusion plants until 1964. Throughout the course of its operations, the potential for beryllium exposure existed at this site. According to GAO, since 1988, DOE has spent $823 million, adjusted to fiscal year 2002 constant dollars, on the Paducah cleanup program.
•LA **Ethyl Corporation** now **Albemarle Corporation** Baton Rouge BE - 1967-1971 - Lawrence Livermore National Laboratory purchased beryllium from the Ethyl Corporation, Baton Rouge.

279GAO: **Nuclear Waste Cleanup**: Preliminary Observations on DOE's Cleanup of the Paducah Uranium Enrichment Plant, 2004. - 15 pp.

Former Worker Medical Surveillance Program at Department of Energy Gaseous Diffusion Plants. Phase I: Needs Assessment./ Robert Wages, Steven Markowitz, Sylvia Kieding, Mark Griffon, Elizabeth Averill, 1997. - 215 pp.

State-Corporate Crime and the Paducah Gaseous Diffusion Plant / Alan pp. Bruce, Paul J. Becker. Western Criminology Review 8(2), 29–43 (2007).

•LA **Barksdale Air Force Base**[280] Bossier City AWE - Former AEC sites - On November 1, 1949, Barksdale was reassigned to Strategic Air Command (SAC), and became home of Headquarters Second Air Force.

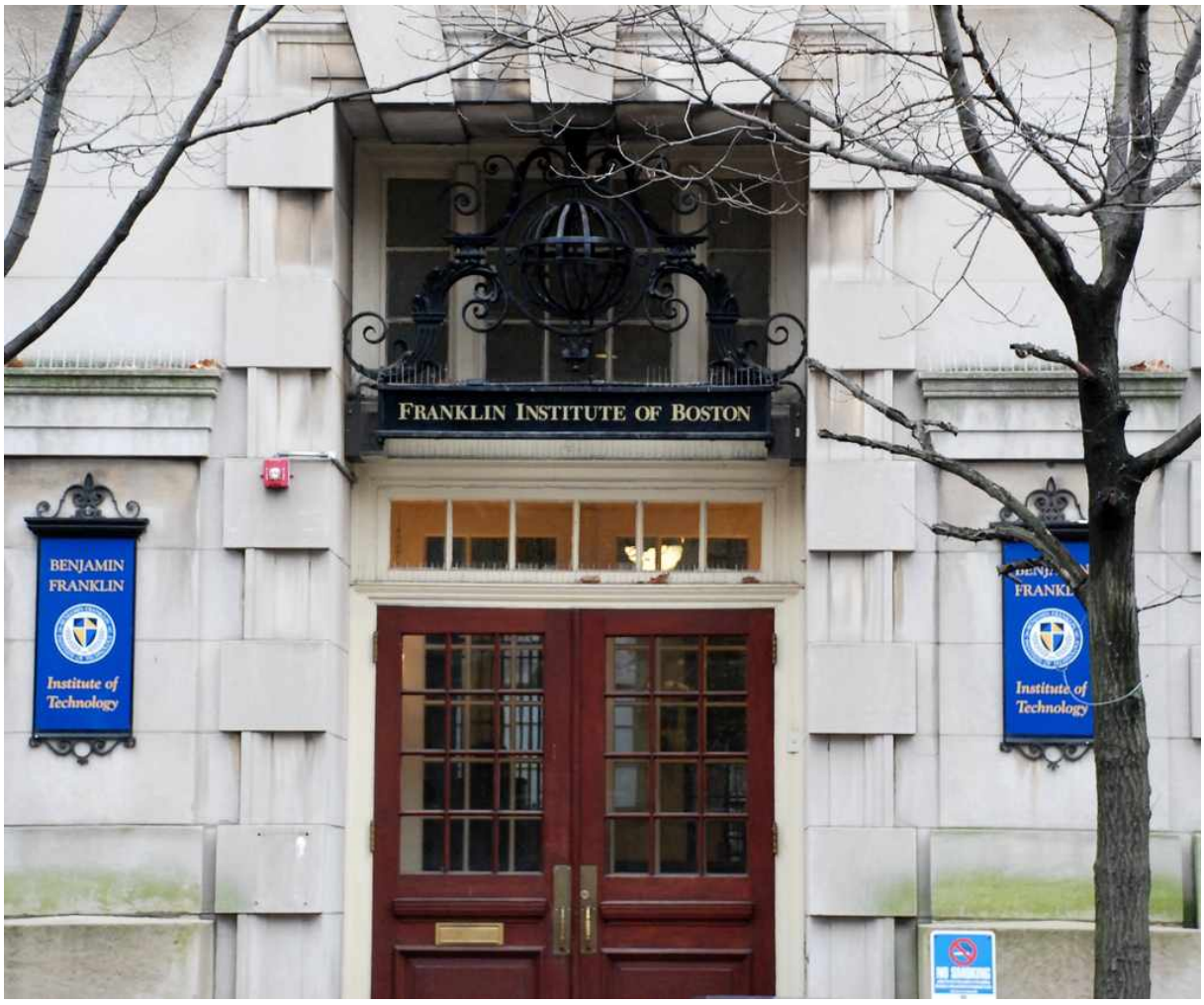
•MA **American Potash & Chemical** or **National Fireworks Ordnance Corp. National Northern Div.**[281] West Hanover AWE - 1959 -1961 - American Potash and Chemical Company (sometimes abbreviated as AMPOT) was a large chemical manufacturer in the United States from the 1920s through the 1960s. It produced various chemicals for US industry and the US military and conducted uranium metal shaping and uranium-magnesium explosive forming studies for the Union Carbide Nuclear Corporation, Oak Ridge. In 1967 AMPOT was bought by Kerr-McGee. Around 1970 Kerr-McGee reorganized and AMPOT became the Kerr-McGee Chemical Corporation which in 2006 was spun off as Tronox.

280 **The Barksdale Air Force Base Historic District. Project: History and Maintenance Plan**. / Don Kermat et al. US Army Construction Engineering Research Laboratories, 1995. - 180 pp.
- http://www.dtic.mil/dtic/tr/fulltext/u2/a304695.pdf

281 DOE: Memorandum; Williams to The File; Subject: **Elimination of the American Potash and Chemical Site**; May 21, 1991. - 2 pp.
- http://www.lm.doe.gov/Considered_Sites/N/National_Fireworks_Ordnance_Corp_-_MA_13/MA_13-1.pdf

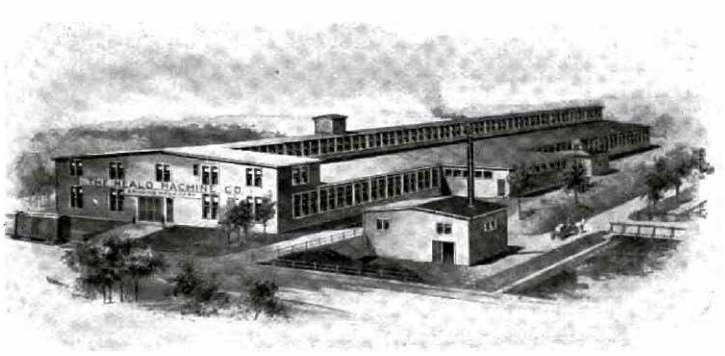
•MA **C.G. Sargent & Sons** Graniteville AWE - 1968 - C.G. Sargents and Sons Company performed extruder and drying oven tests with thorium for National Lead of

Ohio (Fernald). It also conducted a uranium sump cake drying test for NLO.
•MA **Chapman Valve**[282] Indian Orchard AWE/DOE - 1948-1949 - Chapman Valve supplied valves to the MED and the AEC. In 1948, Chapman Valve machined uranium rods into slugs for the Brookhaven National Laboratory. Uranium slugs were used as reactor fuel.
•MA **Edgerton Germeshausen & Grier, Inc.** Boston AWE - 1950-1953 - EG&G was under contract to the AEC during the period from 1950-1953 for "research and development and manufacturing incident to the installation of scientific test instrumentation at AEC test sites; design, manufacture, test, maintenance of operations systems, weapons systems; and participation in weapons test evaluation."
•MA **Fenwal, Inc.**[283] Ashland AWE - 1967-1968 - In 1967 and 1968, National Lead of Ohio (Fernald) asked Fenwal to conduct tests aimed at determining the capabilities of Fenwal's fire extinguishing equipment for suppressing fires originating in uranium contaminated magnesium. The tests were conducted at Fenwal facilities and involved small amounts of uranium.



282 DOE: **Long-Term Surveillance and Maintenance Requirements for Remediated FUSRAP Sites**. 2011. - 146 pp. - http://www.lm.doe.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=7978&libID=8084
283 DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; August 29, 1994. - 3 pp.
- http://www.lm.doe.gov/Considered_Sites/Gleason_Works_-_NY_55/

•MA **Benjamin Franklin Institute of Technology**[284] Boston BE - 1962 - The Franklin Institute conducted a study for the Division of Reactor Development of the United States Atomic Energy Commission in 1962.



•MA **Heald Machine Co.**[285] Worcester AWE - 1960 - National Lead of Ohio (Fernald) conducted tests on a drilling machine at the Heald facility. The tests involved drilling a few uranium slugs on the machine which Fernald intended to purchase. In May, 1960 an engineering acceptance test was conducted at Heald Machine Company to demonstrate the capability of a "multi-bore" drilling machine to drill four uranium slugs at a time. 100 solid uranium cylinder test pieces were contracted to be run, provided by NLO, along with the drill bits. There are no records of the actual number tested. There also are no records of any other work involving uranium at this site other than the May 1960 period. The actual test dates where uranium was processed are May 17-19, 1960. Decontamination was conducted from May 19-20, 1960, and is described as having no contamination above background level.

•MA **La Pointe Machine and Tool Co.**[286] Hudson DOE - 1956 - National Lead of Ohio (Fernald) conducted a single test involving the use of uranium metal on a broaching machine and an arbor press at the La Pointe Machine Tool Company facility.

284 **Radioisotope shielding design manual** / William H Steigelmann; Franklin Institute (Philadelphia, Pa.). Laboratories for Research and Development.; U.S. Atomic Energy Commission. Division of Technical Information. - Washington, D.C.: United States Atomic Energy Commission, Division of Isotopes Development ; [Springfield, Va. : Available from the Clearinghouse for Federal Scientifice and Technical Information], 1963.

285 DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program;** August 29, 1994. - 3 pp.
- http://www.lm.doe.gov/Considered_Sites/Gleason_Works_-_NY_55/

National Institute for Occupational Safety and Health: **Site Profiles for Atomic Weapons Employers that Worked Uranium and Thorium Metals Appendix BD – Heald Machine Company**, 2007. - 8 pp.
- http://www.cdc.gov/niosh/ocas/pdfs/tbd/b-6000-apbd-r0.pdf

286 DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program;** August 29, 1994. - 3 pp.
- http://www.lm.doe.gov/Considered_Sites/Gleason_Works_-_NY_55/

National Institute for Occupational Safety and Health: **Site Profiles for Atomic Weapons Employers that Worked Uranium and Thorium Metals Appendix BO – LaPointe Machine & Tool Co.**, 2007. - 9 pp. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/b-6000-apbo-r0.pdf

•MA **Massachusetts Institute of Technology**[287] Cambridge AWE/BE - 1946-1963 - The Massachusetts Institute of Technology (MIT) began experimental work on producing uranium metal in the spring of 1942 using a process involving melting and casting. It is this uranium metallurgical work which took place on the MIT campus by MIT employees that supports its designation as an Atomic Weapons Employer (AWE). MIT is also designated as a beryllium vendor. MIT's work with beryllium was known as the "Metallurgical Project" and started when it entered into a research and development contract with the Manhattan Engineer District (MED). The Metallurgical Project involved studying the characteristics of beryllium metal and attempting to make a satisfactory beryllium-uranium alloy. In addition, beryllium oxide crucibles were made for use by the MED.

287 Smithsonian Videohistory Collection: **The Manhattan Project** (RU 9531).
'This collection consists of eighteen interview sessions, separated into five collection divisions, totalling approximately 47:00 hours of recordings, and 1188 pages of transcript.
- http://siarchives.si.edu/research/videohistory_catalog9531.html

After a number of its employees contracted beryllium disease, MIT consolidated the activities described above in an off-campus site known as the Hood Building, which is a separate covered facility under the EEOICPA. The transition to the Hood Building was complete by the fall of 1946.[288] In 1946, the Massachusetts Institute of Technology (MIT) relocated the work it had been performing under Manhattan Engineer District (MED) contracts into The 155 Massachusetts Avenue facility or the Hood Building as a means of consolidating work with unique health hazards. The MED, and subsequently the Atomic Energy Commission (AEC) owned the Hood Building, which was located adjacent to the MIT campus. Contractors working in the Hood Building performed the same work that was previously performed on MIT's campus, including work with uranium, beryllium and other metals under contract with the MED and AEC. In 1954 Nuclear Metals Inc. was established and took over the work that MIT had been performing in the Hood Building. Those operations continued until October 29, 1958, when the work was relocated again. The Hood Building was subsequently demolished after which the AEC released it to its new owners on July 11, 1963. Contractors: MIT (1946-1954); Nuclear Metals, Inc. (1954-1958).

288 National Archives: **Textual Records from the Office for Emergency Management. War Assets Administration. Region 1. Office of Real Property. (1946 - 1949**): NARA's Northeast Region (Boston), Waltham, MA Series from Record Group 270: Records of the War Assets Administration, 1939 - 1958
National Institute for Occupational Safety and Health: SEC Petition Evaluation Report Petition SEC-00101: Hood Building in Cambridge, MA. / James Mahathy, 2009. - 34 pp
- http://www.cdc.gov/niosh/ocas/pdfs/sec/mit/hooder.pdf

•MA **Metals and Controls Corp.**[289] Attleboro DOE - 1952-1967 - Records indicate that Metals and Controls Corporation fabricated fuel elements for production reactors, but it is unclear whether its work related to the nuclear weapons complex. For example, Metals and Controls Corporation fabricated uranium foils for reactor experiments and fuel components, fabricated complete reactor cores for the Naval Reactors program, and fabricated uranium fuel elements for experimental and research reactors. Records indicate shipments of depleted uranium between Rocky Flats and M&C during the period from 1955-1958. Waste from the former Metals & Controls was dumped at the former Shpack landfill at the Norton-Attleboro line.
•MA **National Research Corp.** Cambridge AWE - 1944-1952 - National Research had Manhattan Engineer District experience in working with vacuum centrifugal castings, in developing jets and baffles for diffusion pumps, and in developing cold trap systems. National Research's work with vacuum centrifugal castings involved casting tubealloy (uranium metal) using the "lost wax" technique. In 1948, National Research did work for Mallinckrodt involving the vacuum melting of approximately 500 pounds of uranium.

•MA **Norton Co.**[290] Worcester AWE/BE - BE 1944-1956; AWE 1945-1957 - Between

289 National Service Center for Environmental Publications (NSCEP): **SEC Petition Evaluation Report Petition SEC-00149: Metals and Controls Corp.**. / Joseph S. Guido. 2009. - 33 pp.
- http://www.cdc.gov/niosh/ocas/pdfs/sec/metcont/metconter.pdf
Metals and Controls Corp. workers who fell ill may be eligible for benefits./ Gerry Tuoti.
GateHouse News Service, Posted Jan 28, 2010
'Taunton — People who worked with radioactive materials at the former Metals and Controls Corp. — including those from Taunton — and were diagnosed with certain types of cancer may be eligible for up to $150,000 in compensation and benefits under a federal program administered by the U.S. Department of Labor. '

290 Draft: **A Focused Review of the Norton Company SEC Petition Evaluation Report SEC-00173 Concerning the Use of ORAUT-OTIB-0070 for the Reconstruction of Doses from Residual/Post-Operational Contamination**. / U. Hans Behling. S. Cohen & Associates. Vienna, VA, 2011. - 14 pp.
- http://www.cdc.gov/niosh/ocas/pdfs/abrwh/scarpts/sca-norton-173-r0.pdf

1945 and 1957, the Norton Company conducted Atomic Weapons Employer (AWE) radiological operations that involved the use of unspecified quantities of UO_2, U_3O_8, and thorium. Norton manufactured also refractory products from boron, beryllium, uranium, thorium, and magnesium oxide for the MED and the AEC. As early as 1943, Norton was providing boron to the SAM laboratory. Documents show that Norton began working with beryllium for the MED in approximately September 1944 and that work with beryllium continued through 1956. Work with thorium and uranium continued through 1957 at Norton's Worcester location. Norton continued to manufacture refractory products until at least 1965 for the AEC weapons complex, including Rocky Flats, Hanford and Y-12. However, after 1957 these contracts specified that the refractory products were to be made out of magnesium oxide.

•MA **Nuclear Metals**, Inc.[291]. Concord AWE/BE - BE 1954-1986; AWE 1958-990 - Nuclear Metals, Inc. was incorporated in 1954. Its work evolved out of the MIT's Metallurgical Laboratory. On October 29, 1958 the company moved its operations from the Hood Building in Cambridge (which is a separate covered facility under the EEOICPA) to their new Concord location. The company's current name is Starmet. In 1958, Nuclear Metals began operating as a facility that produced depleted uranium products, primarily as penetrators for armor-piercing ammunition. It also supplied copper-plated uranium billets that were used to fuel Savannah River's production reactors. Other work at this facility included the manufacture of metal powders for medical applications, photocopiers and other applications. Thorium and thorium oxide was also handled at the site under license to the NRC. During the period from 1962-1986, Nuclear Metals was the sole source supplier for beryllium alloy end closure fuel element rings used in the "N" Reactor in Richland.

•MA **Reed Rolled Thread and Die Co.**[292] Worcester AWE - 1955 - In 1955, Reed

291 George Matthews: CEO and Chairman of the Board. Nuclear Metals, Inc. 229 Main Street. Age 66. Interviewed November 22, 1996. **Interviewed for the Nuclear Metals Archives and the Concord Oral History Program**. Renee Garrelick, Interviewer.

292 DOE: OTS/Weston Note; Stout to Williams; Subject: **Additional Considered Sites**; December 18, 1990. - 2 pp. - http://www.lm.doe.gov/Considered_Sites/R/Reed_Rolled_Thread_Co_-_MA_18/MA_18-2.pdf

Rolled Thread and Die was scheduled to thread roll a test lot of 1500 Savannah River plant slugs for National Lead Company of Ohio (Fernald).

•MA **Shpack Landfill**[293] Norton and Attleboro AWE/DOE - 1960-1965 - The Shpack Landfill began operating as a private landfill in the early 1960s and received both industrial and domestic wastes. The landfill was closed in 1965 under court order. In 1978, a concerned citizen who had detected elevated radiation levels at the site contacted the Nuclear Regulatory Commission. The Commission investigated the site and confirmed the presence of radioactivity in excess of natural background levels for the area. Exactly when these contaminants were deposited at the site is not known. The ORNL survey confirmed NRC results, which indicated that the main radioactive contaminants are radium-226, uranium-234, uranium-235, and uranium-238. On the basis of field observations field laboratory analysis, the uranium and radium do not appear to have a common source. The radium is thought to have originated from the manufacture of electronic switches for military applications (Bechtel National, Inc. 1982). Depleted, normal, and enriched uranium were found in contaminated st)il and metal objects. Uranium isotope concentration ratios (uranium-238:uranium-234:uranium-235) found in Shpack site soils range from 1:120:7.7 for enriched uranium to 1:0.17:0.016 for depleted uranium.[294] However, the Nuclear Regulatory Commission

293 DOE **Radiological Survey of the Shpack Landfill, Norton, Massachusetts** / W. D. Cottrell et al. 1981. - 173 pp. - http://www.osti.gov/bridge/servlets/purl/5802644-2bXDrp/5802644.pdf

294 **Derivation of guidelines for uranium residual radioactive material for the Shpack Landfill, Norton,**

determined that the Texas Instruments plant (see Metals and Controls Corp.) of Attleboro had used the landfill to dispose of trash and other materials. The Nuclear Regulatory Commission concluded that the contaminants probably resulted from this waste stream.

•MA **Stony Brook Air Force Station**[295], Westover AFB AWE - National Nuclear Weapons Stockpile Site, one of five in the United States, and the nuclear weapons storage and maintenance facility for Westover Air Force Base alert.

Massachusetts. / Cheng, J.J. ; Yu, C. ; Monette, F. ; Jones, L. . Argonne National Lab., IL. 1991. - 25 pp.
- http://www.osti.gov/bridge/servlets/purl/6124315-0vRPww/6124315.pdf

295 **Ammunition and Explosives Storage for the Navy (1939-1989) and the Air Force (1946-1989)**, 2008. - 200 pp.
- http://www.denix.osd.mil/cr/upload/af-navy-ammunition-storage-public-rfs_pg1-200_rev.pdf

Nuclear Weapons Maintenance and Storage at Stony Brook Air Force Station. Excerpt from "History of the Strategic Air Command, 1 January 1958 – 30 June 1958, Historical Study No. 73, Volume I"
- http://www.3084adg.us/Nuclear%20Weapons%20Section.pdf

•MA **Ventron Corporation** Beverly AWE/DOE - 1942-1948 - From 1942 to 1948, **Metal Hydrides Corp.**[296] was under contract to the Manhattan Engineer District and the AEC to convert uranium oxide to uranium metal powder. This work, as well as later operations to recover uranium from scrap and turnings from a fuel fabrication plant at Hanford, was conducted at a foundry at the site. During this period, Metal Hydrides was the AEC's primary uranium scrap recovery contractor. The plant is currently owed by the Ventron Division of Morton International.

•MA **Winchester Engineering and Analytical Center**[297] Winchester DOE - 1952-1961 - The Winchester Engineering and Analytical Center, built in 1952 under sponsorship of the AEC, was used to continue development of methods for extraction of uranium and thorium form ore and to prepare metal grade uranium tetrafluoride. Massachusetts Institute of Technology (MIT) began the work in 1946 at Cambridge, MA and continued the work after it was transferred later that year to Watertown Arsenal, Watertown[298], MA. American Cyanamid Company succeeded MIT in operating

296 DOE: **Radiological Survey Results at 15 Cliff Street, Beverly, Massachusetts** (VB014) / R. D. Foley and R. F. Carder. 1992. - 20 pp. - http://www.osti.gov/bridge/servlets/purl/10180507-rmBFMe/10180507.pdf
Formerly Utilized Sites Remedial Action Program (FUSRAP): **Post-Remedial Action Report for the Remedial Action at the Ventron Site. Beverly, Massachusetts**. 2003. - 82 pp.
- http://www.lm.doe.gov/Beverly/MA_04-7.pdf

297 Formerly Utilized Sites Remedial Action Program: Elimination Report for Winchester Engineering and Analytical Center (Northeastern Radiological Health Laboratory) Winchester, Massachusetts. Undated. - 18 pp.

298 Formerly utilized MED/AEC sites remedial action program : **Radiological survey of the Building Site 421, United States Watertown Arsenel, Watertown, MA** / prepared for U.S. Department of Energy, Assistant Secretary for Environment, Division of Environmental Control Technology ; by Argonne National Laboratory, 1980. - 66 pp.

the project at Watertown Arsenal from 1951 until October 1952, when it was transferred to the Winchester Facility. In 1954, National Lead Company, Inc. took over operations. Beginning in 1959, facility use shifted to laboratory testing of environmental analysis methods pertaining to uranium waste. In 1961, the work was discontinued, and the facility was transferred to the Department of Health, Education and Welfare (HEW) for use as a low-level environmental radiation surveillance laboratory and for analysis of radiopharmaceuticals. The facility is now run by the Food and Drug Administration. Contractors: National Lead Company (1954-1961); American Cyanamid (1952-1954).

•MA **Woburn Landfill**[299] Woburn AWE - 1955-1960 - Fifty 55-gallon drums of low grade uranium ore were buried at the Woburn site. The material came from the AEC Raw Materials Development Laboratory (see the Winchester Engineering and Analytical Center) operated by the National Lead Company from 1955-1960.

•MA **Watertown Arsenal**[300], Building No. 100, Watertown, Middlesex AWE - In 1959-1960, the Horace Hardy Lester Reactor was constructed on site, for material research programs, and operated there until 1970. ARL-Watertown was formerly the Materiels Technology Laboratory (MTL) and the Materiel and Mechanics Research Center. The NRC licensed MTL to research and develop alloys and to explore military applications of DU.

•MA **Wyman Gordon Forgings Inc.** Grayton, North Grafton BE - 1959-1965 – Wyman Gordon supplied beryllium powder forgings and beryllium blanks to the Rocky Flats plant and beryllium metal and parts to the Y-12 plant. Now, WG' s North Grafton plant, located at 244 Worcester Street (Route 122), manufactures large metal parts, primarily for the military and the aerospace industry. Operations conducted at the plant include forging, milling, and etching.

299 **Evaluation of Environmental Concerns and Cancer Incidence, 2000-2003, Related to the Woburn Landfill in Woburn, Middlesex County, Massachusetts**: Woburn sanitary Landfill. Massachusetts Department of Public Health. Bureau of Environmental Health. Community Assessment Program. Boston, Massachusetts. Undated. - 145 pp.

300 U. S. Environmental Protection Agency: **Final Third Five-Year Review / Report. U.S. Army Materials Technology Laboratory Watertown, Massachusetts.** January 2011. 158 pp.
- http://www.epa.gov/region1/superfund/sites/amtl/454689.pdf

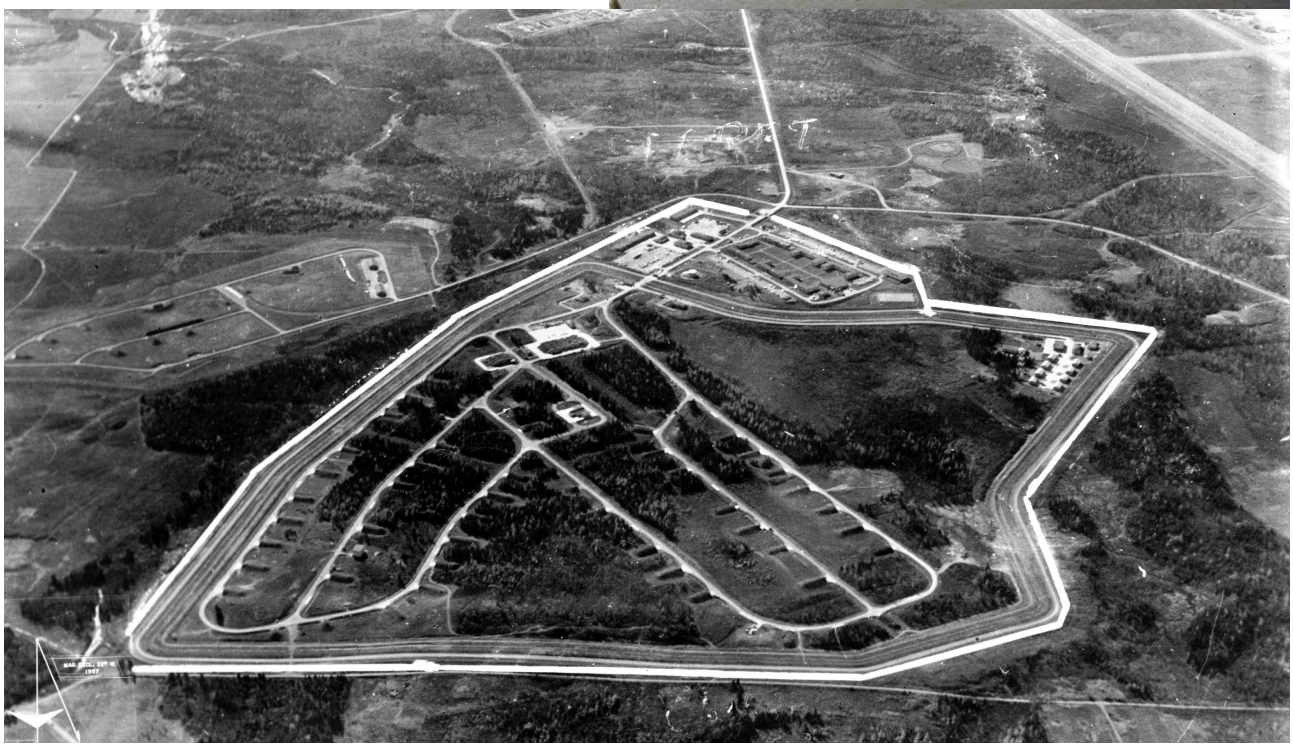
•MD **Aberdeen Proving Ground**[301] Aberdeen AWE formerly Sandy Hook Proving Ground - Tests of DU. Nuclear weapons at the Aberdeen Proving Ground included the Davy Crockett and the W54 Nuclear Warhead. Also there was the Ballistic Research Laboratory, now the United States Army Research Laboratory, and the Edgewood Chemical Activity located at the proving ground.
•MD **Armco-Rustless Iron & Steel Co.**[302] Baltimore AWE - 1948 - Armco-Rustless Iron and Steel Co. rolled eight billets of uranium for the AEC. It was a one time test of rolling.
•MD **Johns Hopkins University, Applied Physics Laboratory**[303] Baltimore DOE -1951 suggested nuclear targets for the Far East Command.[304]

301 WISE Uranium Project: **Bibliography: Military Use of Depleted Uranium (DU)**. (last updated 30 Apr 2008) - http://www.wise-uranium.org/dlit.html
Oxenberg, Tanya Palmateer: Subsurface transformations of depleted uranium at Aberdeen Proving Ground, Maryland. Ph.D., The John Hopkins University. 2007. - 364 pp. - http://gradworks.umi.com/3262364.pdf
'Approximately 130,000 kg of depleted uranium (DU) from ammunition testing have been deposited in soils since 1974 and remain in the environment at Aberdeen Proving Ground.'
302 DOE Letter; Wallo to Campbell; Elimination of ARMCO Facility from Further Consideration Under FUSRAP; November 17, 1987. - 1 p.
- http://www.lm.doe.gov/Considered_Sites/Armco-Rustless_Iron_and_Steel_-_MD_03/MD_03-1.pdf
'we are eliminating your site from further consideration under FUSRAP. The basis for the elimination Is the fact that the operation was of short duration and only involved a limited amount of uranium. This coupled with the fact that your company has performed several radiological surveys (for other activities) since the time of the AEC activities, suggests that there is no potential residual radioactive material derived from these activities to cause exposures that would exceed dose guidelines for the general public.'
303 **The nuclear taboo**: the United States and the non-use of nuclear weapons. / Nina Tannenwald. Cambridge University Press, 2007 - 449 pp, partly here:
- http://wiki.victorybriefs.com/downloads/0816/Tannenwald_99_The_Nuclear_Taboo.pdf
304 **War and state terrorism: the United States, Japan, and the Asia-Pacific in the long twentieth century**. / Mark Selden, Alvin Y. So. / Rowman & Littlefield, 2004 - 293 pp.
- http://books.google.dk/books/about/War_and_state_terrorism.html?hl=da&id=D0icvm2EQLIC

•MD **Rogers Iron**[305] Joplin DOE - provided goods and/or services to the Fernald facility as subcontractor.

•MD **W.R. Grace and Company**[306] Curtis Bay AWE/DOE - 1955-1958 - Processing of radioactive materials at W.R. Grace began in July 1955 when Rare Earths, Inc. (W.R. Grace's predecessor) entered into a contract with the Atomic Energy Commission to extract thorium and rare earths from naturally-occurring monazite sands. In 1956, the AEC contract and Rare Earths' license to possess, transfer, and use radioactive thorium were transferred to W.R. Grace & Company. The facility where thorium processing took place (Building 23) operated until late spring of 1957, when W.R. Grace and the AEC agreed to terminate the contract, effective January 31, 1958.

•ME **Bath Iron Works**[307] Bath DOE - The shipyard, owned by General Dynamics, has built warships which later was nuclear weapons equipped and The Aegis Ballistic Missile Defense System (BMD) role of the class become that all ships of the class are being updated with BMD capability.



Loring Air Force Base, Weapons Storage Area.
Source: Historic American Engineering Record, Library of Congress

305 DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; August 29, 1994. - 3 pp.
- http://www.lm.doe.gov/Considered_Sites/Gleason_Works_-_NY_55/

306 National Institute for Occupational Safety and Health: **SEC Petition Evaluation Report Petition SEC-00182: W.R. Grace and Company (Maryland)**. / Ray Clark, Bob Coblentz, Jason Davis, Joe Guido. 2011. - 58 pp. - http://www.cdc.gov/niosh/ocas/pdfs/sec/wrgracemd/wrgracemder-182-r0.pdf

307 **Moving from a War Economy to a Peace Economy**. / Mary Beth Sullivan Published in the January / February 2012 Humanist.
- http://thehumanist.org/january-february-2012/moving-from-a-war-economy-to-a-peace-economy/

•ME **Caribou Air Force Station** or **North River Depot** and **East Loring**[308], Loring AFB 1951-1962 - National Nuclear Weapons Stockpile Site It was an Operational Storage Site for Air Materiel Command (AMC-OSS), one of five in the US, and the nuclear weapons storage and maintenance facility for Loring alert aircraft. It was the closest Air Force base on the east coast to Europe. It was originally built with a capacity of 100 B-36 Peacemaker bombers.

•ME **Loring Air Force Base**, Limestone vicinity, Aroostook AWE - Loring Air Force Base is a former United States Air Force base that was under the operational control of the Strategic Air Command (SAC) for most of its existence. In 1992, it was transferred to the newly-established Air Combat Command, and it was finally closed as an active Air Force installation in 1994. The Nuclear Weapons Storage Area at Loring once operated as a separate, top secret facility. Originally called the North River Depot, the remote area to the northeast of Loring's property was the first US. operational site specifically constructed for the storage, assembly, and testing of atomic weapons.

308 **Ammunition and Explosives Storage for the Navy (1939-1989) and the Air Force (1946-1989)**, 2008. - 200 pp. - http://www.denix.osd.mil/cr/upload/af-navy-ammunition-storage-public-rfs_pg1-200_rev.pdf

•MI [General Motors Co.] **AC Spark Plug, Dort Highway Plant**[309] Flint BE - 1946-1947 - There was also a small amount of thorium procurement related to AC Spark Plug in the 1946-1947 timeframe.
•MI **Baker-Perkins Co.**[310] Saginaw DOE - 1956 - On May 14-18 1956, Baker-Perkins performed a test of their mixing equipment for National Lead Company of Ohio (Fernald).

309 **Delphi / AC Spark Plug Demolition Flint Michigan** 2008
- http://www.youtube.com/watch?v=QMRRh8gAII4
310 National Institute for Occupational Safety and Health: **Technical Basis Document for the Baker-Perkins Company Saginaw, Michigan**. 2011. 12 pp.
- http://www.cdc.gov/niosh/ocas/pdfs/tbd/bakerperk-r0.pdf

•MI **Bridgeport Brass Company**, **General Motors** or **the Adrian, Michigan, Site**[311] Adrian DOE - The site encompasses the former General Motors (GM) plant, a large complex covering approximately 17 acres. During the 1950s, the previous owner of the site, the Bridgeport Brass Company, machined and shaped uranium metal under contract with the U.S. Atomic Energy Commission (AEC) for the fabrication of reactor fuel elements in the Hanford, Washington, and Savannah River, South Carolina, nuclear reactors. (The site was sold to Martin Marietta in the early 1960s and then to GM in 1974). At the end of the contract, the site was decontaminated to comply with radiological protection standards in effect at the time. General Motors Corporation remediated radioactive contamination at the site in the 1970s and additional remediation was conducted under FUSRAP in 1995.

•MI **Brush Beryllium Co.**[312] Detroit AWE- 1942-1950s - The Brush Beryllium Company in Detroit, MI, was one of several companies that rolled or extruded uranium rods for Hanford reactor fuel in the late 1940s and early 1950s and the development of a powder metallurgy process, by the Brush Beryllium Co., known originally as Process Q, which yielded a fine grained beryllium suitable for fabrication.. In 1950, Hanford began making rolled uranium rods on site, but the Atomic Energy Commission shifted

311 DOE Report; **Independent Radiological Verification Survey Results for the Remedial Action Performed at the Former Bridgeport Brass Company Facility, Adrian, Michigan** (AD001V); August 2002. - 17 pp. - http://www.lm.doe.gov/Adrian/MI_01-8.pdf

312 **Mechanical Properties of Beryllium Fabricated By Powder Metallurgy** by W. W. Beaver and K. G. Wikle. May 1954, Journal of Metals.

the rolling work to the Fernald, OH, Feed Materials Production Center and its supporting contractors in 1952. A number of private companies, including Brush Beryllium Company, contracted with Fernald to provide Hanford with these rolled rods.

•MI **Carboloy Co.** Detroit AWE - 1956 - In 1956, the Carboloy Company conducted operations to turn down the outer diameter of uranium slugs.

•MI **Extruded Metals Co.** Grand Rapids AWE - 1944 - A November 7, 1944, document indicates that Extruded Metals participated in work related to metal fabrication for the Manhattan Project.

•MI **Gerity-Michigan Corp.** Adrian BE - 1949-1950s - Gerity-Michigan operated a 2200/550 ton tube and rod extrusion press and performed the first extrusion of beryllium there on May 11, 1949 for the AEC.

•MI **Michigan Technological University**[313] Ann Arbor AWE - 1944 - The University of Michigan developed radar fuses and conducted ordnance research to assist Los Alamos in atomic bomb research and production.

•MI **Mitts & Merrel Co.**[314] Saginaw AWE - 1956 - In a test for National Lead of Ohio

313 **Michigan Tech and the Manhattan Project** / Marcia Goodrich. Michigan Tech Magazine, 2007.
- http://www.mtu.edu/umc/services/pr-news/magazine/pdf/spring07-tech-mag-1.pdf

314 DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; December 23, 1993. - 1 p.
- http://www.lm.doe.gov/Considered_Sites/Sutton_Steele_and_Steele_Co_-_TX_09.aspx
'In each case, the potential for radiological contamination above applicable guidelines is small. In each case the amounts of radioactive materials handled was small. Based on these considerations, these sites are hereby eliminated from further consideration under the Formerly Utilized Sites Remedial Action Program.'
National Institute for Occupational Safety and Health: **Site Profiles for Atomic Weapons Employers that**

(Fernald), Mitts and Merrell reduced a thorium metal chunk to small particle size pieces in its Hog Grinder.

•MI **Oliver Corp.** Battle Creek AWE - 1956-1957; 1961-1962 - The Oliver Corporation participated in green salt briquetting testing for the National Lead Company of Ohio (Fernald). Records indicate that testing took place in November 1956, July 1957, May 1961 and May 1962.

•MI **Revere Copper and Brass** Detroit AWE/BE - BE 1946-1950; AWE 1943-1954 - Revere Copper and Brass extruded uranium rods at its Detroit plant starting in 1943 under contracts for the Atomic Energy Commission (AEC). Additionally, in October 1964, Revere Copper and Brass produced one thorium bar, which was divided up and sent to a number of AEC facilities. Revere also extruded beryllium ingots and billets into rods at its Detroit plant between 1946 and 1950. Revere had a contract with the AEC for beryllium work, but not with the MED. Revere also worked with beryllium alloys. Some of the beryllium work was done on parts or components for the Materials Testing reactor.

•MI **A.O. Smith Corporation** 1948-1950 - A.O. Smith studied methods for protecting beryllium carbide-matrix bodies for the Nuclear Energy for the Propulsion of Aircraft (NEPA) project

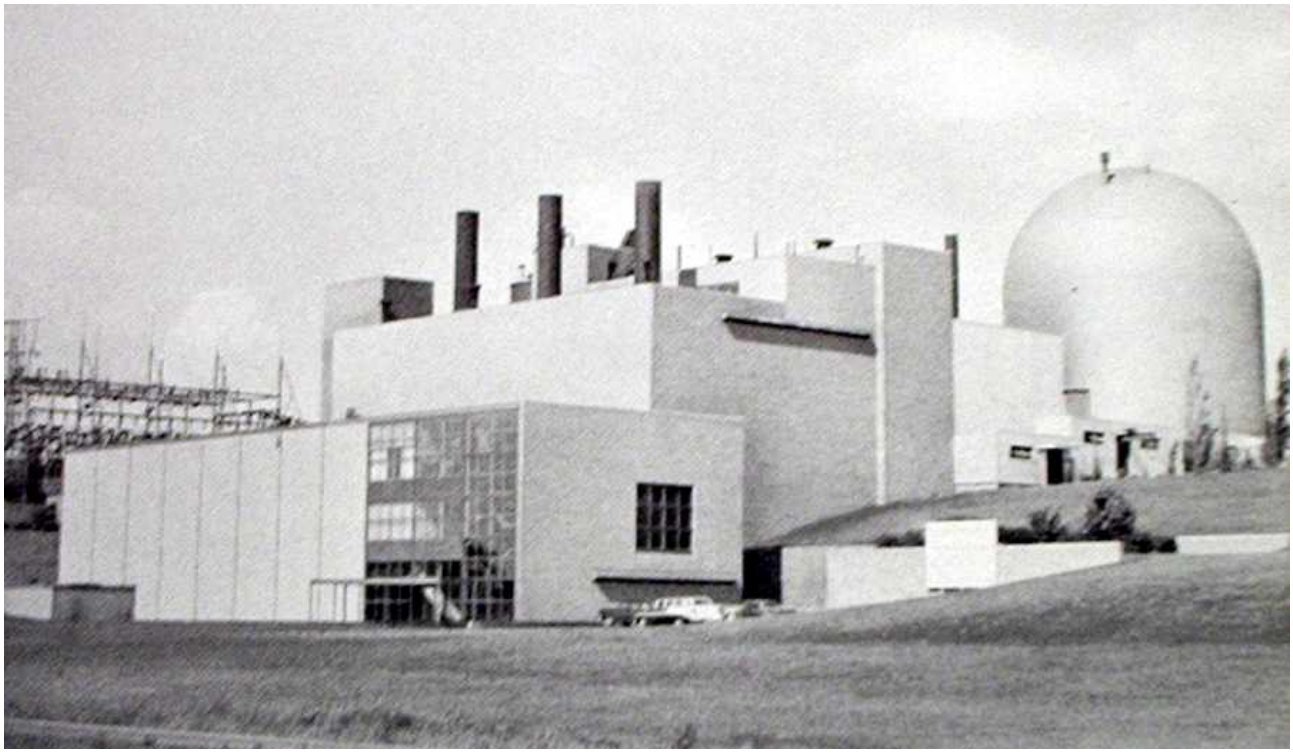
•MI **Speedring Experimental & Tool Company** Detroit BE -

•MI **Speedring Systems, Inc.** Detroit BE- 1963; 1968; 1973-1975; 1992 - Speedring machined beryllium-containing parts for Rocky Flats and Y-12. The Detroit Speedring office designation covers both of the locations to which the Detroit forwarding office sent work, including their locations in Warren, MI and Rochester Hills, MI. There is a separate Speedring facility in Culman, Alabama.

•MI **Star Cutter Corp.** Farmington AWE - 1956 - The Star Cutter Corporation manufactured machine tools. Records indicate that National Lead of Ohio (Fernald) conducted a one-time test of a Star Cutter drill to hollow uranium slugs.

MI **Wolverine Tube Division**[315] Detroit AWE/BE - 1943-1946 - In 1943, the University of Chicago subcontracted to Wolverine Tube of Detroit, Michigan, for help in extrusion of metals that were needed as part of the Manhattan Project. Wolverine Tube performed research on the fabrication of aluminum slugs and the process of aluminum canning and also experimented with thorium and beryllium. This contract ended in 1946.

315 **James Francis Schumar, 85: Pioneer metallurgist in uranium** / Joan Giangrasse Kates. Special to the Chicago Tribune, August 03, 2002. James Francis Schumar, 85, of Hinsdale, a retired senior scientist from Argonne National Laboratory and a pioneering metallurgist in the study of uranium who worked on the Manhattan Project ...



•MN[316] **Elk River Reactor**[317] Elk River DOE - 1962-1968 - The Elk River Reactor in Minnesota was constructed by the AEC as part of its power reactor demonstration program. The Rural Cooperative Power Association received a contract for the dismantling of the reactor and the removal of all detectable reactor radioactivity when operations ceased.

• MN **Alliant Techsystems Inc.** Edina DOE - Alliant Techsystems (formerly Hercules Powder Company and Thiokol Chemical[318] to 1995) has produced propulsion systems for NASA and all branches of Department of Defense (DOD) services for 50 years. Factories in Bacchus, southwest Salt Lake City. In 2000, the company also acquired the remote Thiokol rocket plant at Promontory, the other large explosives and propellant plant in northern Utah. Programs that used, or are using, Alliant propulsion systems and fuels include the following: Polaris, Poseidon, Trident, Pershing, Scout, Nike, Shrike, Sparrow, Phoenix, Honest John, Sidewinder, Pioneer, Telstar, Explorer, Vanguard, Tiros, Alto, Echo, and the Space Shuttle. In addition to

316 Minnesota Department of Health: **Hazardous Sites and Substances in Minnesota**.
- http://www.health.state.mn.us/divs/eh/hazardous/sites/sitesbyname.html#w

317 DOE: Memorandum/Checklist; Jones to File; Subject: **Elimination Report - Elk River**; October 15, 1985. - 8 pp. - http://www.lm.doe.gov/Considered_Sites/E/Elk_River_Reactor_-_MN_01/MN_01-1.pdf

Examination of an irradiated prototype fuel element for the Elk River Reactor / L. A. Neimark. Argonne National Laboratory. 1961. - 21 pp.
- http://www.osti.gov/bridge/servlets/purl/4069257-WrGjSW/4069257.pdf

Elk River Reactor Vessel Cladding Effects. Allis-Chalmers Mfg. Co. Nuclear Power Dept., Washington, D.C., 1961. - 34 pp.

'Examination of the Elk River reactor vessel after performance of the initial preoperational testing program revealed several cracks and flaws in the stainless steel welded overlay on the vessel and head flange forgings. A description is presented concerning the characteristics of these defects and their cause. '

318 **Measure**: A monthly magazine for the Hewlett·Packard family of affiliated companies, July, 1963.
- http://www.hparchive.com/measure_magazine/HP-Measure-1963-07.pdf

'Principal customers served from the Denver office include a large Dow Chemical-AEC facility, the Air Force Academy, Martin-Denver, and the National Bureau of Standards at Boulder. Sperry Utah, Hercules Powder Company, and Thiokol Chemical are handled out of Salt Lake City.'

propellant fuels and solid rocket engines, Alliant was a pioneer in the development of materials and structures for large strategic rocket motors. Alliant produces rocket motors and rocket motor components for the following tactical missiles:
AGM-88A/B/C HARM
AGM-114A/B HELLFIRE
AIM-7 Sparrow
AIM-9 Sidewinder
AIM-9X Sidewinder
AIM-54A/C/C+ Phoenix
AIM-120A AMRAAM
BGM-71 TOW
FGM-77 DRAGON
FGM-148 Javelin
MIM-72 Chaparral
MIM-104 Patriot
Predator
RIM-66/67 Standard
Alliant was also involved in the manufacture of motors for the following strategic missile programs:
LGM-30F/LGM-30G Minuteman
MGM-118A Peacekeeper
UGM-133A Trident II
•MO **Eagle-Picher Technologies**[319] Joplin BE

319 **Documentation of Environmental Indicator Determination RCRA Corrective Action. Environmental Indicator**: Eagle-Picher Technologies, LLC, Joplin. Undated. - 25 pp.
- http://www.epa.gov/region7/waste/pdf/EaglePicherCA725.pdf
p 12: 'In surface soil, arsenic, barium, beryllium, chromium, lead, and mercury have all exceeded MDNR's CALM target concentrations for industrial soil and residential soil.'

Drums that contain radioactive waste can become radioactive waste themselves, as seen here at the Hazelwood Interim Storage Site outside St. Louis. Source: Linking Legacies.

•MO **Hazelwood Interim Storage Site & Vicinity** or **Latty Avenue Properties, Futura Coatings, Futura Chemical Company Facility**[320] Latty Avenue, Hazelwood, Missouri. 1994. AWE - In early 1966, ore residues and uranium- and radium-bearing process wastes that had been stored at SLAPS were purchased by the Continental Mining and Milling Company and moved to a storage site on Latty Avenue. These wastes had been generated at the Mallinckrodt plant in St. Louis from 1942 through the late 1950s under contracts with MED/AEC. Residues on the property at that time included 74,000 tons of Belgian Congo pitchblende raffinate containing approximately 13 tons of uranium; 32,500 tons of Colorado raffinate containing roughly 48 tons of uranium; and 8,700 tons of leached barium sulfate containing about 7 tons of uranium. The Commercial Discount Corporation of Chicago, Illinois, purchased the residues in January 1967.

320 **Environmental Surveillance Results for 1994 for the Hazelwood Interim Storage Site**, 1995. - 54 pp.; FUSRAP Technical Memorandum No. 140-95-01 I Rev 0 ESR I994 - HISS.

Feasibility Study St. Louis North County Site - FUSRAP Final May 1, 2003. U.S. Army Corps of Engineers, St. Louis District Office, Formerly Utilized Sites Remedial Action Program. - 829 pp

North St. Louis County Sites Annual Environmental Monitoring Data and Analysis Report for CY 2010. U.S. Army Corps of Engineers, St. Louis District Office, Formerly Utilized Sites Remedial Action Program. - 469 pp. 'This Environmental Monitoring Data and Analysis Report provides an evaluation of the data collected as part of the implementation of the Environmental Monitoring Program for the NC Sites within the FUSRAP. Environmental monitoring of various media at the Latty Avenue Properties (Futura Coatings Company, Hazelwood Interim StorageSite [HISS], and other Vicinity Properties [VPs]), [and] the St. Louis Airport Site (SLAPS).'

In January 1967 Commercial Discount Corporation of Chicago seized the assets of Continental Mining and Milling Co., including the residues, in a foreclosure action, dried them and shipped them to their Canyon City, Colorado Uranium Mill except for 8,700 tons of leached barium sulfate residues. These residues, which were not considered economical to process were mixed with an estimated 39,000 tons of soil removed from the top 12 to 18 inches of the Latty property. Most of the residues were shipped to a landfill. The soil was removed in an effort by Cotter Corporation to decontaminate the site. Shipment to the landfill was without the knowledge or approval of the Atomic Energy Commission. In December 1970, an estimated 10,000 tons of Colorado raffinate and 8,700 tons of leached barium sulfate remained at the Latty Avenue properties.

•MO **Hematite Fuel Fabrication Facility** Festus DOE

•MO **Mallinckrodt Chemical Co.**[321],Destrehan St. Plant St. Louis AWE/DOE - 1942-1962 - From 1942 to 1957, Mallinckrodt Chemical Company conducted a variety of milling and recovery operations with uranium chemical compounds at the St. Louis Downtown Site, also known as the Destrehan Street Plant. The plant refined uranium ore, ultimately producing uranium metal. The activities supported research, development, and production programs for the national defense program. By 1957, the Mallinckrodt Chemical Company had processed more than 45,000 metric tons (50,000 tons) of natural uranium products at its facilities. During closeout of operations in 1957, government-owned buildings were either dismantled or transferred to Mallinckrodt as part of a settlement. Decontamination work continued to 1962 when the plant was released back to Mallinckrodt.

•MO **Medart Co.** St. Louis AWE - 1951-1952 - The Medart Company manufactured steel mill machining equipment which was useful in uranium processing.

•MO **Roger Iron Co.** Joplin AWE - 1956 - The Roger Iron Company conducted a test Operation involving crushing of a dolomite c-liner for the AEC. The liner had trace amounts of uranium and magnesium fluoride.

•MO **Spencer Chemical Co.** Kansas City AWE - 1956-1961 - The Spencer Chemical Company, Jayhawks Works, processed unirradiated uranium scrap for the AEC, recovering enriched uranium from it for use in the weapons complex.

321 National Institute for Occupational Safety and Health: **Basis for Development of an Exposure Matrix for the Mallinckrodt Chemical Company St. Louis Downtown Site and the St. Louis Airport Site, St. Louis, Missouri** / Janet L. Westbrook and Cindy W. Bloom. 2010. -242 pp.
- http://www.cdc.gov/niosh/ocas/pdfs/tbd/mallink-r3.pdf

Public Perceptions of a Radioactively Contaminated Site: Concerns, Remediation Preferences, and Desired Involvement. / David L. Feldman2 and Ruth A. Hanahan. Environmental Health Perspectives. Volume 104, Number 12, December 1996 pp 1344-1352.

•MO **St. Louis Airport Site**[322] St. Louis AWE/DOE - 1947 -1973; 1984-1998 - The Manhattan Engineer District (MED) began utilizing the St. Louis Airport Storage Site (SLAPS) in 1946 as a place to store residues from the Mallinckrodt Chemical Works. Uranium extraction was performed by the Mallinckrodt Chemical Works, under a contract with the MED, at its Destrehan Street Plant in St. Louis, Missouri. For the initial years of operation, only pitchblende ores from the Belgian Congo were processed. Later, domestic ores of much lower uranium assay from western states were also processed.

The MED acquired title to the property on January 3, 1947. In 1973 the property was transferred back to the city of St. Louis. Then in 1984, through the Energy and Water Development Appropriations Act (Public Law 98-3060) the property was returned to the Department of Energy until 1997 when Congress transferred it to the US. Army Corps of Engineers.

•MO **Tyson Valley Powder Farm** St. Louis AWE - 1942-1949 - The Tyson Valley Powder Farm was a storage site for radioactive materials in the late 1940s. Records show, for example, that at the end of 1946, 206,110 pounds of uranium metal were stored at this location for the Manhattan Engineer District.

322 Formerly utilized MED/AEC sites remedial action program : **Radiological survey of the St. Louis Airport storage site, St. Louis, Missouri** / prepared for U.S. Department of Energy, Assistant Secretary for Environment, [Office of Environmental Compliance and Overview], Division of Environmental Control Technology, by Oak Ridge National Laboratory ; W. A. Goldsmith ... [et al.], 1979. - vii, 119 pp.

National Institute for Occupational Safety and Health: **SEC Petition Evaluation Report: Petition SEC-00150**: St. Louis Airport Storage Site. / Roger Halsey, Joseph Guido, Paul Ruhter. 2010. - http://www.cdc.gov/niosh/ocas/pdfs/sec/slaps/slapser-150-r0.pdf

•MO **United Nuclear Corp.**[323] Hematite AWE - 1958-1973 - The United Nuclear Corporation in Hematite, Missouri, processed unirradiated uranium scrap for the AEC, recovering enriched uranium from it for use in the nuclear weapons complex.
The property consists of approximately 228 acres. The operating facility consists of two main plant buildings, an administration and several support buildings, and a parking area. Plant operations included low-enriched uranium fuel fabrication, processing and treating uranium compounds, including all forms of uranium from depleted to enriched uranium, and thorium fuel. Contamination at the site consists of uranium and thorium in the soil and groundwater. Mallinckrodt Chemical Works built the plant which became operational in July 1956. The plant initially produced uranium products for use in the naval nuclear fuel program. Ownership transferred to United Nuclear Corporation in May of 1961. In 1970 the operator became Gulf United Nuclear Fuels Corporation, which was a joint venture between UNC and Gulf Nuclear Corporation.

323 **Remedial Investigation Feasibility Study Work Plan for the Westinghouse Electric Company LLC. Hematite Missouri Facility**. - St. Louis, : Leggette, Brashears and Graham, Inc. 2003. - 459 pp. - http://www.dnr.mo.gov/env/hwp/news/hrs-ri-fs-rev0-20030509.pdf

National Institute for Occupational Safety and Health: **Site Profiles for Atomic Weapons Employers that Refined Uranium and Thorium - Appendix D United Nuclear Corp.** / David Allen. 2010. - 12 pp. - http://www.cdc.gov/niosh/ocas/pdfs/arch/oc-6001-apd-r1.pdf

National Institute for Occupational Safety and Health: **White Paper: SEC-00116 United Nuclear Corporation Petitioner Issues** / Ray Clark. 2011. 8 pp. - http://www.cdc.gov/niosh/ocas/pdfs/dps/uncsec116dp-r0.pdf

'Issue 5: Workers often wore their work clothes home, thus contaminating their homes and families.'

Technical Basis Document for the United Nuclear Corporation, Hematite, Missouri / David Allen. National Institute for Occupational Safety and Health (NIOSH), Division of Compensation Analysis and Support; March 21, 201l. - 15 pp. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/unc-r0.pdf

The facility was closed in 1973 and sold to Combustion Engineering in May of 1974. In 1989 Asea Brown Boveri (ABB) began operating the facility as ABB Combustion Engineering. In April of 2000, Westinghouse purchased the nuclear operations of ABB which included the Hematite facility (Westinghouse 2003). The nuclear fuel plant in Hematite, Missouri, was closed in summer 2001.

•MO **Weldon Spring Plant**[324] or **Weldon Spring Ordnance Works** Weldon Spring DOE - 1955-1966 - On January 25, 1955, through a permit from the US. Department of the Army (Army), the US. Atomic Energy Commission (AEC) occupied land on the Army's Weldon Springs Ordnance Works for a planned uranium facility. On August 6, 1956, the Army transferred 205 acres of what had been the Weldon Springs Ordnance Works to AEC for construction of a uranium feed materials plant. AEC constructed the Weldon Spring Uranium Feed Materials Plant at this location and contracted with the Mallinckrodt Chemical Company to operate the plant starting in June 1957. The plant was used for uranium refining activities in support of the national defense program. AEC closed the plant in December 1966 after deciding it was obsolete. After

324 **Analysis of Leukemia Incidence (1996-2000) and Mortality (1994-2002) Data in St. Charles County, and Weldon Spring and Surrounding Areas**. Missouri Department of Health and Senior Services. Division of Community Health, 2005. - 9 pp. - http://health.mo.gov/data/pdf/weldonspringcancerreport.pdf

'The Weldon Spring site is an area in St. Charles County, about 30 miles west of St. Louis, that was contaminated with hazardous radiological and chemical substances. The contamination stems from production of 2, 4, 6 – trinitrotoluene (TNT) and 2, 4 and 2,6 Dinitrotoluene (DNT) by the U.S. Department of Army from 1941 to 1945 and from enrichment of uranium ore and thorium processing by the Atomic Energy Commission from 1958 to 1966.'

Issues Matrix for the Weldon Spring Site Special Exposure Cohort Petition and NIOSH Evaluation report, and SC&A's review of the Weldon Spring Site Profile / S. Cohen & Associates, Vienna, Virginia, 2011. - 29 pp. - http://www.cdc.gov/niosh/ocas/pdfs/abrwh/scarpts/sca-weldonsp-143sp-r0.pdf

National Institute for Occupational Safety and Health: **Weldon Spring Plant – Site Description**. / Craig A. Little and Laura McDowell-Boyer, 2005. - 39 pp. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/weldon2.pdf

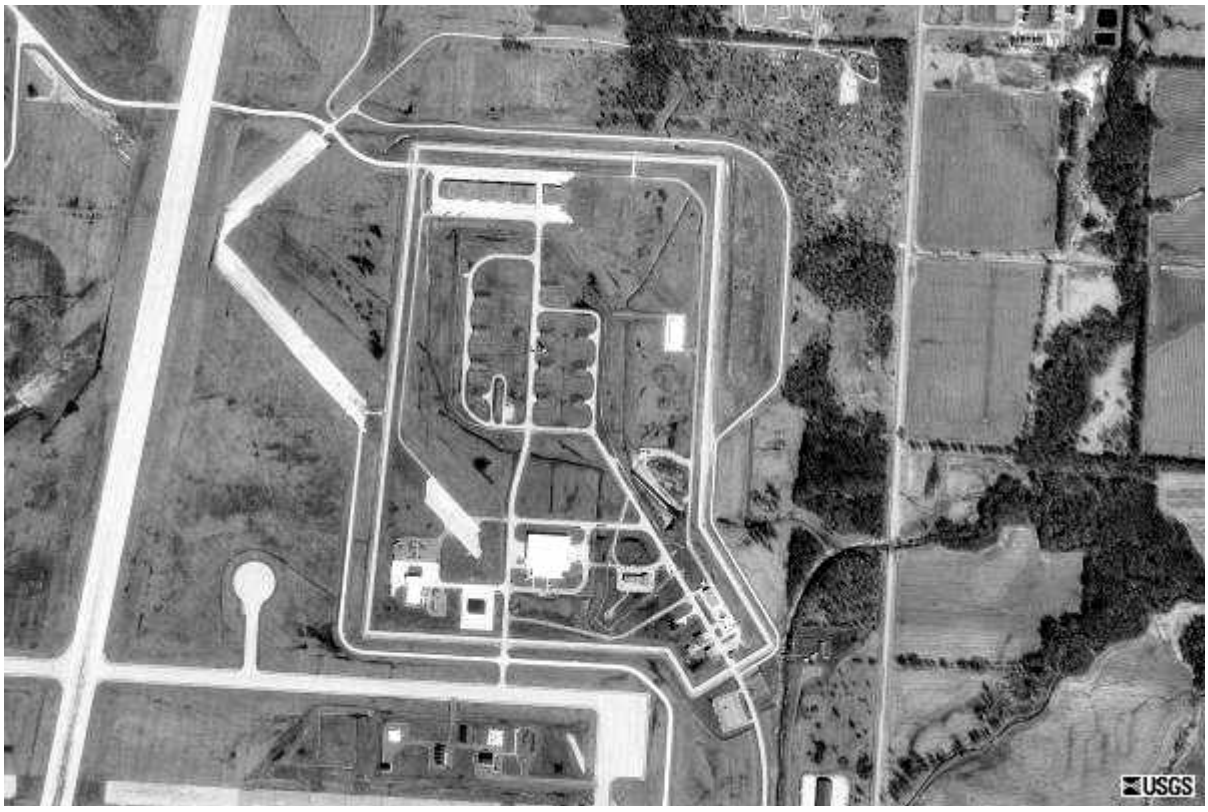
closing the plant, AEC transferred the plant and the land back to the Army on December 31, 1967. On October 1, 1985, custody of the chemical plant was retransferred from the Army back to the DOE, which was given responsibility for remediation of the plant.

Contaminated groundwater still exists. The area is under institutional controls and monitoring until natural flushing reduces contaminates to acceptable levels. Contractors: Mallinckrodt Chemical Company (1957-1966), National Lead of Ohio (1975-1981); Bechtel National Inc. (1981-1985); MK-Ferguson Company and Jacobs Engineering Group (1986-2002).

•MO **Weldon Spring Raffinate Pits**[325] Weldon Spring DOE - 1955-1966 - On January 25, 1955, the US. Atomic Energy Commission (AEC) occupied land, by a permit from the US. Department of the Army, to build a uranium feed materials plant. On August 6, 1956, the Army transferred 205 acres of what had been the Weldon Springs Ordnance Works to AEC to construct the plant. In addition to the plant, the AEC also constructed four raffinate pits adjacent to the plant between 1958 and 1964. The pit area expansion was located on an additional 14.88 acres transferred by the Army to AEC on August 24, 1964. The pits were used as collection points and settling basins for chemical and radioactive waste streams coming from the plant. After closing the plant (including the associated raffinate pits) in December 1966, AEC transferred the land back to the Army, but AEC retained ownership and control of the wastes in the raffinate pits. On October 1, 1985, the land was retransferred from the

325 **Analysis of potential groundwater contamination in the vicinity of the Weldon Spring Raffinate Pits site, Weldon Spring, Missouri** / Tsai, S.Y. ; Peterson, J.M. ; Winters, M.C.B. . Argonne National Lab., IL (USA) . 1984. - 35 pp - http://www.osti.gov/bridge/servlets/purl/6805777-fvRruM/6805777.pdf

Army back to the DOE, which was given responsibility for remediation of the pits. Contaminated groundwater still exists. The area is under institutional controls and monitoring until natural flushing reduces contaminates to acceptable levels. Contractors: Mallinckrodt Chemical Company (1957–1966); National Lead of Ohio (1966–1981); Bechtel National, Inc. (1981–1985); M-K Ferguson Company and Jacobs Engineering Group (1986–2002.)



The Weapons Storage Area. Source: Whiteman AFB Minuteman Missile Site Coordinates

•MO **Whiteman Air Force Base and Minuteman II Sites**[326] Warrensburg AWE - ,

326 **Final 2009 Five-Year Review Report - Environmental Restoration Program, Whiteman Air Force Base, MO**, March 2010. - 311 pp. Includes maps.

including the Oscar-01 Minuteman II ICBM Launch Control Facility. Established as the Sedalia Glider Base, 1 March 1942 The first B-47 arrived on March 25, 1954 and six months later the first KC-97 arrived. In June 1961, the Department of Defense chose Whiteman to host the fourth Minuteman ICBM wing. On Jan. 17, 1962, the firm of Morrison, Hardeman, Perrini, and Level, a joint venture consisting of Morrison-Knudsen Company, Inc., Paul Hardeman, Inc., Perini Corporation, and C. H. Leavell & Company[327], received the prime contract for construction of hardened, underground launch facilities and 15 launch control centers.

Construction began on Whiteman's ranges in 1962, at a cost of $75 million. The now-inactive 351st Strategic Missile Wing dispersed its arsenal - 150 silos and 15 launch control facilities - over 14 counties and more than 10,000 square miles, an area bigger than Massachusetts. Silos were built three to five miles apart to avoid the possibility

- http://www.dnr.mo.gov/env/hwp/docs/Whiteman_Final_2009_5-Year_Review.pdf

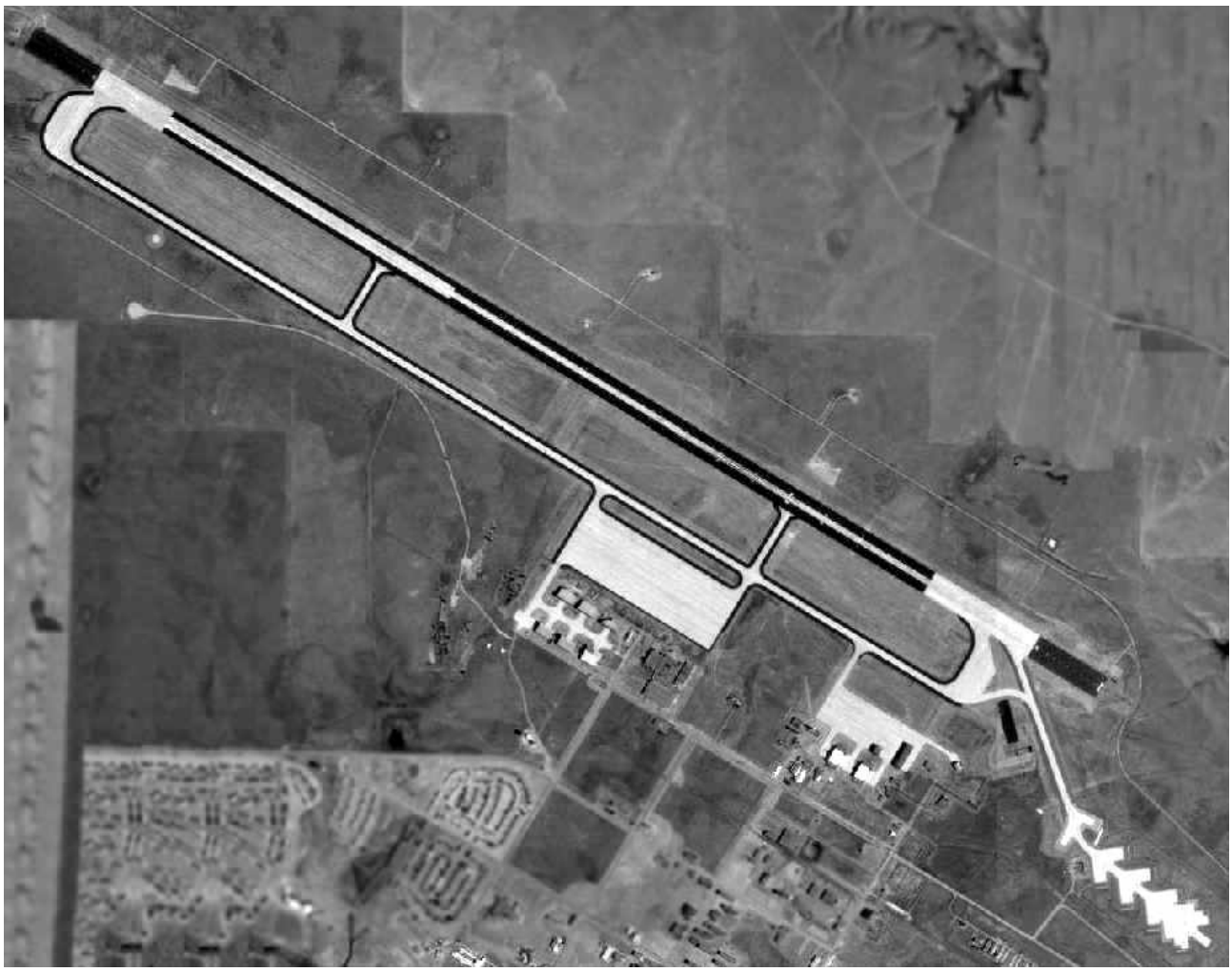
Subterranean bunker converted to historical display / Tech. Sgt. Pat McKenna. Air Force News Agency. Posted 11/7/2007 - http://www.af.mil/news/story.asp?id=123075045

Community coordination plan for basing the B-2 bomber at Whiteman Air Force Base, Missouri. / : Braid, R.B.; Kornegay, F.C.; Lasley, B.D.; Sage, P.; Fichera, J.P.; Lufkin, P.; Taylor, L.. Oak Ridge National Lab., TN (USA); URS Corp., Santa Barbara, CA (USA). 1987. - 103 pp.

'This preliminary report examines the potential community impacts of basing the B-2 bomber at Whiteman Air Force Base (AFB), Missouri. The study focuses on examining the direct and indirect employment, population, and income impacts of the B-2 on the socioeconomic resources of the communities neighboring the base. The specific socioeconomic resources analyzed are housing, education, transportation, land use, utilities, public finance, and community services, such as fire and police protection.'

327 **Morrison-Hardeman-Perini-Leavell v. the United States**. No. 378-65. United States Court of Claims. April 19, 1968. 'Plaintiff's claim, in the amount of $666,740, is for increased labor costs incurred during its performance of a $74,000,000 contract, dated March 20, 1962, for the construction of Minuteman missile facilities.' - http://ftp.resource.org/courts.gov/c/F2/392/392.F2d.988.378-65.html

of a single enemy missile from destroying more than one Minuteman.



•MT **Glasgow Air Force Base**[328] Glasgow, Montana AWE - 1960-1971 Construction began in 1955. Strategic Air Command Glasgow AFB was briefly reactivated as a SAC dispersal base from 1971 to 1976, and was also used as an Army Safeguard ABM depot supporting construction of a second ABM complex northwest of Malmstrom AFB, Montana which was not completed. According to the Health and Safety Plan Portions of the base have been leased to other federal and state agencies and to businesses and has been used to clean and pack ammunition cartridge belt links, clean and repaint ammunition boxes, sew mortar powder bags, and assemble artillery shell primers. The Boeing Company continues to own most of the former Glasgow AFB and it is now known as the Boeing Glasgow Flight Test Facility. The facility supports Boeing Technology Services (BTS) customers and is maintained and operated by Montana Aviation Research Company (MARCO), a subsidiary of The Boeing Company.

328 **Abandoned & Little-Known Airfields Eastern Montana**. / Paul Freeman
- http://www.airfields-freeman.com/MT/Airfields_MT_E.html
Site Health and Safety Plan: **Evaluation of Long Term Monitoring Former Glasgow Air Force Base. Glasgow, Montana**. CDM Federal Programs Corporation. Helena, Montana, 2011. - 154 pp.
- http://cdmsmith.com/

• MT **Malmstrom AFB**[329] Cascade County, Montana AWE – Minuteman III [330]Missile Site. The North American Aerospace Defense Command (NORAD) was created in 1957. Beginning in 1959, Malmstrom was the headquarters of the Great Falls Air Defense Sector, until inactivated in 1966. In 1978, Malmstrom AFB became responsible for the 24th NORAD region, which covered the western half of the North America.

•NC **Beryllium Metals and Chemical Corp.**[331] Bessemer City BE - 1962-1969 - Purchase orders from Y-12 indicate that Beryllium Metals and Chemical Corp. (BER-MET) did some beryllium work for Y-12, beginning in 1963 and continuing at least through 1965. Beryllium Metals & Chemicals Corp., Bessemer City, N.C., a subsidiary of Lithium Corporation of America, Inc., produced a small quantity of electrorefined

329 The Minuteman III refurbishment program began in 1998 as a joint venture between Alliant Techsystems Inc. and Pratt & Whitney. All work was transitioned to ATK inc during 2003 and 2004 following a contract restructuring.

Environmental Assessment for Malmstrom Minuteman III Deactivation / David Ahlborn; Derrick Coleman; Susan Hogan-Conrad; David Jury; Matthew Malle. US Air Force. 2007. - 257 pp. - http://www.dtic.mil/dtic/tr/fulltext/u2/a496029.pdf

330 See also the **Minuteman Missile National Historic Site**, including the Launch Control Facility Delta-01 and the Launch Facility missile silo Delta-09 and Minuteman Missile National Historic Site, general management plan : environmental impact statement / United States National Park Service, 2009. - 28 pp. - http://www.nps.gov/mimi/parkmgmt/upload/Final%20GMP%20Comments.pdf

331 DOE: **Energy Employees Occupational Illness Compensation Act of 2000; List of Covered Facilities**, 2001.

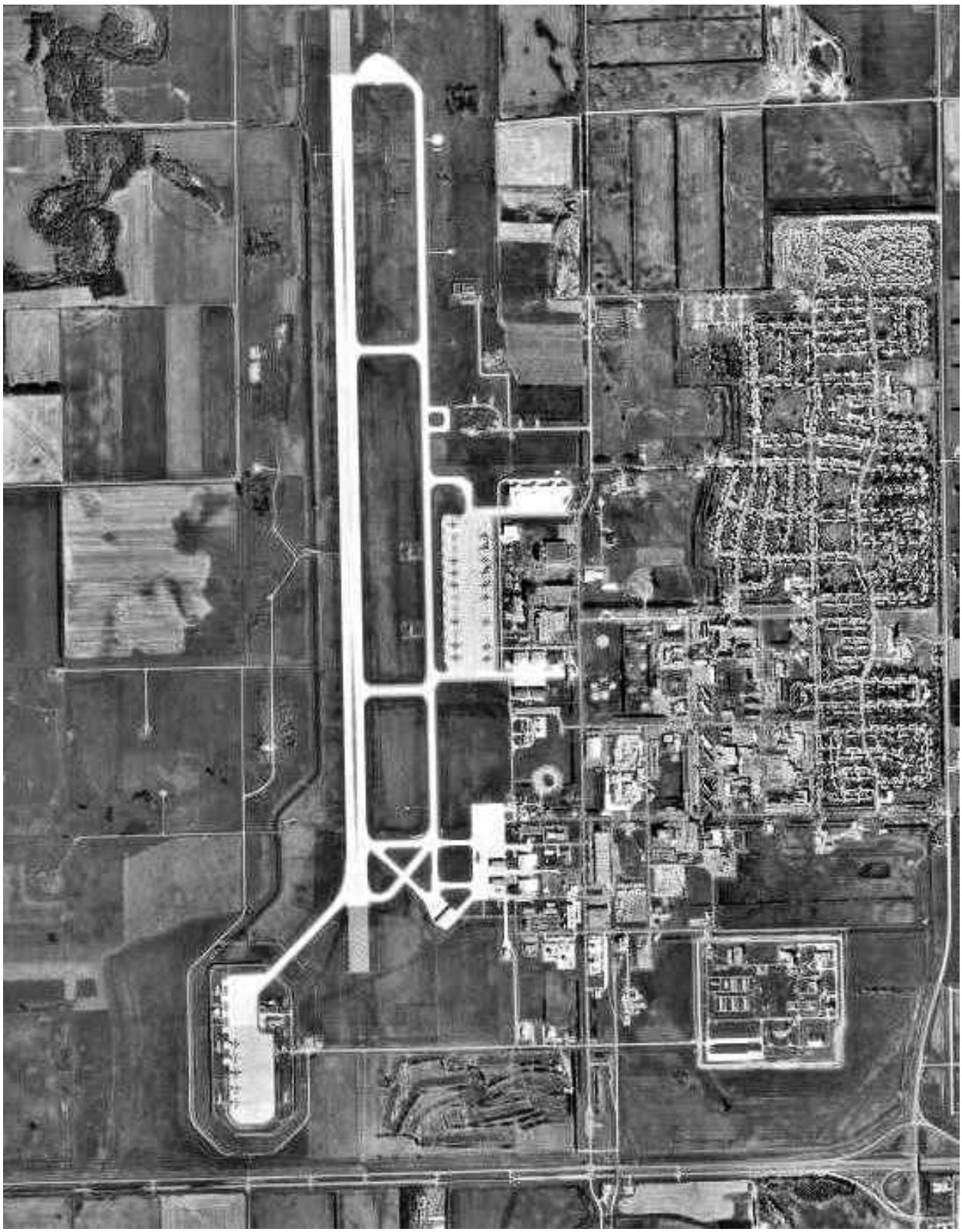
beryllium. [332]

•NC **University of North Carolina**[333] Chapel Hill BE - 1949-1954 - The AEC Division of Biology and Medicine supported beryllium research at the University of North Carolina.

332 Bureau of Mines / Minerals yearbook metals and minerals (except fuels) 1963. Year 1963, Volume I (1964). Eilersten, Donald E.: **Beryllium**, pp. 301-309 .
See also: North Carolina Geological Survey - http://www.geology.enr.state.nc.us/Default.htm

333 DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; December 23, 1993. - 1 p.
- http://www.lm.doe.gov/Considered_Sites/Sutton_Steele_and_Steele_Co_-_TX_09.aspx
'In each case, the potential for radiological contamination above applicable guidelines is small. In each case the amounts of radioactive materials handled was small. Based on these considerations, these sites are hereby eliminated from further consideration under the Formerly Utilized Sites Remedial Action Program.'

•ND **Aurora Pulsed Radiation Simulator**, US. Army Research Laboratory, Building No. 500, Adelphi, Prince George's AWE - The Aurora Pulsed Radiation Simulator was the first gamma radiation simulator of its size and capacity built in the world, The simulator achieved a new plateau of nuclear effects simulation, able to test complete weapons electronics packages critical œor both strategic and tactical nuclear weapons design.



•ND **Grand Forks Air Force Base**[334] Grand Forks AWE - Grand Forks Air Force

334 **Cold War ends with a bang**: Private contractors blow up missile silos / Sharon Cohen, The Associated Press, Mon, August 21, 2000. 'Private contractors implode a former U.S. missile silo in a field near LuVerne, N. D., July 20. The silo, which once housed an intercontinental ballistic missile with nuclear warheads, was destroyed in compliance with the START treaty with Russia.'

Grand Forks AFB Minuteman Missile Site Coordinates, Undated.

Base was established on 1 December 1955, with construction beginning in the fall of that year. It was occupied for use on January 28, 1957. Minuteman III Missile Site. On November 3, 1967, the Department of Defense revealed that Grand Forks AFB was one of 10 initial locations to host a Sentinel Anti-Ballistic Missile (ABM) site. In 1995 the federal Base Realignment and Closure Commission decided to empty the Minuteman III missile silos under the jurisdiction of Grand Forks Air Force Base in eastern North Dakota. The last missile was removed from its silo in June 1998 in preparation for demolishing the silos and their control facilities.

•ND **Minot AFB**, North Dakota AWE 1957-. - Minuteman III Missile Site. Construction of Minot AFB began in May 1956, and the base officially opened on January 10, 1957. Minot AFB is named after the nearby city of Minot, North Dakota. The 91st Missile Wing (91 MW) of the Air Force Global Strike Command is responsible for

- http://asuwlink.uwyo.edu/~jimkirk/gf.html

maintaining the Minuteman III nuclear missiles.
On August 30, 2007, a B-52 took off from Minot AFB carrying six cruise missiles with W-80 Intermediate Yield Strategic Cruise Missile Warheads to Barksdale AFB in Louisiana. No base personnel nor the crew knew the nuclear weapons were aboard. Additionally on 12 July 2008, three Air Force officers fell asleep while in control of an electronic component that contained old launch codes for nuclear intercontinental ballistic missiles.

•ND **Stanley R. Mickelsen Safeguard Complex** Missile Site Control Building Nekoma AWE - The Safeguard Program was a United States Army anti-ballistic missile system developed during the late 1960s. Safeguard was designed to protect US. ICBM missile sites from counterforce attack.

•NE **Cornhusker Army Ammunition Plant**[335] Grand Island AWE - Prior to 1961, this plant shipped explosive powders to nuclear weapons facilities, which fabricated them into explosive lenses for nuclear weapon primaries.

335 EPA: **Cornhusker Army Ammunition Plan**t. 2011. - 9 pp.

•NE **Hallam Sodium Graphite Reactor**[336] Hallam DOE - 1960-1971 - The Atomic Energy Commission (AEC) built and operated the Hallam Nuclear Power Facility in the 1960s. When the AEC retired this facility in 1971, the reactor core and most other radioactive materials were removed from the site; some radioactive materials were entombed in place.

•NE **Indian Springs Air Force Base**[337] 1952-. now Creech Air Force Base - The mission of the Indian Springs Air Force Base was to support nuclear testing at the Nevada Proving Grounds, 30 miles southwest. This included providing logistic and support functions for nuclear test operations from Operation Ranger in 1951 to Operation Storax in 1962..

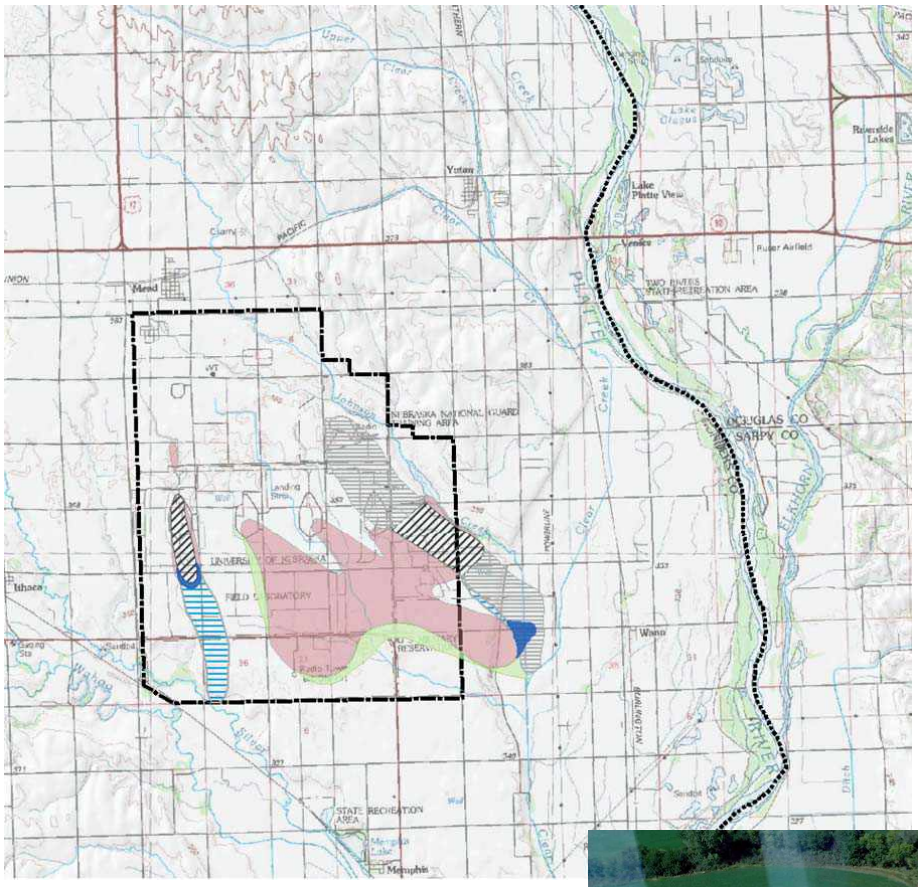
Weather Balloons at Indian Springs Air Force Base

"These captive, helium-filled 'Kytoon' balloons are used to obtain information concerning air pressure, temperature and humidity, as well as other meteorological data during the

336 **Geology and Hydrology of the Site of the Hallam Nuclear Power Facility, Nebraska** / C. F. Keech. Studies of Sites for Nuclear Energy Facilities. Geological Survey Bulletin 1133-B. Prepared in cooperation with the U.S. Atomic Energy Commission. - Washington : GPO, 1962. - 58 pp. - http://pubs.usgs.gov/bul/1133b/report.pdf

337 U.S. Air Force., "**Weather Balloons at Indian Springs Air Force Base**.," in Special Collections, Item #1521, http://osulibrary.oregonstate.edu/specialcollections/omeka/exhibits/show/atomic/testing/item/1521 (accessed January 10, 2012).

atomic test periods at the Nevada Proving Grounds. Sent aloft before each nuclear test, the balloons are hauled down minutes before the actual detonation occurs. Last minute weather information is thus relayed from the Indian Springs Air Force Base to the Atomic Energy Commission's Test Director at the control point. Such data is used to predict subsequent paths of radioactive clouds through the atmosphere."



•NE **Nebraska Ordnance Plant**[338] Mead, Saunders County AWE -1959-1964 - The Air Force built and maintained three Atlas missile silos at the facility from 1959 to 1964. In 1959, the U.S. Air Force acquired 1,185 acres north of Load Line 4 and 34 acres of the northern portion of Load Line 1 and constructed the Offutt Air Force Base Mis-

338 Albano, Jeffrey. A., "**In situ chemical oxidation of rdx-contaminated groundwater with permanganate at the Nebraska Ordnance Plant**": A Thesis Presented to the Faculty of The Graduate College at University of Nebraska In Partial Fulfillment of Requirements For the Degree of Master of Science (2009). Dissertations & Theses in Natural Resources. Paper 30.
- http://digitalcommons.unl.edu/natresdiss/30

Sampling and Analysis Plan for Ground-Water Monitoring of Wells near the Metropolitan Utilities District's Platte River West Well Field near Wann, Nebraska: Part I, Field Sampling Plan and Part II, Quality Assurance Project Plan. / V.L. McGuire, J.A. Godberson, and R.C. Wilson. U.S. Department of the Interior, U.S. Geological Survey, 2005. - 76 pp.
- http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADA441948

EPA: **The Former Nebraska Ordnance Plant**, 2009. - 6 pp.

Final Ordnance and Explosives (OE) Recurring Review Report. Department of the Army. US. Army Corps of Engineers. Kansas City District, 2010. - 48 pp.

sile Fire S-1 launch area (Atlas Missile Area).[339] Launch Complex for 3 Atlas D Intercontinental Ballistic Missiles. The missiles were manned by the 549th S[340]MS which was activated August 15 1959, went on alert March 30 1962, started going off alert October 1 1964, and was inactivated December 14, 1964. The last Atlas D left Offutt on October 22, 1964.

•NH **Pease Air Force Base**[341] Pease AWE - The Air Force assumed control in 1951, when the installation was selected for development as a Strategic Air Command (SAC) base. Purchase of additional land needed for expansion of the base started in 1952 and was completed in 1956. Ground breaking for the new SAC facilities took place in 1954, and the first B-47 Stratojet bombers arrived in 1956. It was closed in 1991.

•NH **R. Brew Company** Concord. DOE - Provided goods and/or services to the Fernald facility as subcontractor

•NJ **Aluminum Co. of America**[342] (Alcoa) Garwood AWE - 1944 - Under subcontract to the Metallurgical Laboratory (University of Chicago), the Garwood facility in New Jersey manufactured casting dies and used them to cast uranium slugs. This work was conducted intermittently between July and November of 1944.

339 LATA-Bay West Joint Venture Awarded $17.4M in Task Orders under its USACE Kansas City District PRAC

'ST. PAUL, Minn. (September 23, 2011)—Bay West, Inc. announced that it has been awarded, in conjunction with our JV partner Los Alamos Technical Associates (LATA), three task orders for more than $17.4M of environmental services at sites for the Kansas City District US Army Corps of Engineers and its customers, including US EPA Region 2. Task orders include waste management at the Cornell Dubilier Electronics Superfund Site, NJ; in situ pilot study, remedial design/engineering at the Nebraska Ordnance Plant, NE; and, remedial action at the Schilling Atlas Missile Site S-5, KS. The $25M, 5-year, Pre-placed Remedial Action Contract (PRAC) is a Service Disabled Veteran Owned Small Business (SDVOSB) set-aside, and LATA is the lead JV member.'

In 1944, the Navy began developing a surface-to-air missile (SAM), known as Project Bumblebee. Convair was one of the companies selected to produce the SAMs and in 1953, began producing the first all-rocket SAM—the Terrier. In the future, Convair would continue producing SAMs such as the Terrier, Tartar, and the Atlas booster rocket or the Consolidated-Vultee Aircraft X-11. The Consolidated-Vultee Aircraft Corporation production plants in San Diego, Pomona and Fort Worth, fabricated the B-58 Hustler supersonic intercontinental nuclear bomber

- http://www.centennialofflight.gov/essay/Aerospace/Consolidated_Vultee/Aero33.htm

'Even with its success, Odlum wanted to merge Convair or sell it completely. He met with numerous people including the eventual acquirer, John Jay Hopkins of Electric Boat. Discussions in 1951 led to their 1953 agreement. The two firms officially merged on April 29, 1954, with the renamed Electric Boat, General Dynamics, creating its Convair Division. As well as its aircraft manufacturing, the Convair Division would be a major participant to the American space program.'

American X-vehicles: an inventory, X-1 to X-50/by Dennis R. Jenkins, Tony Landis, and Jay Miller.
Monographs in aerospace history No. 31, 2003. - 65 pp. - http://history.nasa.gov/monograph31.pdf

340 DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; August 29, 1994. - 3 pp.
- http://www.lm.doe.gov/Considered_Sites/Gleason_Works_-_NY_55/

341 National Priorities List: **Site Narrative for Pease Air Force Base.**
- http://www.epa.gov/superfund/sites/npl/nar1211.htm

Preliminary draft environmental impact statement. Pease Air Force Base closure. Prepared by United States Army Corps of Engineers. Omaha District. for United States Air Force, 1993. - 82 pp.

342 National Institute for Occupational Safety and Health: **Site Profiles for Atomic Weapons Employers that Worked Uranium and Thorium Metals Appendix S – Aluminum Company of America (Alcoa 2) – New Jersey,** 2007. - 7 pp. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/b-6000-aps-r0.pdf

•NJ **American Peddinghaus Corp.**[343] Moonachie AWE/DOE - 1978 - The facility conducted a one-day shear (cutting) test on uranium metal for National Lead of Ohio (Fernald) on April 3, 1978.
•NJ **Baker and Williams Co.** Newark AWE/DOE - 1943-962 - Baker and Williams Company processed radioactive platinum as part of the process of making polonium, which was needed for initiators in nuclear weapons. Baker and Williams Co. also processed unirradiated uranium scrap for the AEC to recover enriched uranium for use in the weapons complex.

•NJ **Bell Telephone Laboratories**[344] Murray Hill AWE - 1943-1944 - This facility

343 Energy Employees Occupational Illness Compensation Program Facility List - http://www.hss.doe.gov/healthsafety/fwsp/advocacy/faclist/findfacility.cfm
344 **John W. Tukey: His life and professional contributions**. / David R. Brillinger. The Annals of Statistics 2002, Vol. 30, No. 6, 1535-1575. - http://www.stat.berkeley.edu/~brill/Papers/life.pdf

handled a quantity of uranium during World War II, probably in support of its work to develop effective barrier materials for the K-25 facility in Oak Ridge and later together with Douglas Aircraft and Western Electric design & manufacturing of Nike Ajax and Hercules nuclear weapons.[345] 'In January 1945 the U.S. Army Air Force contracted with Bell Labs to develop a defense system against the foreseen threat of high-flying bombers. Perhaps because of his work with the Fire Control Research Office, Tukey was hired by H. Bode to help with this major new national security mission. In due course, this project became known as Nike, the first widely deployed surface-to-air missile. It required a systems solution to which Tukey was so profoundly suited: the integration of ground-based tracking radar, computers, and communications with an airborne missile.'

•NJ **Bloomfield Tool Co.** Bloomfield AWE - 1947; 1951 - The facility had a small research contract with the Atomic Energy Commission in 1947. In 1951, it did some experimental machining of uranium slugs for the AEC.

•NJ **Bowen Lab. North Branch** AWE - 1951 - Bowen Engineering conducted some experimental work at their laboratory in New Jersey on uranium compounds during a two-day period in 1951.

•NJ **Callite Tungsten Co.** Union City AWE - 1944 - According to a 1944 document, the Callite Tungsten Co. used its machines to cold roll uranium metal rods for the Manhattan Engineer District.

•NJ **Chemical Construction Co.** Linden AWE - 1953-1955 - The Chemical Construction Company conducted research and development activities to recover uranium and other metals from low-grade waste materials. The wastes were generated by uranium processing operations at the Mallinckrodt facility in St. Louis, Missouri.

345 **Locations of Former Nike Site Locations & Status**. - http://ed-thelen.org/loc.html#Design

Source: Hagley Library Pictorial Collections

•NJ **Du Pont Deepwater Works**[346] Deepwater AWE/DOE - 1942-1949 - In the 1940s, E.I. DuPont de Nemours & Company (DuPont) produced uranium products and conducted research on uranium hexafluoride. These activities were conducted first for the US. Office of Scientific Research and Development, and later under contract to the Manhattan Engineer District and the Atomic Energy Commission. DuPont also developed processes to convert uranium dioxide to uranium hexafluoride, and produced uranium oxide and uranium metal which was used to fuel the CP-1 reactor at the University of Chicago.

346 **Site Profiles for Atomic Weapons Employers that Refined Uranium and Thorium** / R.J. Traub. National Institute for Occupational Safety and Health. 2006. - 75 pp.
- http://www.cdc.gov/niosh/ocas/pdfs/arch/bat-6001-r0.pdf
Technical Basis Document for the DuPont Deepwater Works Deepwater, New Jersey. National Institute for Occupational Safety and Health. 2011. - 16 pp.
- http://www.cdc.gov/niosh/ocas/pdfs/tbd/dupontd-r0-pc1.pdf

Jackson Laboratory at DuPont's Deepwater Works in Deepwater, New Jersey
Source: Hagley Library Pictorial Collections

After completion of these activities, the AEC conducted limited decontamination and released the site to DuPont for reuse. DuPont currently operates a chemical plant at this site. The original research work was conducted at the Jefferson Lab in Building J-16. This building was demolished and several feet of earth removed sometime between 1943 and 1945. Building J-26 was eventually built at that location. The other two projects were located in buildings 708 and 845. A portion of building 708 was demolished in 1945. The rest of the building along with several feet of earth was removed in 1953.

Before there were houses, this block held racks of metal alloys. This building was the INCO Research Center

•NJ **International Nickel Co., Bayonne Laboratories**[347] Bayonne AWE - 1951-1952 - International Nickel plated uranium slugs with nickel for use in the nuclear weapons production system during the early 1950s.

347 DOE Letter; Wagoner to Kieczk; **No Further Investigations of the International Nickel Site Under FUSRAP**; December 16, 1994. 1 p.

•NJ **J.T. Baker Chemical Co.** Phillipsburg AWE - 1948; 1957-1958 - J.T. Baker Chemical was licensed by Atomic Energy Commission to process and distribute refined uranium.

•NJ **Kellex/Pierpont** or **Kellex Corporation**[348] Jersey City AWE/DOE - 1943-1953; Residual Radiation 1954-1978; 1981-1983 - In 1943, the M.W. Kellogg Company established the Kellex Corporation to design and construct the first gaseous diffusion uranium enrichment facility, the K-25 Plant, in Oak Ridge TN. This work was conducted under contract to the Manhattan Engineer District (MED) and later to the Atomic Energy Commission (AEC). In the 1940s and early 1950s, Kellex conducted research and development on fuel reprocessing and component testing using uranium hexafluoride, and uranium processing and recovery techniques at. In 1951, the Vitro Corporation of America assumed all the rights and obligations of the Kellex Corporation. In 1953, Kellex discontinued all AEC contract work at the Kellex/Pierpont site as Vitro acquired the Kellex Corporation. The same year the company reorganised as the Vitro Corp. of America. One of Vitro's earliest customers was the United States Navy, a relationship which continued into the 1990s.

•NJ **Maywood Chemical Works**[349] Maywood AWE/DOE - 1947-1950 - From 1916 to 1959, Maywood Chemical Works extracted radioactive thorium and rare earth

348 DOE: **Long-Term Surveillance and Maintenance Requirements for Remediated FUSRAP Sites**. 2011. - 146 pp. - http://www.lm.doe.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=7978&libID=8084

National Institute for Occupational Safety and Health: **SEC Petition Evaluation Report Petition SEC-00100: Kellex/Pierpont facility in Jersey City, New Jersey** / Monica Harrison-Maples, 2007. - 21 pp. - http://www.cdc.gov/niosh/ocas/pdfs/sec/kellpier/kellexer.pdf

349 **Pump Test Work Plan. New York District. Formerly Utilized Sites Remedial Action Program Maywood Superfund Site**. Prepared by: Stone & Webster Environmental Technology & Services in Association with Malcolm Pirnie, Inc. for: US Army Corps of Engineers - Kansas City District. Formerly Utilized Sites Remedial Action Program. US Army Corps of Engineers. 2001. - 56 pp. - http://www.fusrapmaywood.com/Docs/MISS-152.pdf

elements from monazite sands for use in commercial products. From 1947 to 1950 the AEC purchased thorium compounds from the Maywood Chemical Company.In 1959, the Stepan Company purchased the Maywood Chemical Works, discontinuing all work with thorium. From 1963-l 968, under license from the Atomic Energy Commission, Stepan removed thorium wastes from properties adjacent to nearby State Route 17, burying the wastes on the Stepan property.

•NJ **Middlesex Municipal Landfill**[350] Middlesex AWE/DOE - 1948-1960 - From 1948 to 1960, the Middlesex Sampling Plant conducted thorium and uranium activities and disposed of the wastes at the Middlesex Municipal Landfill.

350 DOE: **Long-Term Surveillance and Maintenance Requirements for Remediated FUSRAP Sites**. 2011. - 146 pp. - http://www.lm.doe.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=7978&libID=8084
Middlesex Municipal Landfill Still Polluted. Middlesexboro.Net, Tuesday, 28 April 2009.
Formerly utilized MED/AEC sites remedial action program : **Radiological survey of the Middlesex municipal landfill, Middlesex, New Jersey** / prepared for U.S. Department of Energy, Assistant Secretary for Environment, Office of Environmental Compliance and Overview, Division of Environmental Control Technology, by Oak Ridge National Laboratory ; R. W. Leggett ... [et al.], 1980. - vi, 100 pp.
Middlesex Sampling Plant - http://response.restoration.noaa.gov/book_shelf/360_Middlesex.pdf

•NJ **Middlesex Sampling Plant**[351] Middlesex DOE - 1943-1967 - In 1943, the Manhattan Engineer District established the Middlesex Sampling Plant to assay, sample, store, and ship uranium, thorium, and beryllium ores.

351 DOE: **Middlesex Sampling Plant Site**. 2011. - 3 pp.
The Administrative Record for the MSP Site is located at the Middlesex Borough Library

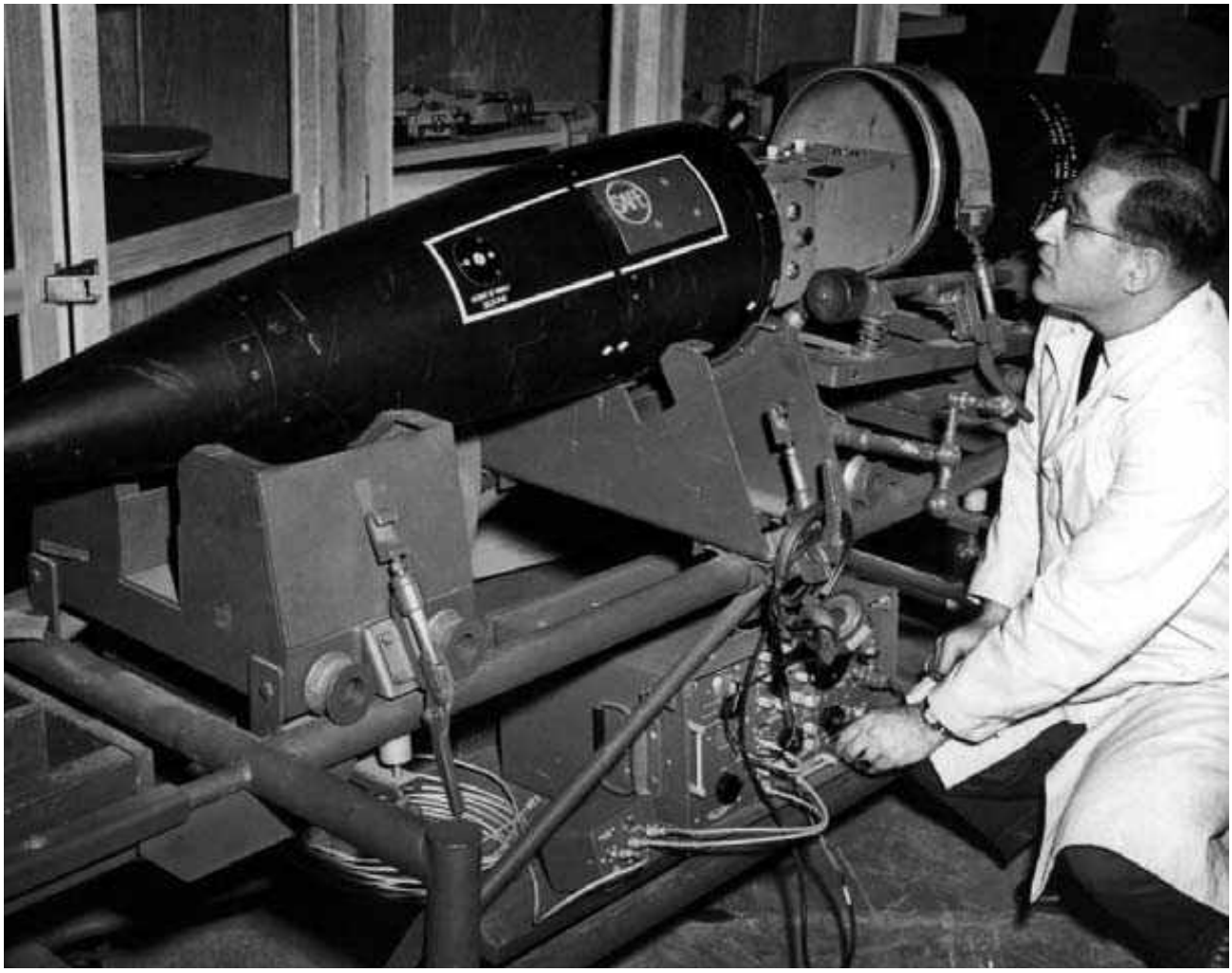
Until 1950, the plant was operated by the MED and then the AEC. By 1948, Ledoux and Company and Lucius Pitkin, Inc. personnel were stationed on site to perform assaying work. Another contractor, Perry Warehouse, provided laborers until about 1950. From 1950 to 1955, United Lead, a subsidiary of National Lead Co., operated the plant for the AEC. The plant discontinued uranium and beryllium assaying and sampling activities in 1955 and was used as a thorium storage and sampling site until 1967. In 1967, operations at Middlesex were terminated and all remaining thorium sampling activities were transferred to the Feed Materials Production Center and to the Weldon Spring Plant. Contractor: United Lead Company (1950-1955)

•NJ **National Beryllia** Haskell BE - 1968 - 1973; 1983-1986 - National Beryllia performed a demonstration of its capabilities for production of parts for Y-12 beginning in late 1968, with delivery in March 1969. Additionally, National Beryllia delivered some parts to Union Carbide (Y-12), though the records indicate there was only partial performance for this purchase order, which was terminated in April of 1973. Between 1984 and 1986 the National Beryllia division of General Ceramics had a series of purchase orders through Martin Marietta, which was operating Y-12 at the time. These contracts involved the shipment of beryllium from BrushWellman to National Beryllia with Y-12 being the ultimate customer.

•NJ **New Brunswick Laboratory** New Brunswick DOE - 1948-1977 - From 1948 to 1978, the Atomic Energy Commission (AEC), used the New Brunswick Laboratory as a general nuclear standards laboratory for assaying nuclear and non-nuclear materials used in reactor and weapons programs. The New Brunswick Laboratory (NBL) provided a variety of activities using nuclear materials, including thorium and uranium ores, high purity plutonium and americium, and enriched uranium. In 1977 the New Brunswick Laboratory was moved from New Jersey onto the campus of Argonne National Laboratory -- East, where it remains today.

•NJ **Picatinny Arsenal**[352] Dover AWE - The Picatinny Arsenal was tasked to create a nuclear capable artillery piece in 1949. With the development of nuclear technology, Picatinny started working with the Atomic Energy Commission todevelop ammunition for nuclear weapons. Beginning in 1954, this ammunition included nuclear warhead sections for various rockets and missiles, such as Intercontinental Ballistic Missiles (ICBMs), surface-to-air missiles, and Atomic Demolition Munitions (ADMs) used to create barriers to delay invading armies.

352 American Institute of Aeronautics and Astronautics:**Historic Aerospace Site. Picatinny Arsenal. New Jersey**. 2007. - 12 pp. - http://www.aiaa.org/Participate/Uploads/06-0609%20PICATINNEY.pdf



Testing a nuclear warhead missile section

Picatinny also designed the explosive payload for the Nike series of missiles. Another missile, the Corporal, was armed with either nuclear or conventional warheads, and was capable of hitting targets up to 75 miles away. Picatinny developed the Honest John medium- to long-range artillery, the Redstone (later used in the development of rockets for space), and its successor, the Pershing.

•NJ **Princeton Plasma Physics Laboratory** Princeton DOE - 1951-. - In 1951, the Atomic Energy Commission, began operating the Princeton Plasma Physics Laboratory (PPPL) on Site C and Site D of the James Forrestal Campus. This property It grew out of the top secret Cold War project to control thermonuclear reactions, called Project Matterhorn. It is owned by Princeton University. Research at PPPL began with construction of the Model-C Stellerator, which was later converted to a pulse-operated device. Today, this laboratory continues to conduct research on nuclear fusion and development of nonweapons applications of this technology.

•NJ **Rare Earths/W.R. Grace Wayne**[353] AWE/DOE - 1950-1960 - Rare Earths extracted thorium from monazite sands from 1950-1960 under various contracts with the AEC. The AEC needed the thorium for its weapons program. Although the processing of monazite sands continued at Rare Earths through 1971, it was no longer performed under contract for the AEC, but rather was for commercial purposes. Remediation activities were conducted from 1985-1987 by Thermo Analytical/Eberline and Bechtel National Inc. (BNI) under the BNI umbrella contract as part of the Formerly Utilized Site Remediation Action Program (FUSRAP).
•NJ **Standard Oil Development Co. of NJ** Linden AWE - 1942-1945 - Standard Oil locations at both 1900 East Linden Avenue (Linden) and the property at 1400 Park Avenue (Bayway) performed a variety of tasks for the Manhattan Engineer District (MED) during World War II. The company was contracted to obtain materials for work being done by the Metallurgical Laboratories of the MED. It also conducted studies and performed development work to produce uranium metal through chemical reduction processes and to construct and operate a centrifuge pilot plant for uranium separation. The company continued to provide consulting and analytical services for the Atomic Energy Commission.

353 DOE: **Long-Term Surveillance and Maintenance Requirements for Remediated FUSRAP Sites**. 2011. - 146 pp.- http://www.lm.doe.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=7978&libID=8084

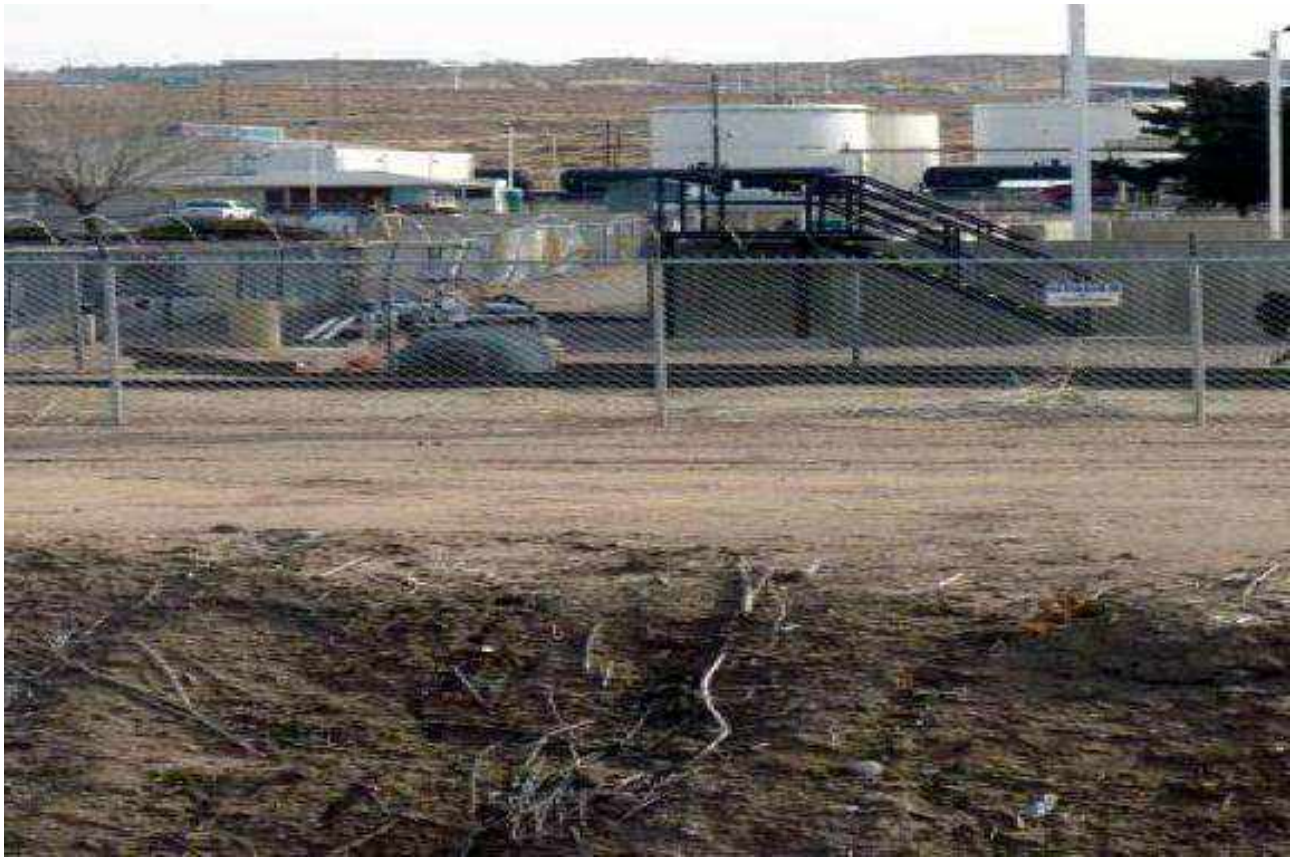
•NJ **Stevens Institute of Technology** Hoboken BE - 1959-1960 - The Stevens Institute of Technology performed beryllium research and development for the AEC. Researchers at the school's Powder Metallurgy Laboratory experimented with slip casting production techniques as a replacement for the conventional vacuum-hot-pressed block process. Beryllium powder was the primary ingredient in the production process. The laboratory's working inventory during the course of the contract included approximately 50 pounds of beryllium metal powder produced by the Brush Beryllium Company.
•NJ **Tube Reducing Co.** Wallington AWE - 1952; 1955; 1957 - Tube Reducing Co. conducted tests for National Lead of Ohio (Fernald) on shaping and sizing uranium rods. In January 1952, two uranium rods were processed. More tubes were extruded in a reduction experiment in January 1955. Another test was conducted in 1957.
•NJ **US. Pipe and Foundry** Burlington BE- 1943 - A small amount of beryllium mesh (15 pounds) was sent to US. Pipe and Foundry by the MED.
•NJ **United Lead Co.** Middlesex AWE - 1950-1967 - From 1950 to 1955, United Lead, a subsidiary of National Lead Company, was the AEC's operating contractor for the Middlesex Sampling Plant. The Middlesex Sampling Plant sampled, assayed, stored, and shipped uranium, thorium, and beryllium ores. The plant discontinued uranium and beryllium assaying and sampling activities in 1955. Until 1967, the site was used as a thorium storage and sampling site.
•NJ **Vitro Corp. of America** West Orange AWE - 1951-early 1960s - In December 1951, Vitro was asked to submit a proposal for research on thorium fluoride production, scrap recovery and waste recovery to involve 14 chemists and analysts. Though it is not certain whether this work was undertaken, by the late 1950s and early 1960s, Vitro conducted work under AEC contract converting low-enrichment uranium dioxide to uranium carbide spheres. The uranium dioxide was shipped from Rockwell International (then known as the Atomics International Division of North

American Aviation, Inc.) to Vitro for conversion into uranium carbide and was then shipped back to Rockwell. Around 1958, Vitro also conducted work under contract to the AEC Oak Ridge Operations Office for the separation of fission products.

•NJ **Westinghouse Electric Corp.** Bloomfield AWE - 1942 -1949 - Westinghouse Electric, located in Bloomfield, NJ, was one of the large commercial contributors to Manhattan Project research. Specific tasks related to uranium metal production and enrichment. Because developing the technology to produce pure uranium metal became a priority for the Manhattan Project, universities, and private companies experience in related chemical processes participated in the task. From 1942-1943, Westinghouse used a photochemical process for metallic uranium and supplied metallic uranium for the first self-sustaining chain reaction in Chicago. In addition to contributing to uranium metal production, Westinghouse Electric participated in activities related to uranium enrichment. Westinghouse also worked with thorium for the Manhattan Project at this location.
•NJ **Wykoff Steel Co.** Newark AWE - 1950 - Wykoff Steel conducted tests of methods to straighten and finish uranium rods on September 6, 1950.
•NM **Accurate Machine & Tool** Albuquerque - 1987-2002 - Accurate Machine & Tool provides machine shop services to Sandia National Laboratory, CA

•NM **Albuquerque Operations Office**[354] Albuquerque DOE 1942-. - The Albuquerque Operations Office is the major defense program field organization in the Department of Energy. Although its roots can be traced to the Manhattan Engineer District's efforts to provide the nation with a nuclear weapons capability, the Albuquerque Operations Office did not officially come into existence as a civilian organization until the establishment of the Atomic Energy Commission in 1946. Originating during the war years as the Los Alamos "Z" division - the engineering branch of the project. After the establishment of the AEC, it was called the Santa Fe Operations Office. The Office moved to Albuquerque in 1951 and in 1956, became the Albuquerque Operations Office. Today, in managing a national program, Albuquerque's primary mission continues to be stewardship and maintenance of the nation's nuclear weapons stockpile.

354 DOE: Office of Environmental Management, Office of Technology Development: **Albuquerque Operations Office. Albuquerque, New Mexico. Technology Summary**. 1994. - 231 pp. - http://www.osti.gov/bridge/servlets/purl/10192451-MgEDFx/webviewable/

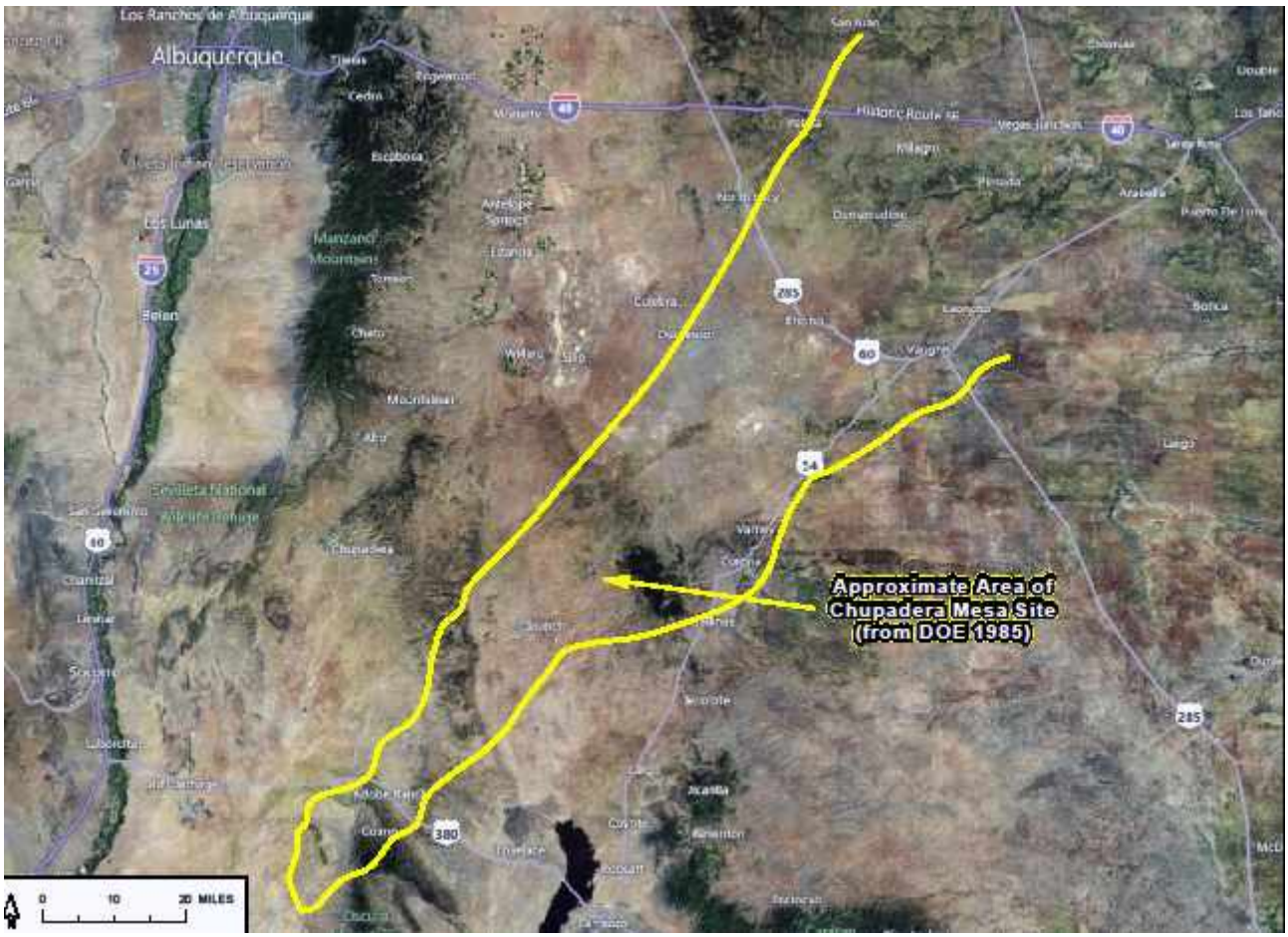


•NM **Air Force Plant 83** Albuquerque DOE - The Plant 83 facility consisted of two facilities: North Plant 83 Area located north of Woodward Road, which was demolished in October 1997, and South Plant 83 Area located south of Woodward Road, which is still in use today. Both facilities have been used for manufacturing purposes since the 1950s, first by Eidel Manufacturing, followed by the Atomic Energy Commission through its contractor American Car Foundry, followed by U.S. Air Force through its contractor General Electric, and finally by General Electric Aviation (GEA) as facility owner since 1984.

•NM **Bayo Canyon Site**[355] Los Alamos AWE - Los Alamos National Laboratory radiochemistry operations and explosives experiments conducted between 1943 and 1961 contaminated buildings, sewer lines, and soils at this site.

355 Formerly utilized MED/AEC sites remedial action program : **Radiological survey of the Bayo Canyon, Los Alamos, New Mexico** / prepared for U.S. Department of Energy, Assistant Secretary for Environment, [Office of Environmental Compliance and Overview], Division of Environmental Control Technology, by Oak Ridge National Laboratory ; [compiled by: Donald L. Mayfield, Allan K. Stoker, A. John Ahlquist], 1979. - 108 pp.

Uranium Resources in New Mexico. / V. McLemore, New Mexico Bureau of Geology and Min. Res., Socorro, NM. SME Annual Meeting, Feb. 25-Feb. 28, 2007, Denver, CO. 2007. - 13 pp.
- http://geoinfo.nmt.edu/staff/mclemore/documents/07-111_18.pdf



•NM **Chupadera Mesa**[356] Chupadera Mesa DOE —The Chupadera Mesa Site is privately owned land northeast of the White Sands Missile Range and the city of Bingham in New Mexico. The site consists of the fallout zone of the first nuclear weapons test, the Trinity test, conducted on July 16, 1945. The test was part of the Manhattan Project that was established during World War II to conduct research for the development and production of nuclear weapons.

356 DOE: **Long-Term Surveillance and Maintenance Requirements for Remediated FUSRAP Sites**. 2011. - 146 pp. - http://www.lm.doe.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=7978&libID=8084

•NM **Fort Wingate Depot**[357] or **Fort Wingate Depot Activity** AWE - The Missile Defense Agency used the base between 1963 and 1967 as a test site for Pershing missiles. Also between 1960 and 1967, portions of the installation were used by the Army to test the performance of several ballistic missile systems, including the launching of ballistic missiles from the installation.

•NM **Hangar 481**[358] DOE 1989 - 1996 - Radioactive materials were transported to Hangar 481 in sealed containers. Based on Ross Aviation shipment records, radioactive material shipments predominantly consisted of tritium, depleted uranium, and mixed fission products. The Department of Energy contracted with Ross Aviation, Inc. to manage and operate Hangar 481 on the premises of the Kirtland Air Force Base for the convenience of the adjacent Sandia National Laboratory.

357 **Community Relations Plan Fort Wingate Depot Activity. McKinley County, New Mexico**. 2006. - 185 pp. - http://www.ftwingate.org/docs/pub/FWDA_CRP-V1-8-29-06.pdf

Fort Wingate Depot Activity Base Realignment & Closure Installation Action Plan. 2010. - 50 pp. - http://www.ftwingate.org/docs/pub/FWDA_IAP_Current.pdf

Master Environmental Plan: Fort Wingate Depot Activity, - Gailup, New Mexico. / C. A. Biang, C. R. Yuen, R. P. Biang, A. A. Antonopoulos,and J. D. Ditmars. Environmental Assessment and Information Sciences Division. Argonne National Laboratory, 1990. - 149 pp. - http://www.osti.gov/bridge/servlets/purl/6231102-ht9QB5/6231102.pdf

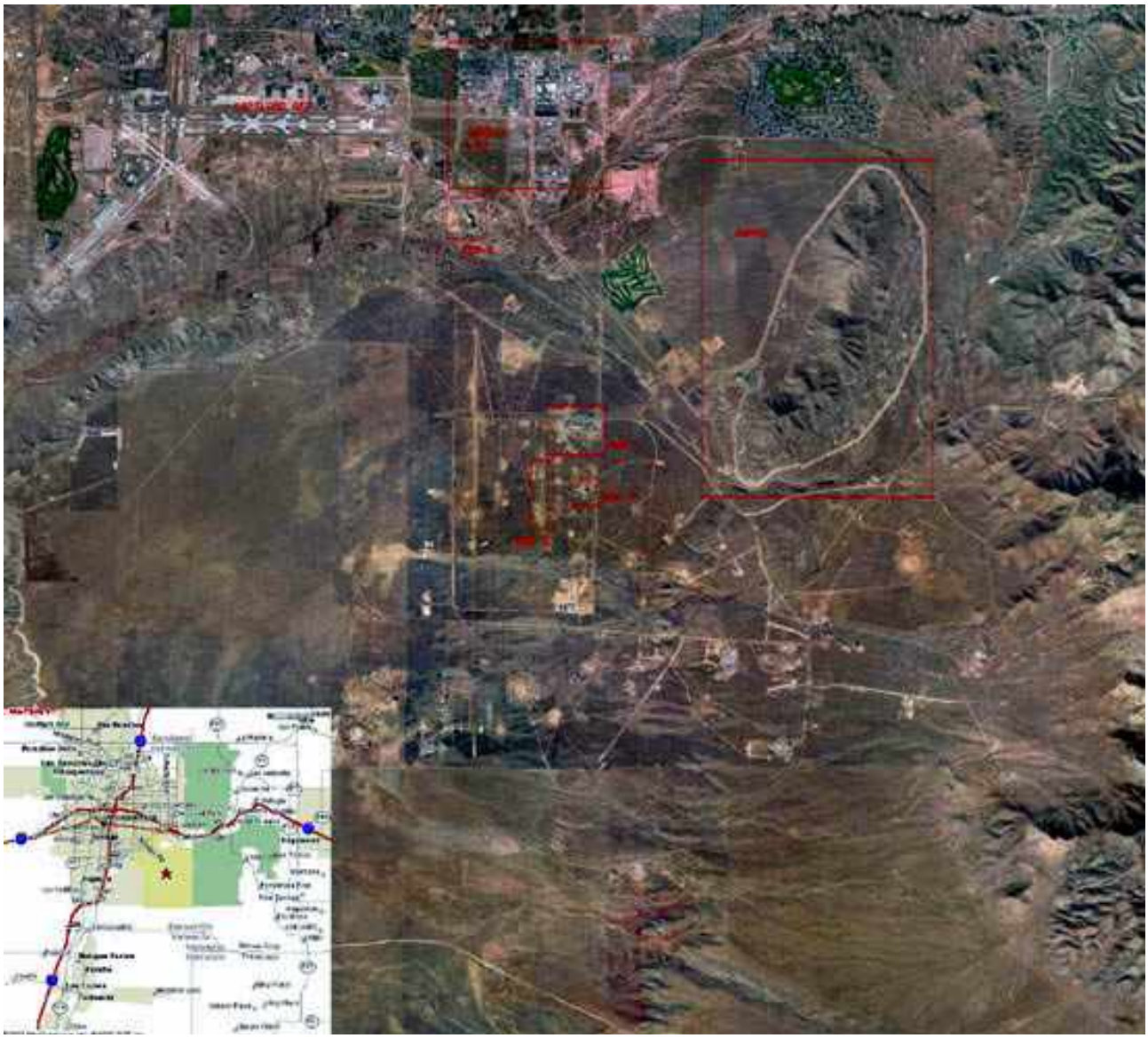
358 National Institute for Occupational Safety and Health: **Hangar 481**. Special Exposure Cohort Petition Evaluation Report Update / Samuel E. Glover, PhD. 2011. - 28 pp. - http://www.cdc.gov/niosh/ocas/pdfs/abrwh/pres/h4810811fc.pdf

National Institute for Occupational Safety and Health: **SEC Petition Evaluation Report Petition SEC-00139: Hangar 481, Kirtland Air Force Base**. / Robert Coblentz, Mike Domal. 2010. - 51 pp. - http://www.cdc.gov/niosh/ocas/pdfs/sec/h481/h481er-139-r1.pdf

•NM **Holmes and Narver, Incorporated**[359] AWE - Nevada Test Site contractor. Holmes & Narver also employed many of the civilians that were stationed on Johnston Island in the Pacific Proving Grounds.

•NM **Holloman Air Force Base** Alamogordo AWE - After World War II, the future of the base was uncertain. In fact, rumors spread concerning the closure of the site, fueled by the fact that most operations had ceased. However, in 1947, a new era began when Air Materiel Command announced the air field would be its primary site for the testing and development of pilot less aircraft, guided missiles, and other research programs. For the next 25 years the site, which became known as the Holloman Air Development Center, and later the Air Force Missile Development Center, launched many missiles including Tiny Tim (the first Army rocket), Rascal, V-2, XQ-2 Drone, Falcon, MACE, Matador, and Shrike.

359 National Archives: **Records of the Atomic Energy Commission** [AEC] (Record Group 326) 1923-75.



•NM **Kirtland Air force Base**[360] AWE - National Nuclear Weapons Stockpile Site - In December 1949, Kirtland became headquarters for the Air Force Special Weapons Center. In 1963, the Special Weapons Center gave up much of its research and development work to the newly created Air Force Weapons Laboratory. In 1992, the Kirtland Underground Munitions Storage Complex (KUMSC) was activated at Kirtland AFB. KUMSC is the largest storage facility for nuclear weapons in the world. The facility provides storage, shipping and maintenance for the United States Air Force and Navy.

•NM **Kirtland Operations Office** Albuquerque DOE – 1964.- -The Kirtland Operations Office was founded in 1964 as part of the US atmospheric nuclear testing readiness program. Today, this applied-science and engineering organization supports the National Nuclear Security Administration. Contractors: Honeywell Corporation (2000 - 2009); AlliedSignal(1984-2000); Allied Corporation (1982 - 1984); Bendix Corporation (1 964- 1982).

360 **Ammunition and Explosives Storage for the Navy (1939-1989) and the Air Force (1946-1989), 2008.** - 200 pp. - http://www.denix.osd.mil/cr/upload/af-navy-ammunition-storage-public-rfs_pg1-200_rev.pdf

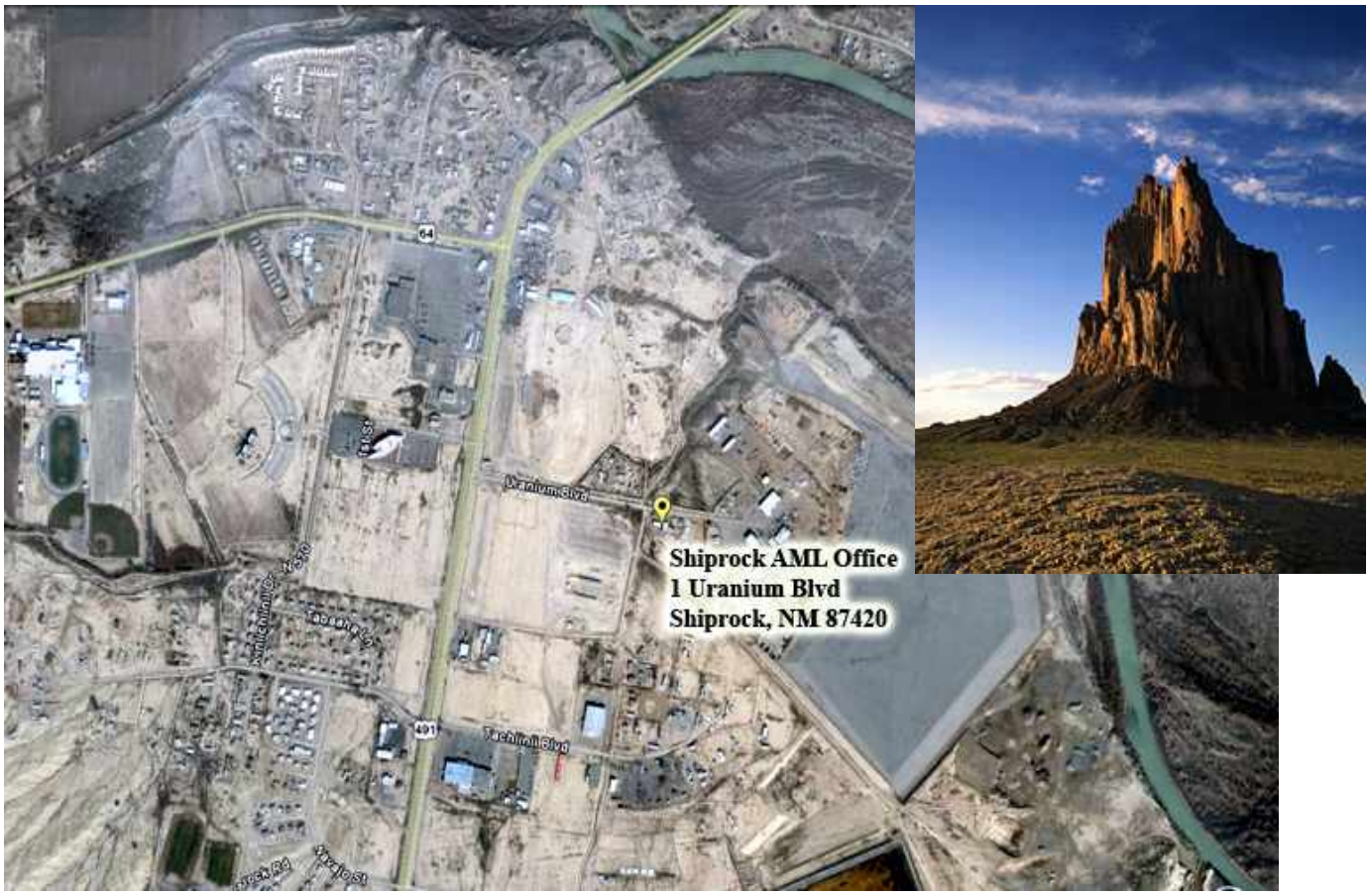
•NM **Los Alamos Medical Center** Los Alamos DOE - 1952-1963 - Los Alamos Medical Center started as an Army hospital for Manhattan Project workers. A new facility was constructed in 1951 and opened in January 1952. The AEC sold the hospital in 1963.

•NM **Los Alamos National Laboratory** Los Alamos DOE - 1942-. - Operated by the University of California since its inception, Los Alamos National Laboratory designed, developed and tested the world's first nuclear weapons. After World War II, Los Alamos (called the Los Alamos Scientific Laboratory) continued as an important nuclear weapons research and development facility. Research programs included nuclear physics, hydrodynamics, chemistry, metallurgy, radiochemistry and life sciences. LANL also used its research facilities to back up other areas of the weapons production complex, particularly plutonium processing and fabrication of weapon components.

Lovelace Complex in 1972

•NM **Lovelace Respiratory Research Institute** Albuquerque DOE - 1960-. - The Lovelace Respiratory Research Institute (formerly the Inhalation Toxicology Research Institute or ITRI) is located on Kirtland Air Force Base. It was established in 1960 to conduct research on the human health consequences of inhaling airborne radioactive materials. The Institute is operated for Department of Energy (DOE) by the non-profit Lovelace Biomedical and Environmental Research Institute.

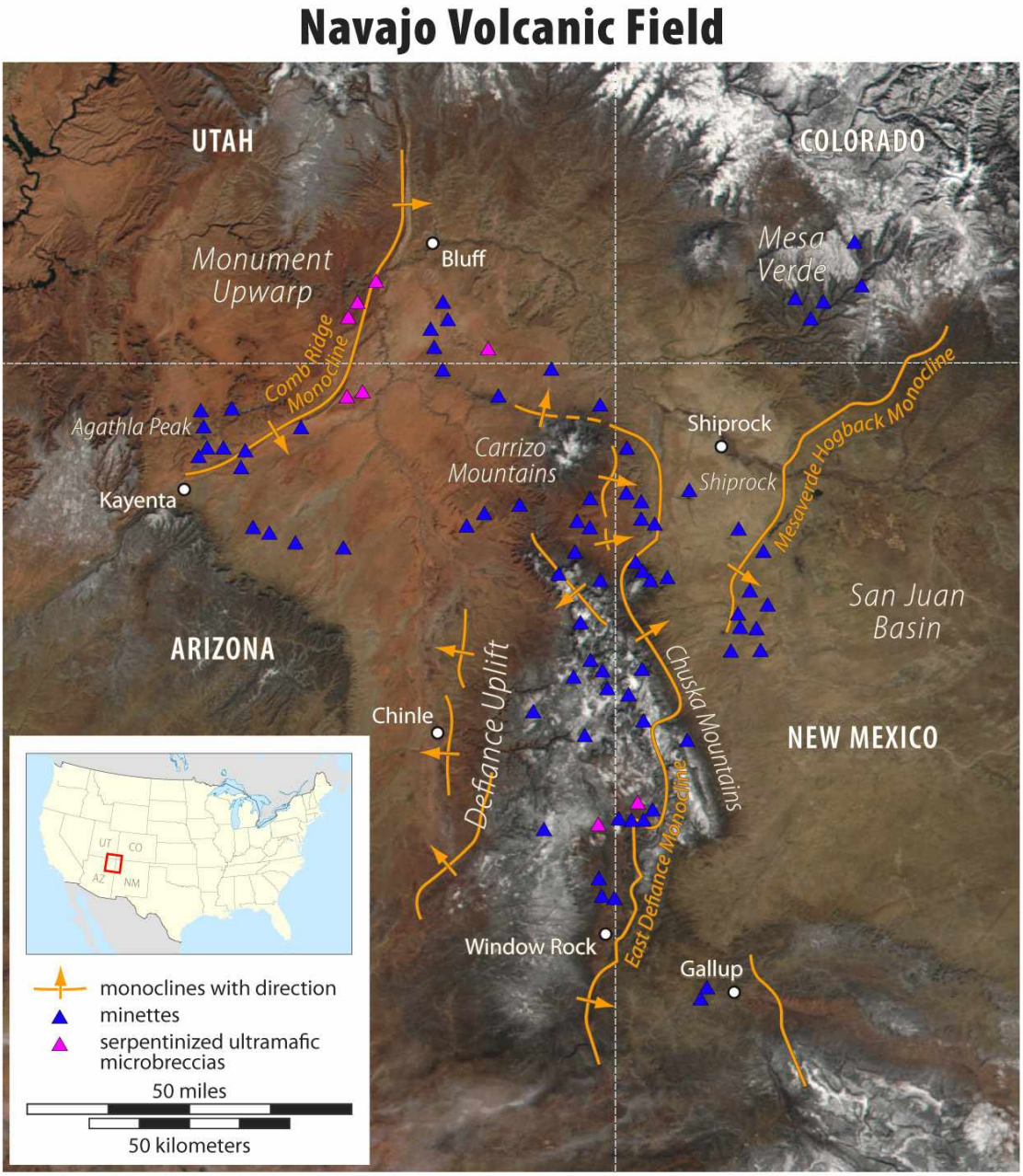
•NM **Ore Buying Station at Grants**[361] Grants DOE - 1956-1958 - The ore buying station at Grants purchased uranium ore for the AEC. Lucius Pitkin managed and operated the Grants station on behalf of the AEC from July 1956 to mid-1958. Contractors: Lucius Pitkin, Inc. (1956-1958).



361 **The AEC and the Grants Mineral Belt** / M. Clifford Smith, JR.. US. Atomic Energy Commission, Grand Junction, Colorado. New Mexico Geological Society-Eighteenth field conference.

A cohort study of uranium millers and miners of Grants, New Mexico, 1979-2005. / Boice JD Jr, Cohen SS, Mumma MT, et al., in: Journal of Radiological Protection, Vol. 28 (2008), No. 3 (Sep), p. 303-325

A cohort mortality study of workers engaged in uranium milling and mining activities near Grants, New Mexico, during the period from 1955 to 1990 was conducted. Vital status was determined through 2005 and standardised mortality ratio (SMR) analyses were conducted for 2745 men and women alive after 1978 who were employed for at least six months. Overall, mortality from all causes (SMR 1.15; 95% CI 1.07-1.23; n = 818) and all cancers (SMR 1.22; 95% CI 1.07-1.38; n = 246) was greater than expected on the basis of US mortality rates. Increased mortality, however, was seen only among the 1735 underground uranium miners and was due to malignant (SMR 2.17; 95% CI 1.75-2.65; n = 95) and non-malignant (SMR 1.64; 95% CI 1.23-2.13; n = 55) respiratory diseases, cirrhosis of the liver (SMR 1.79; n = 18) and external causes (SMR 1.65; n = 58). The lung cancer excess likely is attributable to the historically high levels of radon in uranium mines of the Colorado Plateau, combined with the heavy use of tobacco products.



•NM **Ore Buying Station at Shiprock**[362] Shiprock DOE - 1952-1954 - The ore

362 **Selected Literature on: The Navajo Uranium Mining Experience, 2003-1952** (listed chronologically from most recent to oldest) / Compiled by Chris Shuey, MPH Southwest Research and Information Center. Revised December 11, 2003. - http://www.sric.org/uranium/navajorirf.html

Shields,L M; Wiese,W H; Skipper,B J; et al.: **Navajo birth outcomes in the Shiprock uranium mining area**: Health Physics Vol.63, No.5, Nov.1992, p.542-551

An investigation performed at the Shiprock, New Mexico, uranium mine showed that babies from mothers who lived near the tailings dump, suffered a significant increase in birth defects by a factor of 1.83. Since no dependency on the duration of exposure prior to birth could be found, the result is seen by the authors with caution, though statistically significant.

Impacts of past uranium mining practices: Hearing before the Subcommittee on Mineral Resources Development and Production of the Committee on Energy and Natural Resources, United States Senate, One Hundred First Congress, second session ... Shiprock, NM, March 13, 1990. - 242 pp.

buying station at Shiprock purchased uranium ore for the AEC. American Smelting and Refining Company managed and operated the Shiprock station from July 1952 to January 1954. Contractor: American Smelting and Refining Company (1952-1954).

•NM **Sandia National Laboratories**[363] Albuquerque DOE - 1949-. - Sandia National Laboratory originated in the 1940s as the Z Division of Los Alamos, the engineering arm of the US nuclear weapons development program. In 1949, it was given the mission to design the non-nuclear components for nuclear weapons. Since 1953, areas have been used to test nuclear and non-nuclear weapons components. From 1946-1957, Sandia also housed a weapons assembly line and from 1963-1971, an onsite liquid waste disposal system for liquid radioactive discharges from the Sandia Experi-

363 **Annual Report Purchasing and Materials Management Organization, Sandia National Laboratories Fiscal Year 1993**. / D. R. Martin. Prepared by Sandla National Laboratories Albuquerque,New Mexico and Livermore, California, for the United States Department of Energy, 1994. - 142 pp.
- http://www.osti.gov/bridge/servlets/purl/10131353-DE3Ldo/native/10131353.pdf
'This report summarizes the purchasing and transportation activities of the Purchasing and Materials Management Organization for Fiscal Year 1993. Activities for both the New Mexico and California locations are included.' A customers book...
Furman, Necah Stewart: **Sandia National Laboratories: The Postwar Decade** - Albuquerque: The University of New Mexico Press, 1990. Covering the 1945-1955.
Status of Upcoming SEC Petitions / LaVon B. Rutherford, CHP. National Institute for Occupational Safety and Health Division of Compensation Analysis and Support. 2011. - 6 pp.
- http://www.cdc.gov/niosh/ocas/pdfs/abrwh/pres/secstat0811bw.pdf
Karafantis, Layne Rochelle, "**Weapons labs and city growth: Livermore and Albuquerque, 1945-1975**" (2010). UNLV Theses/Dissertations/Professional Papers/Capstones. Paper 228.
- http://digitalcommons.library.unlv.edu/thesesdissertations/228

mental Reactor Facility. Throughout the course of its operations, the potential for beryllium exposure existed at this site, due to beryllium use, residual contamination, and decontamination activities. Contractors: Lockheed Martin (1995-present); Martin Marietta (1993-1995); AT&T (1951-1993)

•NM **South Albuquerque Works** Albuquerque DOE - 1951-1967 - The AEC owned the South Albuquerque Works from 1951-1967 and used it to produce weapons components of steel. It was opened in anticipation of the 1952 closing of the Buffalo Works. American Car and Foundry was part of the Buffalo Operation and also operated the South Albuquerque Works for the AEC. Contractor: American Car and Foundry, Inc. (1951-1967).

• NM **South Valley Superfund Site**[364] South Valley of Albuquerque DOE

•NM **Uranium Mill at Shiprock**[365] Shiprock DOE - 1960-1989 -Foote Mineral Co. leased its uraniumvanadium properties on the Colorado Plateau to Climax Uranium Co. After Foote ceased mining the properties in midyear, Climax reopened some of the mines and processed ore from them at its uranium mill in Grand Junction. Previously, ores from these mines were processed at Foote's uranium mill at Shiprock, N. Mex., which the company also shut down in mid-1968. The former Uranium Mill at Shiprock processed a total of about 1.5 million short tons of uranium ore.

364 **South Valley Environmental Quality Profile**. Bernalillo County Office of Environmental Health, Albuquerque. 2003. - 95 pp.
- http://www.bernco.gov/upload/images/environmental_health/EQPSouthValley.pdf

365 U.S. Department of Labor : **DOL Notifies Workers of 17 Facilities Associated with Uranium Mill Tailings Radiation Control Act about Potential Eligibility under EEOICPA**, Friday 13, 2012.
'WASHINGTON — The U.S. Department of Labor is notifying former workers of 17 facilities associated with the Uranium Mill Tailings Radiation Control Act about compensation and medical benefits potentially available to them under the Energy Employees Occupational Illness Compensation Program Act, which is administered by the department's Division of Energy Employees Occupational Illness Compensation. Survivors of qualified workers also may be entitled to benefits...'

Bureau of Mines / **Minerals yearbook area reports: domestic 1968**. Year 1968, Volume III (1970). Bieniewski, Carl L.; Henkes, William C.: Colorado, pp. 159-188

Stream Surveys in Vicinity of Uranium Mills. IV. Area of Shiprock, New Mexico - November 1960 : Public Health Service, Denver, Colo. Div. of Water Supply and Pollution Control. 1962.

•NM **Waste Isolation Pilot Plant** Carlsbad DOE - 1999-. - The Waste Isolation Pilot Plant (WIPP) was designed for the disposal of transuranic radioactive waste resulting from the research and production of nuclear weapons. It is the world's first underground repository licensed to safely and permanently dispose of transuranic radioactive waste left from the research and production of nuclear weapons. WIPP began operations on March 26, 1999. Contractor: Westinghouse WIPP Company (1999-present).

Beginning in 1945, JPL personnel went to White Sands Proving Ground in New Mexico to conduct a series of preliminary flight tests of the Corporal missile and WAC Corporal, a 1/5 scale model. This high-altitude test vehicle was designed and built for the Army Ordnance Department. They used a variety of configurations, launch vehicles, propellants ... and names (Bumper WAC, Baby WAC, WAC Dummy, WAC A, WAC B, Tiny Tim booster, and Corporal E). Launch equipment, stage separation, and stabilization were studied, data recorded, and photographs taken. The WAC Corporal would eventually be used as a second stage on top of a modified V-2 (German A-4) rocket. Source: - https://pub-lib.jpl.nasa.gov/docushare/dsweb/Services/Document-387

•NM **White Sands Missile Range** or the **White Sands Proving Ground**, including the Trinity test site and the White Sands Missile Range Museum AWE 1945-.

• NV **Device Assembly Facility Nevada Test Site** AWE - The DAF was designed and built for the purpose of assembling Los Alamos and Lawrence Livermore National

Laboratory nuclear test devices prior to placing them underground for testing. 'Merrick & Company served as the primary engineering firm for the design of the first gloveboxes to be installed inside the Device Assembly Facility.'

• NV **Lake Mead Base**,[366] or **Nellis AFB** AWE - National Nuclear Weapons Stockpile Site. 'The nuclear weapons storage area (WSA) at Nellis was initially constructed by the AEC between 1953 and 1955 as one of 13 original facilities built for storage, maintenance, and operational readiness of the nuclear stockpile. This storage area was originally separate from Nellis AFB and known as Lake Mead Base. Jointly operated by the AEC, the Armed Forces Special Weapons Project, and the U.S. Navy, the first weapons arrived at Lake Mead in 1955. The original complex included up to 10 storage buildings with vaults ("A" structures), a maintenance building ("C" structure), two other assembly/maintenance buildings, storage igloos, and a dry low-level radioactive waste disposal area. An emergency holding tank was connected the "C" structure. Area 2 became part of the main base in September 1969. Today, the 896th operates the largest U.S. above-ground munitions storage facility in the world.
• NV **Lembke Construction** Las Vegas DOE – Nevada Test Site Contractor.

366 **Ammunition and Explosives Storage for the Navy (1939-1989) and the Air Force (1946-1989)**, 2008. - 200 pp. - http://www.denix.osd.mil/cr/upload/af-navy-ammunition-storage-public-rfs_pg1-200_rev.pdf
Taking Stock: Worldwide Nuclear Deployments 1998´. / William M. Arkin, Robert S. Norris and Joshua Handler. Natural Resources Defence Council, 1998. - http://www.nrdc.org/nuclear/tkstock/p53-94.pdf

•NV **Nevada Site Office** or Nevada Operations Office North Las Vegas DOE - 1962-. - The Nevada Site Office was created and assumed responsibility for operations and programs at the Nevada Test Ste (NTS) on March 6, 1962, when nuclear weapons testing became a year-round effort. Prior to that date, it had been operated by the Albuquerque Field Office and prior to that the Santa Fe Operations Office. Atmospheric nuclear testing began at the Nevada Test Site on January 27, 1951 and continued through 1963 when the Test Ban Treaty was signed. After the Test Ban, all nuclear testing was conducted underground. In 2002, beryllium contamination was found in buildings B-1, B-2, B-3 and A-1 in the North Las Vegas Complex.[367] Operations in these building were halted and employees were relocated, due to exposure concerns. Contractors: EG&G Energy Measurements, Raytheon Services Nevada and Reynolds Electrical & Engineering Company (REECO) (1962-1995), Bechtel Nevada (1996-present); Wackenhut Services Incorporated (security)(1965-present); IT Corp. (Environmental Services (1993-2003) Stoller/Navarro (Environmental Services)(2003-present).

367 **Test Site workers screened for beryllium**.
Anyone who worked at least one year from 1951 to 1992 in areas at the Nevada Test Site where nuclear weapons experiments were conducted, or at the North Las Vegas Atlas complex on Losee Road, may be eligible for free medical screenings. More than 9,000 workers have been contacted and almost 3,000 have been screened for possible exposure to asbestos, silica dust, radiation, diesel exhaust, beryllium or loud noise. Las Vegas Sun, Wednesday, Nov. 5, 2003.

•NV **Nevada Test Site,** now **the Nevada National Security Site**[368] Mercury DOE - 1951-. - The Nevada Test Site was established in 1951. The mission of the Test Site is to conduct field tests of nuclear devices in connection with the research and development of nuclear weapons. The Nevada Test Site, slightly larger than the State of Rhode Island, has been the primary location for testing nuclear explosive devices since Operation Ranger was first conducted in 1951.[369]

368 **Nevada Test Site – Site Description** / Eugene M. Rollins. National Institute for Occupational Safety and Health, 2008.- 99 pp. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/nts2-r1-p1.pdf

Nevada Test Site Oral History Project, University of Nevada, Las Vegas
- http://digital.library.unlv.edu/ntsohp/

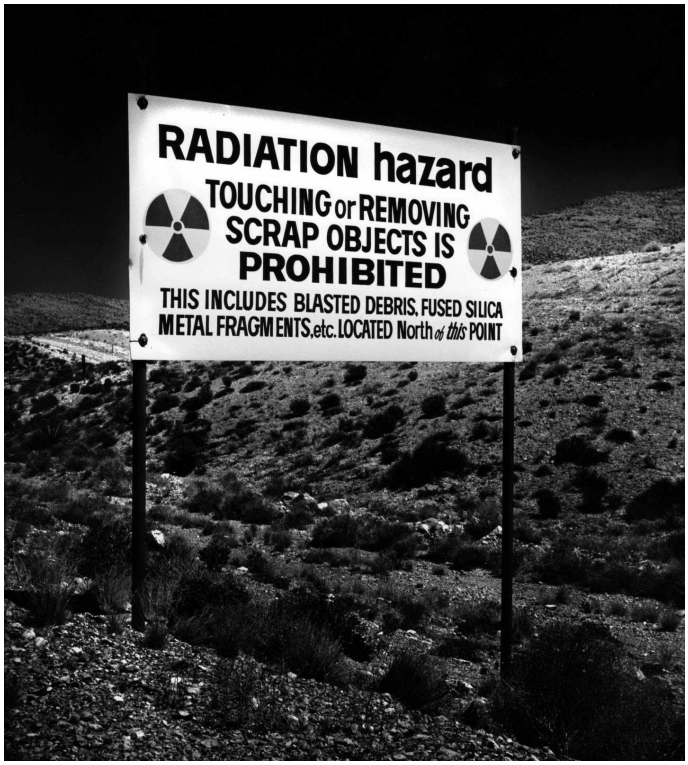
The Nevada Test Site Oral History Project at the University of Nevada, Las Vegas is a comprehensive program dedicated to documenting, preserving and disseminating the remembered past of persons affiliated with and affected by the Nevada Test Site during the era of Cold War nuclear testing.

Sample: **Interview with Raymond Harbert**. February 18, 2005. Las Vegas, Nevada. / Interview Conducted By Mary Palevsky. 2007. - 47 pp.

369 Hacker, Barton C.: **Elements of controversy: the Atomic Energy Commission and radiation safety in nuclear weapons testing, 1947-1974**. University of California Press, 1994 - 614 pp.

Carl Maag, Stephen Rohrer, Robert Shepanek : **Operation Ranger: Shots Able, Baker, Easy, Baker-2, Fox, 25 January-6 February 1951**. United States Atmospheric Nuclear Weapons Tests, Nuclear Test Personnel Review, Prepared by the Defense Nuclear Agency as Executive Agency for the Department of Defense, 1982. - 186 pp.

Department of Energy: Nuclear Test Film - **Operation Ranger, Operation Buster/Jangle** (1951).



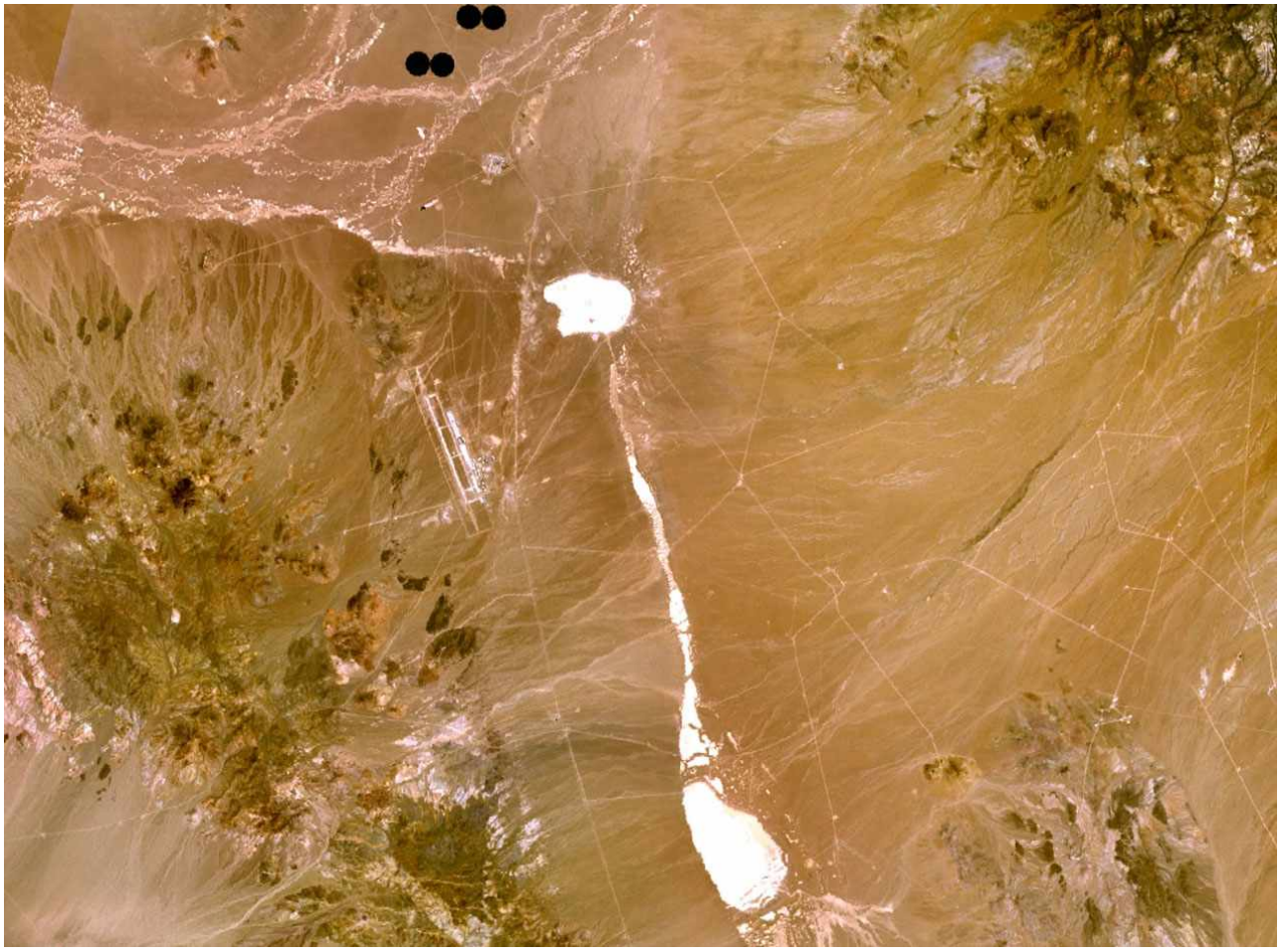
In addition, the site is used for low-level waste disposal. Currently, the site is allowing other types of testing at the site, conducting remediation, and is in a standby mode so that if nuclear weapons testing ever is needed again, it could be conducted at the Nevada Test Site.

Contractors: Bechtel Nevada (1996-present); Reynolds Electrical & Engineering Company (1952-1995). Holmes and Narver was an architectural and engineering contractor at the Nevada Test Site from late 1951 until November 1990. Holmes and Narver's role at the Nevada Test Site was to design and supervise construction of facilities that included towers, bunkers, instrument stations, tunnel complexes, and

other test-support facilities. In November 1990, this function was assumed by a new contractor, Raytheon Services, Nevada.

•NV **Reynolds Electrical and Engineering Company**[370] Las Vegas DOE – Nevada Test Site contractor.

•NV **Titanium Metals Corp. of America**[371] Henderson DOE - provided goods and/or services to the Fernald facility as subcontractor.



•NV **Tonopah Test Range**[372] Tonopah DOE - 1956-. - The Tonopah Test Range was established by Sandia Corporation and continues today as an outpost to Sandia National Laboratories. Tonopah was established to provide an isolated place for the Atomic Energy Commission to test ballistics and non-nuclear features of atomic weapons. The AEC began leasing this isolated 525 square mile property from the Air Force in early 1956. In August of the same year the AEC contracted Reynolds Electrical and Engineering Company for the construction of temporary facilities on the test range. The AEC contracted with Lembke Construction for permanent facilities at the

370 **Reynolds Electrical and Engineering Company (REECo) Dosimetry Records**, ca. 1945-1983. LANL, Records Center, G-12, Los Alamos, NM 87545
- http://hss.energy.gov/healthsafety/ohre/new/findingaids/epidemiologic/lanl/study/129.html

371 DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; August 29, 1994. - 3 pp.
- http://www.lm.doe.gov/Considered_Sites/Gleason_Works_-_NY_55/

372 US Air Force: **Final environmental assessment for sanitary landfill expansion on the Tonopah Test Range, Nye County, NV.** 2007 . - 49 pp.

site in 1960. Rocket testing began in 1957 with the series "Doorknob."[373] It is believed that the only operation on site involving radiation occurred in 1963 and was known as Operation Roller Coaster.[374] Studies were also conducted in 1964 at the Tonopah test range as part of the AEC program known as Project Plowshare.[375] These involved the use of non-nuclear explosives to examine earth cratering patterns. A separate Air Force installation at the test range, which consisted of housing, hangers, and other facilities standard to modern Air Force bases, was constructed on the Tonopah Test Range in the late 1970s for developmental testing of the Air Force's F-117 Stealth Fighter plane. The Air Force moved its stealth program to Holloman Air Force Base and mothballed its Tonopah base in 1994. The Air Force installation does not qualify as a DOE facility. CAU 426 consists of one Corrective Action Site (CAS) which is comprised of four waste trenches (CAS Number RG-23-001-RGCS). The trenches were excavated to receive solid waste generated in support of .Operation Roller Coaster, primarily the Double Tracks Test in 1963, and were subsequently baclctllled. The Double Tracks Test involved the use of live animals to assess the biological hazards associated with the non-nuclear detonation of plutonium-bearing devices (i.e., inhalation uptake of plutonium aerosol).[376] Contractors: REECO; Lembke Construction of Las Vegas, EG&G, and Advanced Security. Raytheon also served as a contractor at the site, and in the 1993, KMI received Tonopah's primary support and maintenance contract.

•NV **Yucca Mountain Site Characterization Project** Yucca Mountain DOE

•NY **AEC New York Operations Office** AWE

•NY **Allegheny-Ludlum Steel**[377] Watervliet AWE - 1950-1952 - Allegheny-Ludlum Steel rolled uranium billets into rods for the AEC as part of the multi-site process overseen by the New York Operations Office for the production of uranium metal for fabrication into slugs for fueling the Hanford production reactors.

•NY **American Machine and Foundry** Brooklyn AWE - 1951-1954; Residual Radiation 1955-1992 - During the early 1950s, this location designed and produced industrial equipment for the Atomic Energy Commission. American Machine Foundry also performed a large volume of uranium, thorium and possibly zirconium metal machining work from 1951-1954.

373 Doorknob. Test vehicle developed by Sandia for aeronomy measurements during atmospheric nuclear tests.

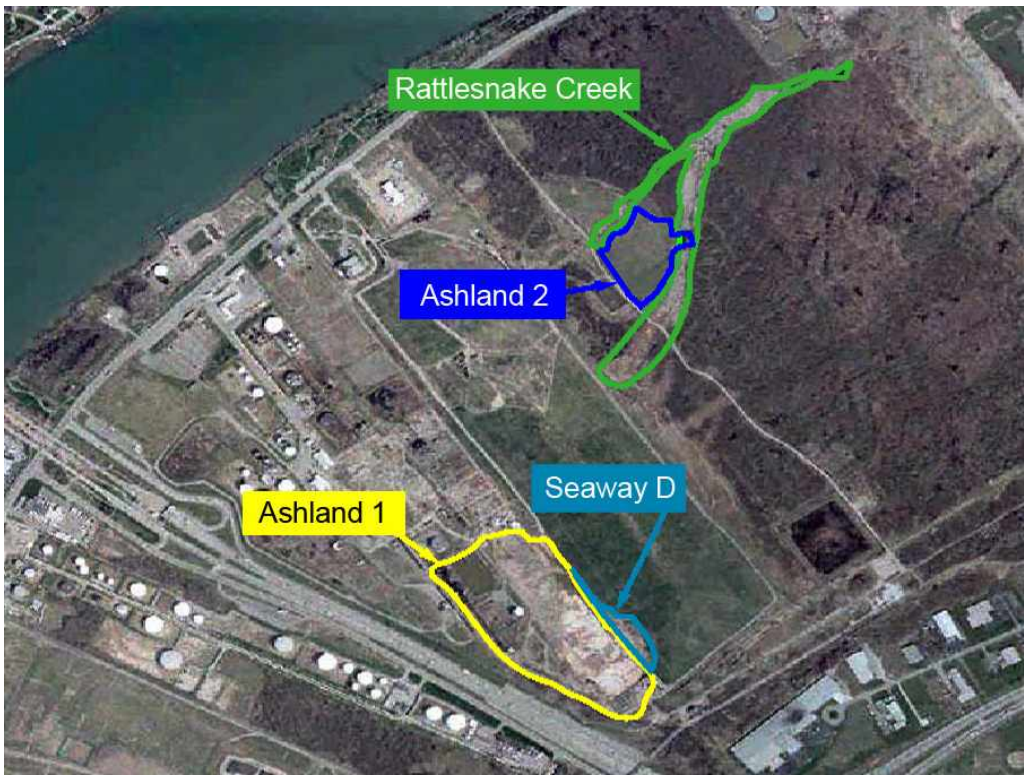
374 Nevada Environmental Restoration Project: **Closure Report for Corrective Action Unit 426**: Cactus Spring Waste Trenches, Tonopah Test Range, Nevada. 1998.- 63 pp.

'CAU 426 consists of one Corrective Action Site (CAS) which is comprised of four waste trenches (CAS Number RG-23-001-RGCS). The trenches were excavated to receive solid waste generated in support of .Operation Roller Coaster, primarily the Double Tracks Test in 1963, and were subsequently baclctllled. The Double Tracks Test involved the use of live animals to assess the biological hazards associated with the non-nuclear detonation of plutonium-bearing devices (i.e., inhalation uptake of plutonium aerosol) (DOE, 1996).'

375 DOE, Nevada Operations Office, Office of Public Affairs and Information: **Plowshare Program**, undated. - 41 pp. - https://www.osti.gov/opennet/reports/plowshar.pdf

376 Nevada Environmental Restoration Project: **Closure Report for Corrective Action Unit 426: Cactus Spring Waste Trenches**, Tonopah Test Range, Nevada. 1998.- 63 pp.

377 National Institute for Occupational Safety and Health: **Site Profiles for Atomic Weapons Employers that Worked Uranium and Thorium Metals Appendix Q – Allegheny-Ludlum Steel Company**, 2007. - 16 pp.- http://www.cdc.gov/niosh/ocas/pdfs/tbd/b-6000-apq-r0.pdf



•NY **Ashland Oil Company** Tonawanda AWE/DOE - 1944-1960; 1974-1982 - In August 1944, the Manhattan Engineer District purchased the Ashland #1 property, formerly known as the Haist Property, for use as a disposal site for approximately 7,250 metric tons (8,000 tons) of uranium ore tailings and concentrate refining residues generated at the nearby Linde site. When the uranium residues were transported to the Ashland #1 site, they were spread over two-thirds of the property to estimated depths of 0.3 to 1.5 meters (one to five feet). In 1960, the Atomic Energy Commission determined that the levels of residual radioactivity at Ashland #1 site were below then current criteria and released the land as surplus. The Ashland Oil Company eventually acquired the property.

From 1957 to 1982, the Ashland Oil Company used a portion of the Ashland #2 site as a landfill for disposal of general plant refuse and industrial and chemical wastes and materials. Between 1974 and 1982, Ashland Oil transported from the Ashland #1 site an unknown quantity of soil mixed with radioactive residues to the Ashland #2 landfill.

•NY **Baker and Williams Warehouses**[378] New York AWE/DOE - 1942-1949 - The Manhattan Engineer District and the Atomic Energy Commission used the Baker & Williams site warehouses for short-term storage of uranium concentrates. This material was generated in Port Hope[379], Canada, by milling African ores from the African Metals Corporation.

[**Shinkolobwe**[380] - DR Congo AWE 1942-1960 - The United States used the Shinkolobwe's uranium resources to supply the Manhattan Project to construct the atomic bomb in World War II. Edgar Sengier, then director of Union Minière du Haut Katanga had stockpiled 1,200 tonnes of uranium ore in a warehouse on Staten Island, New York. This ore and an additional 3,000 tonnes of ore stored above-ground at the mine was purchased by Colonel Ken Nichols for use in the project. The Congo mine had been closed since 1939 as it was flooded. The American Army sent a squad from its Corps of Engineers to restore the mine, expand the aerodromes in Léopoldville and Lubumbashi (formally Elizabethville), and build a port in Matadi, on the Congo River. Between 1942 and 1944, about 30,000 tons of uranium ore were sold to the US Army. The mine was closed in 1960.

378 DOE: **Long-Term Surveillance and Maintenance Requirements for Remediated FUSRAP Sites**. 2011. - 146 pp. - http://www.lm.doe.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=7978&libID=8084

379 **Port Hope Radiobiological Studies Project 2007** : Presented and Peer Reviewed at the EANM Congress 2007 - Copenhagen, Denmark: The Quantitative Analysis of Uranium Isotopes in the Population of Port Hope, Ontario Canada / Asaf Durakovic, Axel Gerdes, Isaac Zimmerman. Uranium Medical Research Center. - http://www.porthopehealthconcerns.com/radiobiological_studies.htm

'The Port Hope Community Health Concerns Committee (PHCHCC) and Uranium Medical Research Centre (UMRC) is an incorporated nonprofit community organization which was established in 1995.'

See also: **Eldorado Uranium Refinery** 1942-. now Cameco, Blind River, Ontario, Canada.

Biomonitoring with Moss Monitors in the Vicinity of the Cameco Uranium Refinery, Blind River, Ontario (1992). - 46 pp. - http://www.archive.org/details/biomonitoringwit00ontauoft

380 International Atomic Energy Agency: **Radiological Report on an Inter-Agency mission to the Shinkolobwe mine site, Democratic Republic of Congo, 24 October to 4 November 2004**. - 22 pp. - http://ochanet.unocha.org/p/Documents/Radological_Final_Report_161204.pdf

•NY **Bethlehem Steel**[381] Lackawanna AWE - 1949-1952 - In 1949, Bethlehem Steel of Lackawanna, New York developed improved rolling mill pass schedules for uranium billets into 1.5-inch rods to be used for reactor fuel rods to later be used at the Fernald plant. Bethlehem also performed uranium rolling experiments to help design the Fernald rolling mill. 'Retired workers in western New York say they have had a hard time meeting program requirements because they worked for companies, like Linde and Bethlehem Steel, where weapons development projects contracted by the government made up only a small part of their business. Over time, the companies changed hands or closed, making records hard to come by, thus blocking compensation for former workers.'[382]

'On May 7, 1976 an article appeared in the Buffalo Courier Express listing Bethlehem Steel Corporation's Lackawanna Plant as one of several facilities which handled radioactive material for the US Atomic Energy Commission (AEC) during the late 1940's and early 1950'pp. The U, pp. Energy Research and Development Administration (ERDA), formerly the research and development arm of the AEC, had developed a list of 49 sites for which only incomplete records' existed. Lackawanna was one of the 49

381 National Institute for Occupational Safety and Health: **SEC Petition Evaluation Report Petition SEC-00056: Bethlehem Steel Corporation** / Robert Coblentz, Roger Gard, Timothy Adler. 2007. - 53 pp. - http://www.cdc.gov/niosh/ocas/pdfs/sec/bethst/bethster.pdf

'When doing experimental work, you are working with the unknown. The government admits to destroying these records.'

National Institute for Occupational Safety and Health: **Technical Basis Document: Basis for Development of an Exposure Matrix for Bethlehem Steel Corporation, Lackawanna, New York; Period of Operation: 1949-1952** / Sam Glover, Dave Allen, 2010. - 34 pp. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/dcastbd3-r1.pdf

382 **Sickened, and Fighting Another Cold War**. New York Times, December 23, 2007.

sites. The initial story was reported by the Washington Star and subsequently picked up by the Buffalo paper. The report in the Star indicated that Federal experts were surveying for possible contamination from lax handling methods, for material. possibly buried at the sites, and for possible spreading to other sites.'[383]

'• There are no records for the time period from 1949 through 1950.
• Workers were not supplied with personal protective equipment.
• Thirteen ton of radioactive materials were left at the Bethlehem Steel site.
• The amount of uranium rolling could not have been done in a 10-hour day.
• The work at Bethlehem Steel involved more manual labor than at Simonds Saw and Steel.
• The government admits to destroying records.
• The work areas could not have been cleaned in one day.
• NIOSH initially stated that the highest dust levels were at the rollers, and then later, NIOSH stated the highest exposures were somewhere else.
• Grinding was not recognized or incorporated in the Bethlehem Steel Technical Basis document.
• Workers ate and drank in dusty areas and could have ingested uranium.
• Workers wore contaminated coveralls.'[384]

•NY **Bliss & Laughlin Steel**[385] Buffalo AWE/DOE - 1951-1952 - Under contract to

383 **Preliminary Survey of Bethlehem Steel Lackawanna, New York** / Work performed by the Health and Safety Research Division. Oak Ridge National Laboratory. Oak Ridge, Tennessee, 1980. - 14 pp.

384 **SEC Petition Evaluation Report Petition SEC-00056** : Bethlehem Steel Corporation / Robert Coblentz, Roger Gard, Timothy Adler. National Institute for Occupational Safety and Health, 2006. - 53. pp

385 **SEC Petition Evaluation Report for Bliss & Laughlin Steel (January 1, 1951 through December 31,**

the National Lead Company of Ohio (Fernald), Bliss and Laughlin Steel rolled uranium rods for the AEC and also provided uranium slug machining services. Bliss and Laughlin was part of a complex called the Buffalo Works that fashioned components for the early weapons program. The functions were transferred to the Albuquerque South Valley Site in 1952.

•NY **Brookhaven National Laboratory**[386] Upton DOE - 1947-. - Brookhaven

1952 and/or during the residual period from January 1, 1953 through December 31, 1998 / Donald R. Watkins, Monica Harrison-Maples, Riasp Medora, Kyle Kleinhans, James K. Alexander, and Jack Beck. National Institute for Occupational Safety and Health, 2009. - 53 pp.
- http://www.cdc.gov/niosh/ocas/pdfs/sec/blsteel/blisser.pdf

386 Medical Research Center at Brookhaven National Laboratory, Sample Report: **Evaluation of the Fallout Protection Afforded by Brookhaven National Laboratory Medical Research Center** / H. Borella, Z. Burson, and J. Jacovitch. Civil Effects Test Operations. U.S. Atomic Energy Commission. - Washington D. C. Office of Technical Services, Department of Commerce, 1961. - 77 pp.
- ttp://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADA437760

National Institute for Occupational Safety and Health: **Site Profile for the Brookhaven National Laboratory** / Lori Arent, Samuel Chu, John A. Devanney, Leo Faust, Robert L. Morris, Eugene Potter, and Elyse M. Thomas. 2010. - 115 pp. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/brooknlr1.pdf

Draft: Review of the NIOSH Site Profile for Brookhaven National Laboratory. S. Cohen & Associates, Vienna, Virginia, 2009. - 59 pp.- http://www.cdc.gov/niosh/ocas/pdfs/abrwh/scarpts/sca-t1-sp09-1-r0.pdf

'For internal dose assessment, the site profile fails to address the adequacy and completeness of BNL bioassay data to support dose reconstruction. Uniform and comprehensive historic bioassay policies have not been cited nor located for BNL. With the exception of operators at the BGRR, bioassay monitoring for isotopes other than tritium at BNL appears to have been more "event driven," rather than conducted on a routine preventive basis. A preliminary review of BNL bioassay records does not indicate that consistent long-term routine bioassay monitoring policies were in place. From a preliminary review of available BNL

National Laboratory (BNL) is the former site of a US. Army installation (Camp Upton) and has been involved in research and development activities in support of the Department of Energy (DOE) and its predecessor agencies since 1947. BNL's facilities conduct basic and applied research in high energy and nuclear physics and in other areas of science. Contractors:Brookhaven Science Association (Battelle Memorial Institute and State University of New York at Stony Brook)(1998-Present); Associated Universities, Incorporated (1947-1998)

•NY **Burns & Roe, Inc.** Maspeth BE - 1949 - In 1949, under AEC contract AT(30-1)438, Burns & Roe constructed a pilot plant in Maspeth on Long Island. The plant was constructed as a means of determining the potential value of the Sheer-Korman process in the manufacture of reactor materials. At least one test run involving beryllium was conducted in 1949. The New York Operations Office Health and Safety Laboratory sampled for beryllium in the air in 1949 and 1950, when the plant was dismantled.

•NY **Carborundum Company** Niagara Falls AWE - 1943-1944; 1959-1967 - In 1943 and 1944 the Carborundum Company at its Globar Plant and Buffalo Avenue locations was engaged in various phases of Manhattan Engineer District (MED) programs to determine suitable methods for engineering and shaping uranium rods. This work also involved the forming, coating, and canning of uranium rods for the MED pile. From 1959 through 1967, the company used powder fabrication techniques to manufacture uranium, plutonium, and carbide pellets for an AEC research program. The Hanford facility supplied Carborundum with materials during that period. Carborundurn also performed work during the 1950s that is not covered under EEOICPA, including fabricating nuclear fuel elements for commercial purposes and producing zirconium, hafnium, and titanium for AEC's special reactor materials program.

records and interviews with BNL health physics personnel, there is sufficient reason to question the completeness, accuracy, and accessibility of bioassay records for BNL from the late 1940s through the mid-1980s, or perhaps into the mid-1990s, when the centralized electronic Health Physics Records System (HPRS) became operational.'

Cultural (Historical) Resource Management at Brookhaven National Laboratory. **Historic Images: Early BNL** - http://www.bnl.gov/ewms/cresources/HistoricImages/early_bnl_pics.asp

•NY **Colonie Site**[387] (National Lead) Colonie AWE/DOE - 1958-1968 - From 1958-1968, National Lead Industries owned and operated the Colonie site and during this time it produced uranium products under contract to the AEC. This contract was terminated in 1968. Thereafter, National Lead fabricated various products from depleted uranium. The largest customer for these products was the US. Department of Defense with its contract for armor penetrator cores.

387 **Former National Lead site on the mend** / Diana Denner. The Record. Sunday, September 26, 2010
'COLONIE — A report published this past spring by the U.S. Army Corps of Engineers (USACE) indicates that 1130 Central Avenue, where radioactive materials contaminated the Colonie Site, is now on the mend.'

Uranium found in residents and workers near former National Lead's Colonie plant. The Business Review, December 5, 2007. 'A joint study by the University at Albany and the University of Leicester in England has found uranium in workers and residents who lived near the former National Lead Industries munitions plant in Colonie between 1958 and 1982.'

The distribution of depleted uranium contamination in Colonie, NY, USA / Lloyd et al. 2009. Science of the Total Environment, 408 (2), 397-407. Reprinted in the Testimony of Prof Randall Parrish, 2009.

Isotope ratio mapping of depleted uranium contamination from the NLI Colonie site / Nicholas S. Lloyd, Simon R. Chenery, Randall R. Parrish. University of Leicester, British Geological Survey, Kingsley Dunham Centre, Keyworth, Nottingham, 2008. - 1 p.
- http://www.asureviews.org/N_Lloyd_BNASS_Poster.pdf

Testimony of Prof Randall Parrish for the Subcommittee on Investigations and Oversight of the Committee for Science and Technology, US House of Representatives. Washington, 12 March 2009.
- http://gop.science.house.gov/Media/hearings/oversight09/march12/parrish.pdf

•NY **Columbia University**[388] New York City AWE/ DOE - including the Nevis cyclotron, which was constructed at Columbia University's Nevis Laboratories in Irvington, N.Y.

•NY **Crucible Steel Co.**[389] Syracuse AWE - 1951 - In 1951, New York Operations Office personnel performed a test forging and rolling of 10 thorium billets at Crucible Steel Company.

•NY **Eastman Kodak Laboratory** or **Eastman Kodak Rochester Lab.**[390] AWE - Research and development with natural uranium solutions in 1943.

•NY **Electro Metallurgical**[391] Niagara Falls AWE - 1942-1953 - In 1942, the Electro Metallurgical Company

388 National Archives: **Records of the Atomic Energy Commission** [AEC] (Record Group 326) 1923-75
According to Wikipedia, Eugene Theodore Booth (1912-2004) was an American nuclear physicist. He was a member of the historic Columbia University team which made the first demonstration of nuclear fission in the United States. During the Manhattan Project, he worked on gaseous diffusion for isotope separation. He was the director of the design, construction, and operation project for the 385-Mev synchrocyclotron at the Nevis Laboratories.'

389 DOE Memorandum/Checklist; **A. Wallo to the File: Elimination of Crucible Steel Company of America**; November 17, 1987. - 3 pp.

390 DOE: Memorandum/Checklist; Wallo to the File; Subject: **Elimination Eastman Kodak**; December 7, 1987. - 4 pp.

(ElectroMet), a subsidiary of Union Carbide and Carbon Corporation, was contracted by the Manhattan Engineer District to design, engineer, construct, and operate a metal reduction plant. Developing the technology to produce pure uranium metal was a priority for the Manhattan Project. ElectroMet received uranium tetrafluoride from Union Carbide's Linde Air Products Division. ElectroMet reacted the uranium tetrafluoride with magnesium in induction furnaces to produce uranium metal. Once the metal was produced, it was cast into ingots, and the ingots were then shipped out for testing or for rolling. The leftover process residues were sent to other sites for uranium recovery, storage, or disposal. The products were generally shipped to either Hanford Engineer Works, Argonne National Laboratory, Argonne, Illinois, or du Pont's Chambers Works, Deepwater, New Jersey, for testing, or to Simonds Saw and Steel Company, Lockport, New York, Vulcan Crucible Steel Company, Alliquippa,Detroit, Pennsylvania, Revere Copper and Brass Company, Wayne, Indiana, for rolling. Process residues (dolomite slag, uranium chips, and crucible dross) were shipped to other sites for uranium recovery, storage, or disposal. These sites included Lake Ontario Ordnance Works, Lewiston, New York, (now known as the DOE Niagara Falls Storage Site[392]), Mallinckrodt Chemical Company, St. Louis, Missouri, Vitro Manufacturing Company, Canonsburg, Pennsylvania, the Du Pont Chambers Works, and Hooker Electrochemical Company, Niagara Falls, NY.

In addition to production of metal from green salt, Electromet recast scrap metal from Simonds,Chapman Valve Manufacturing Company, Indian Orchard, Massachusetts, and American Rolling Mill Company (location unknown). ElectroMet was also in charge of recasting metal, research and development in low- and high-grade uranium ores, and supplying calcium metal to Los Alamos and other laboratories. From 1950 through 1953, the plant casted zirconium metal sponge into ingots. Ownership of the facility was transferred from the AEC to ElectroMet in 1953.

- http://www.lm.doe.gov/Considered_Sites/E/Eastman_Kodak_Laboratory_-_NY_0-09/NY_0-09-1.pdf

391 **Review of NIOSH Petition Evaluation Report for Petition SEC-00136 Dated July 21, 2009, Electro-Metallurgical Corporation** / William C. Thurber. S. Cohen & Associates. Vienna, Virginia. 2011. - 67 pp. - http://www.cdc.gov/niosh/ocas/pdfs/abrwh/scarpts/sca-electromet-136-r1.pdf

Site Profiles for Atomic Weapons Employers that Refined Uranium and Thorium - Appendix C Electro Metallurgical Company. Office of Compensation Analysis and Support. 2007. - 8 pp.

Technical Basis Document for the Electro Metallurgical Company Niagara Falls, New York / David Allen. National Institute for Occupational Safety and Health. Division of Compensation Analysis and Support. 2011. - 8 pp. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/electromet-r0.pdf

392 DOE: **Long-Term Surveillance and Maintenance Requirements for Remediated FUSRAP Sites**. 2011. - 146 pp. - http://www.lm.doe.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=7978&libID=8084

•NY **Environmental Measurements Laboratory**[393] New York DOE - 1946-2003 - EML traces its roots to the Medical Division of the Manhattan Project during and after World War II. The Division focused on industrial hygiene, radiation protection and safety. In 1946, the Atomic Energy Commission (AEC) was created. The lab was renamed the Health and Safety Division of the AEC. In 1953 it became the Health and Safety Laboratory, or HASL. Fallout from nuclear weapons tests became a major concern and the lab's focus shifted to measurements and assessments of fallout using a network of gummed film monitoring stations and measurements of the radioactivity levels in various food products. In the 1950's and 1960's, the worldwide sampling network was expanded considerably to include soil and water samples, air filter samples at the surface and in the stratosphere, biological samples, and measurements of wet and dry fallout. In the 1970's, the lab's worldwide sampling programs were expanded to include non-nuclear pollutants. When the Atomic Energy Commission was abolished in 1975, the Health and Safety Laboratory became part of the Energy Research and Development Administration. In 1977, the Energy Research and Development Administration was absorbed by the Department of Energy, and the Health and Safety Laboratory changed its name to the Environmental Measurements Laboratory. In the 1970's, the lab performed extensive radiation transport and dosimetry studies in and around nuclear facilities, and established the Quality Assurance Program for environmental dosimeters and radioanalytical measurements. The lab also did extensive dose reconstructions for nuclear weapons tests, and studied radon in homes. The lab took immediate measurements after the Three-Mile Island and Chernobyl accidents, providing the ability to accurately and comprehensively reconstruct the environmental contamination resulting from these incidents. In 1997, the lab underwent a major change of focus when it moved from the DOE Office of Energy Research to the Office of

393 **Why They Called It the Manhattan Project**. / William J. Broad. New York Times: October 30, 2007. - http://www.nytimes.com/2007/10/30/science/30manh.html

Environmental Management. Today, EML's primary focus is to support environmental monitoring, decommissioning, decontamination, and remediation efforts. EML continues to put its worldwide monitoring network to good use by developing models of the atmospheric transport of pollutants. The lab has assisted in developing instruments in support of non-proliferation activities and conducts in-situ measurements in support of many decontamination and decommissioning activities undertaken by DOE after the end of the Cold War. In 2003 this laboratory was incorporated into the Department of Homeland Security.

Republic F-105 Assembly Plant at Farmingdale.
Source: Cradle of Aviation Museum, Garden City, Long Island

•NY **Fairchild Hiller Corporation** Farmingdale BE - 1969-1970 - The Republic Aviation Division of the Fairchild Hiller Corporation produced beryllium products for the AEC's Rocky Flats facility in 1969 and 1970. The company produced the F-105 Thunderchief, which was delivered in May 1958. This supersonic aircraft had an internal bomb bay, the first ever on a fighter aircraft, and was capable of deploying nuclear weapons. In 1962 Fairchild Stratos Corporation acquired Hiller Aircraft Company. In 1964 the name was changed from Fairchild Stratos Corporation; division and subsidiaries; Aircraft Missiles Division, Aircraft Services Division, Electronics Systems Division, Inc., Fairchild Aviation (Holland) N.V. and Fairchild Arms International, Inc. to Fairchild Hiller Corporation.

•NY **General Astrometals**[394] Yonkers BE - 1963-1965; 1970 - General Astrometals, formerly Beryllium Metals & Chemicals Corp., Bessemer City, NC.[395], supplied beryllium metal and parts to the Y-12 plant and to Lawrence Livermore National Laboratory. It also purchased beryllium chips and contaminated powder from Oak Ridge. In 1970 they analyzed some beryllium samples for Rocky Flats.

•NY **Gleason Works**[396] now **Gleason Corporation** DOE - Metal fabrication

394 **2 Local Sites on Toxic List.** / Bill Huges and Marilyn Anderson Rhames. The Journal News, Saturday, January 13, 2001. - http://web006.westchestergov.com/articles/011301a.pdf

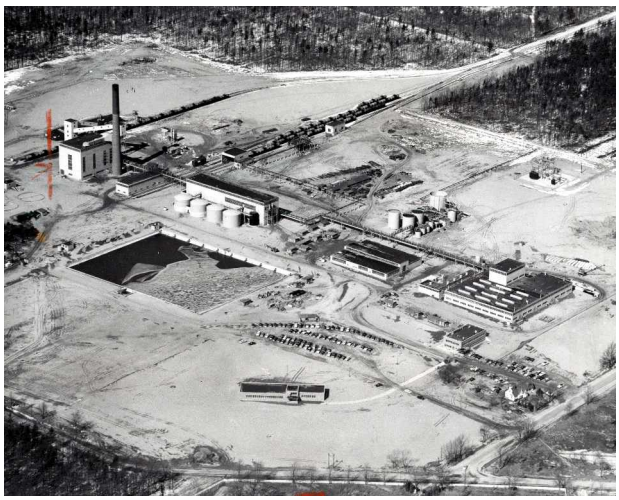
395 Bureau of Mines / Minerals yearbook metals, minerals, and fuels 1969. Year 1968, Volume 1-2 (1969) / Eilertsen, Donald E.: Beryllium, pp. 213-218

396 DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; August 29, 1994. - 3 pp.
- http://www.lm.doe.gov/Considered_Sites/Gleason_Works_-_NY_55/

'In 1990, with the assistance of Mr. Doug Tonlsay and Ms. Michelle Landis, I reviewed a number of sites that had formerly provided goods and/or services to the Fernald facility as subcontractors. For 24 of these sites, recommendations were made to eliminate them from further consideration under Formerly Utilized Sites Remedial Action Program (FUSRAP).' The sites are:

American Machine and Metals, E. Moline, IL
American Steel Foundries, Cincinnati, OH
Bendix Aviation Corp.. Davenport, IL
Besley-Wells Co., Beloit, WI
R. Brew Company, Concord, NH
Cincinnati Milling Machine, Cincinnati, OH
Fenwal, Ashland, MA

operations - rolled uranium metal.



•NY **Hooker Electrochemical**[397] Niagara Falls AWE - 1943-1948; Residual Radiation 1949-1976 - In January 1943, Hooker began work for the Manhattan Engineer District to manufacture fluoridated and chlorinated organic chemicals. The by-product of this work was hydrochloric acid that was subsequently used in the chemical processing of a uranium-bearing slag as a precursor of uranium recovery. This work was continued until shortly after World War II. Activities related to this contract ended June 1948.

•NY **International Rare Metals Refinery Inc.**[398] or **Canadian Radium and Uranium Corp.**[399] Mt. Kisco AWE - 1942-1949 - The International Rare Metals Company processed pitchblende ores for the African Metals Corporation to extract radium. The same ores were processed for the Manhattan Engineer District to recover uranium. 'Under an agreement made as of June 1, 1944, plaintiff, which had developed and perfected a process for producing radon ointment and had patented certain necessary equipment for use in the process, granted Radium Industries, Inc., a license to produce and distribute the ointment. Plaintiff agreed to deliver to Radium Industries, Inc., a sufficient amount of radium in solution for the production of the ointment, together with an emanator and other necessary equipment and supplies.'

Food Machining Corp., Nitro, WV
General Electric Plant, Shelbyville, IN
Gleason Works, Rochester, NY
C.I. Haynes, Cranston, RI
Heald Machine Co., Worcester, MA
John Van Range Co., Cincinnati, OH
Knoxville Iron Co., Knoxville, KY
La Pointe Machine Tool Co., Hudson, MA
Ohmart Corp., Cincinnati, OH
Podbeilnac Corp., Chicago, IL
Rogers Iron, Joplin, MD
Oregon Metallurgical Corp., Albany OR
Ohio State University, Columbus, OH
Stauffer Tenescal Co., Richmond, CA
Tocco Induction Heating Division, Cleveland, OH
Utica Drop Forge & Tool Co., Utica, NY
Titanium Metals Corp. of America, Henderson, NV

397 National Institute for Occupational Safety and Health: **Technical Basis Document for the Hooker Electrochemical Company Niagara Falls, New York** / David Allen. - 2011. - 16 pp. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/hooker-r1.pdf

398 DOE Letter; Wagoner to Merges; **Elimination of the Former Canadian Radium and Uranium Company Site from Consideration under FUSRAP**; August 24, 1993. - 2 pp. - http://www.lm.doe.gov/Considered_Sites/I/International_Rare_Metals_Refinery_Inc_-_NY_38/NY_38-4.pdf

399 2 local sites on toxic list. / Bill Huges and Marilyn Anderson Rhames. The Journal News, Saturday, January 13, 2001. - http://web006.westchestergov.com/articles/011301a.pdf

Canadian Radium & Uranium corp. v. IND. INS. CO. OF N. AM. 411 Ill. 325 (1952) 104 N.E.2d 250. **Canadian Radium & Uranium Corporation, Appellant, v. Indemnity Insurance Company of North America**, Appellee. No. 31979. Supreme Court of Illinois. Opinion filed January 24, 1952.

•NY **Ithaca Gun Co.**[400] Ithaca DOE - 1961-1962 - During 1961-1962, Ithaca Gun conducted tests involving the forging of hollow uranium billets into tubes for the metallurgical group at National Lead Company of Ohio (Fernald). Additional tests to investigate alternative methods of producing fuel cores were conducted at IGC in 1962. The forging process involved heating the uranium billet to extreme temperatures, followed

400 **A Site's History: The Ithaca Gun Company Honors Thesis**. Presented to the College of Agriculture and Life Sciences, Landscape Studies of Cornell University in Partial Fulfillment of the Requirements for the Research Honors Program by Rachel Hendricks. January 2011. - 199 pp.

City of Ithaca Pledges to Overhaul Contaminated Gun Factory Site. / Molly OToole
The Cornell Daily Sun, July 30, 2008. - http://cornellsun.com/node/30924

DOE Survey; T. Vitkus and J.Payne; **Radiological Survey of the Gun Forging Machine Building, Ithaca Gun Company, Ithaca, NY**; October 1995. - 45 pp.
- http://www.lm.doe.gov/Considered_Sites/I/Ithaca_Gun_Co_Inc_-_NY_53/NY_53-1.pdf

'No radioactive materials attributable to the former Ithaca Gun Company or to the activities of the AEC were identified during the radiological survey.'

Gun Factory Building Has Hazardous History. / Molly OToole
The Cornell Daily Sun, November 28, 2007- - http://cornellsun.com/node/26384

'This article is the first in a series examining the history of the Ithaca Gun Factory.'

Gun Factory Clean-Up Site Raises Issues. / Megan Carney
The Cornell Daily Sun, April 30, 2009.

'Prior to a $4.8 million remediation effort led by the Environmental Protection Agency between 2002 and 2004 with Superfund resources, these contaminants included lead levels as high as 215,000 parts per million (500 times the recommended level), as well as asbestos, arsenic, mercury and uranium, The Sun reported in 2007. However, the EPA's clean-up was incomplete, and subsequent soil testing revealed residual lead-contaminated areas, trichloroethylene contamination, as well as toluene levels at over 1000 times the recommended value.

One of Hang's main concerns is that the most heavily polluted area, which he cited as the west base of the "Island" — a projection of land overlooking Ithaca Falls — is not included in the current remediation plans. '

by mechanical hammering and rapid cooling in quench drums. The process created residual contamination in the form of metal tilings and dust.

Toxic concerns: The demolition of the Ithaca Gun Factory and clean-up of the polluted site is raising concerns about nearby residents' health. Source: The Cornell Daily Sun

Because of the potential for contamination of equipment and surrounding surfaces, all testing was conducted in an enclosed, secluded building of the plant.

•NY **Kesselring Site** or **Knolls Atomic Power Laboratory**[401], West Milton, AWE 1950-1953 - The Knolls Atomic Power Laboratory, is engaged solely in research and development for the design and operation of naval nuclear propulsion plants. It operated from 1950 to 1953 as a pilot plant to research the reduction/oxidation and plutonium uranium extraction chemical processes to extract uranium and plutonium from irradiated uranium. These operations resulted in waste that contaminated buildings and about 30 acres of land at the KAPL facility. On September 29, 2010, a radioactive contamination event occurred while performing open air demolition of Building H2 at the Separations Process Research Unit (SPRU) in Niskayuna, New York. Though initial indications demonstrated that low levels of contamination had been found on workers shoes and on KAPL property adjacent to the SPRU work activities, the magnitude and significance of the contamination event were not fully identified and understood by the SPRU project for several days.

401 **DOE shakes up radioactive material cleanup team after leaks at Knolls labs site** : Project manager ousted, private cleanup firm gets warning as DOE studies radioactive material releases at Knolls labs / Brian Nearing. Times Union. November 20, 2010.

US. Department of Energy. Office of Environmental Management: **Type B Accident Investigation Report Radiological Contamination Event During Separations Process Research Unit Building H2 Demolition September 29, 2010**. November 23, 2010. - 82 pp.
- http://spru.energy.gov/Final%20Report%20-%20SPRU%20Type%20B.pdf.

Documentation of environmental indicator determination, Interim Final 2/5/99. **Migration of Contaminated Groundwater Under Control**: US Department of Energy - Knolls Atomic Power Laboratory.
http://www.epa.gov/region2/waste/usdoe750.pdf

•NY **Lake Ontario Ordnance Works**[402] Niagara Falls DOE - 1944-1997 - In 1944, the Manhattan Engineer District (MED) obtained a portion of the Lake Ontario Ordnance Works (LOOW) from the Department of Defense (DOD) for storage of low-grade radioactive residues resulting from pitchblende ore processing at the Linde Air Products facility. In 1948, when the DOD decommissioned the LOOW, the AEC acquired 1511 acres of the site, including the original storage areas. The AEC declared most of this property as excess in 1955, and by 1968 the General Services Administration was able to dispose of 1298 acres, with 213 acres remaining under AEC control. In 1975, additional property was transferred to the town of Lewiston, leaving the present 191-acre site. The DOE portion of the site became known as the Niagara Falls Storage Site (NFSS). The site remained under DOE control until 1997 when it was transferred to the Corps of Engineers under the FUSRAP program. Following World War II, Linde's refinery was decommissioned and contaminated equipment was disposed at the LOOW.

402 FUSRAPFact Sheet: Niagara Falls Storage Site (NFSS): **Radiological Investigation of Underground Utility (UU) Lines on the former Lake Ontario Ordnance Works (LOOW) property.** U.S. Army Corps of Engineers. Buffalo District. 2007. - 107 pp.
- http://www.lrb.usace.army.mil/derpfuds/loow-nfss/loow-fs-radundgutil-2007-10.pdf

Contaminated materials from other MED/AEC facilities were also shipped to LOOW for disposal. Beginning in 1949, residues from operations at the Mallinckrodt Chemical Works were shipped to LOOW for storage. During the early 1950's, the AEC portion of the LOOW was also used for interim storage of uranium and thorium billets and rods being processed by various New York companies. During 1953-1954, the AEC constructed a boron isotope separation plant at the LOOW, which began operations in 1954. The operating contractor for this plant was the Hooker Electrochemical Company which referred to it as Plant 31 (P-31). In 1958, the facility was placed on stand-by and a maintenance contractor, Page Airways, was employed for routine surveillance. The operation was restarted in 1964, with Nuclear Materials and Equipment Company as the operating contractor. In 1971, the boron facility was again placed on stand-by with National Lead Company of Ohio (NLO) as the caretaker. In 1981, Bechtel National took over the caretaker contract and began plans for remedial work at the site. Clean-up began in 1982. Contractors: Hooker Electrochemical (1953-1958); Page Airways (1958-1964); Nuclear Materials and Equipment Company (NUMEC) (1964-1971); National Lead Company of Ohio (1971-1981); Bechtel National (1981-1997).

•NY **Ledoux and Co.**[403] New York AWE – 1946-? - The weighing and assaying of the

403 **Description of the Formerly Utilized Sites Remedial Action Program**. United States, Department of Energy. 1980. - 85 pp.

[African] ore samples were performed for the Federal Princeton University, Princeton, New Jersey; and the National Bureau of Standards (NBS), Washington, D.C. Weighing and assaying for African Metals, Inc., were performed by Ledoux and Company, New York, New York.
'A Ledoux & Company laboratory somehow "lost" a vial of uranium-235 sometime between March 30 and April 1. The lab could receive a whopping $3,250 fine from the NRC for the potentially deadly accident. The mishap resulted from several license violations including:failure to adequately survey a package and remove the U-235; failure to retain the package in spite of the missing uranium; failure to keep the material in a restricted area; and unlawful disposal of the uranium in an ordinary landfill. In an April 12 search, lab staff determined that the container of U-235 had been disposed of in any of several area landfills. No effort to retrieve the radioactive substances planned. The NRC concurred with the company that a search was "impractical" given the number of possible dumps to be checked. The NRC claims that the U-235 emits less than one-tenth of a millirem per hour and posed "no threat to members of the public."'[404]

•NY **Linde Air Products**[405] Buffalo AWE - 1944-1947 - The Linde Air Products facility, also known as the Chandler Plant, was involved in the development and production of barrier for the Oak Ridge Diffusion Plant. During World War II, Linde was part of the Carbide and Carbon Chemical Corporation, later known as Union Carbide. In the 1944-l946 period, with the explicit approval and knowledge of Army officials, Linde Air Products, then a Manhattan Project contractor, disposed of over 37 million gallons of radioactively contaminated liquid chemical wastes in shallow

404 NRC News Release, Nov. 2, 2005.
405National Archives: **Records of the Atomic Energy Commission** [AEC] (Record Group 326) 1923-75

underground wells located beneath the Linde property. These liquid wastes , which were highly caustic, emanated from the first stage of the uranium ore refining processing at the Linde Plant. Both the Army and Linde were well_ aware that this method of disposal would further contaminate Linde ' s wells.[406]

406 The Assembly. State of New York: **The Federal Connection** : A History of US. Military Involvement in the Toxic Contamination of Love Canal and the Niagara Frontier Region. January 29, 1981: An Interim Report to New York State Assembly Speaker, Stanley Fink. New York State Assembly Task Force on Toxic Substances VOLUME I. 1981. - 293 pp. - http://www.factsofwny.com/fedcon1.pdf

The Legacy of the Manhattan Project in Niagara Falls / Geoff Kelly and Louis Ricciuti. Artvoice Nagazine - Buffalo, New York, 2001.

•NY **Linde Ceramics Plant**[407] Tonawanda AWE/DOE - 1942-1953 - The Linde Air Company performed uranium and nickel processing for the Manhattan Engineer District (MED) and the Atomic Energy Commission (AEC) at the Ceramics Plant in Tonawanda. African and Canadian ores were milled to black oxides at the plant. Documents indicate that the facility was placed on standby as of March 1, 1950. Linde's contractual agreements with the AEC continued through 1953 for various activities relating to closing out work at the Tonawanda location. Linde was a part of Carbide and Carbon Chemical Corporation (C&CCC), which later became Union Carbide.
•NY **Lucius Pitkin Inc., Geology Division** New York DOE - metallurgical engineer and uranium mining.
•NY **New York University** New York AWE - 1946-1952 - New York University worked on the development of counting equipment for the Manhattan Engineer District/Atomic Energy Commission.

407 Draft ADVISORY BOARD ON RADIATION AND WORKER HEALTH, National Institute for Occupational Safety and Health: **Review of the Linde Ceramics Plant Special Exposure Cohort (SEC) Petition 00107 and the NIOSH SEC Petition Evaluation Report**, 2009. - 57 pp.

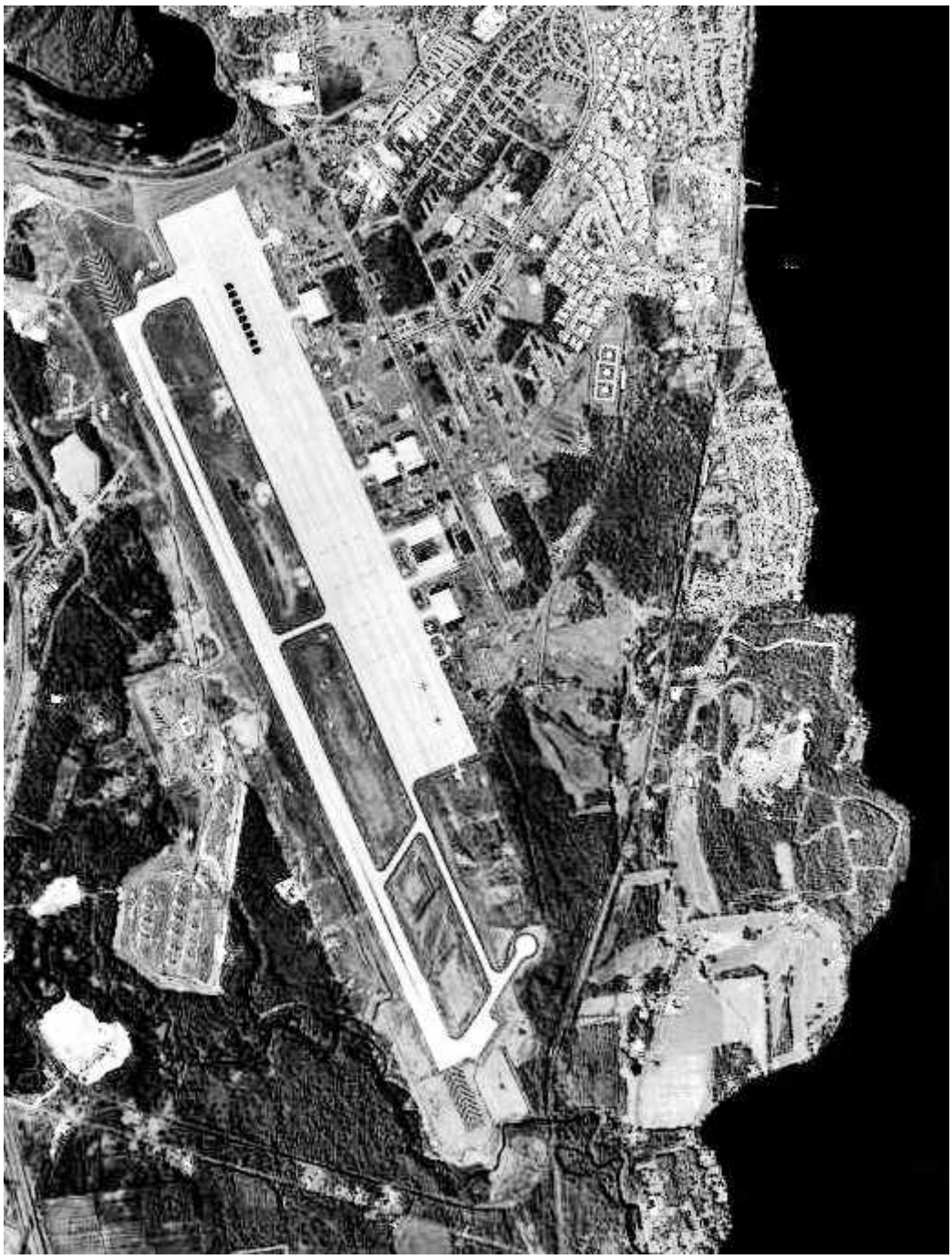
•NY **Peek Street Facility**[408] Schenectady DOE - 1947-1955 - The Peek Street Industrial Facility was operated by the General Electric Company for the Atomic Energy Commission (AEC) between 1947 and 1955. Radioactive materials were used in a variety of operations conducted at the site; primary activities included the design of an intermediate breeder reactor and the development of a chemical process for the recovery of uranium and plutonium from spent reactor fuel. Nonradioactive beryllium metal was machined on the site for breeder reactor application. The site was decommissioned and released in October 1955. Peek Street was a predecessor to the Knolls Atomic Power Laboratory.

408 **A lonely battle against atomic illnesses** : Ex-NL Industries workers unaware of often tough-to-get federal help / Brian Nearing. Times Union. Tuesday, April 19, 2011.

Derivation of cesium-137 residual radioactive material guidelines for the Peek Street site, Schenectady, New York / I,. Jones, M. Nimmagadda, and C. Yu. Enviromnental Assessment and Information Sciences Division, Argonne National Laboratory, 1992. - 25 pp.

- http://www.osti.gov/bridge/servlets/purl/10182449-TlJTeo/10182449.pdf

Results of the Radiological and Beryllium Verification Survey at the Peek Street Site, Schenectady, New York (SYOOIV) /R. D. Foley, C. A. Johnson, R. F. Camer, J. F. Allred. Oak Ridge National Laboratory, 1994. - 84 pp. - http://www.osti.gov/bridge/servlets/purl/10193165-SBL3Rs/10193165.pdf



•NY **Plattsburgh Air Force Base** Plattsburgh, Clinton, NY AWE - Plattsburgh Air Force Base is a former United States Air Force Strategic Air Command (SAC) base .
•NY **Radium Chemical Co.** New York AWE - 1943-1950 - Beginning in 1943, the Radium Chemical Co. supplied most of the radium required for the Manhattan Engineer District. Combinations of material supplied and/or mixed by the Radium Chemical Company included radium bromide and radium bromide mixed with powdered beryllium. Brass was also used.
•NY **Rensselaer Polytechnic Institute** Troy AWE - 1951-1952; 1963 - Under an AEC contract in the early 1950s, researchers at the Rensselaer Polytechnic Institute investigated methods for improving the ductility of beryllium by coating the material with copper. The Brush Beryllium Company supplied the beryllium powder for the

project. RPI also borrowed 400 lbs. of beryllium for AEC sponsored research from Oak Ridge National Laboratory in 1963. Scientists at RPI conducted a number of AEC sponsored research studies in the 1950s and 1960s using enriched uranium obtained from commercial sources.

•NY **Sacandaga Facility**[409] East Glenville DOE - 1947-1953 - The Sacandaga Facility was operated by the General Electric Company, Knolls Atomic Power Laboratory for the AEC from 1947 to 1953. AEC sponsored research at the facility involved physics studies and sodium technology development in support of breeder reactor design. Work also involved the use of beryllium.

Columbia University Pupin Hall

•NY **SAM Laboratories**[410] or Special Alloyed Materials Laboratories, Columbia University New York City DOE - 1942-1947 - Columbia University was already researching some of the problems involved in determining whether it was feasible for the US to build a nuclear weapon prior to the establishment of the Manhattan Engineer District (MED). Once the MED was formed in 1942, Columbia became part of the effort to build the first atomic weapons. At that time, the Columbia effort was reorganized and designated as SAM (Special Alloy Materials or Substitute Alloy Materials) Laboratories. Buildings used as part of the SAM laboratories at Columbia included Pupin[411], Schermerhorn, Prentiss, Havemeyer and Nash.

•NY **Seaway Industrial Park**[412] Tonawanda AWE/DOE - 1974 - In 1974, the Ashland Oil Company constructed bermed areas on the Ashland #1 property to hold two petroleum tanks. Some of the soil removed during construction was disposed of in three areas of the Seaway Industrial Park landfill. Subsequent investigations determined that the soil from the Ashland site contained radioactive contaminants exceeding Department

409 **A lonely battle against atomic illnesses** : Ex-NL Industries workers unaware of often tough-to-get federal help / Brian Nearing. Times Union. Tuesday, April 19, 2011.

'Other former atomic weapons facilities in the Capital Region have been much more active than NL in worker health claims. Most claims have come from the Peek Street facility in Schenectady, where from 1947 until 1955 researchers from Knolls Atomic Power Labs worked to separate plutonium and uranium for atomic bombs. Knolls then moved to its current facility in Niskayuna. Even though the Peek Street facility closed five decades ago -- long before NL shut down -- there are 105 health compensation claims from its workers, with 38 of those paid at a cost of $5.3 million, Labor Department records said.

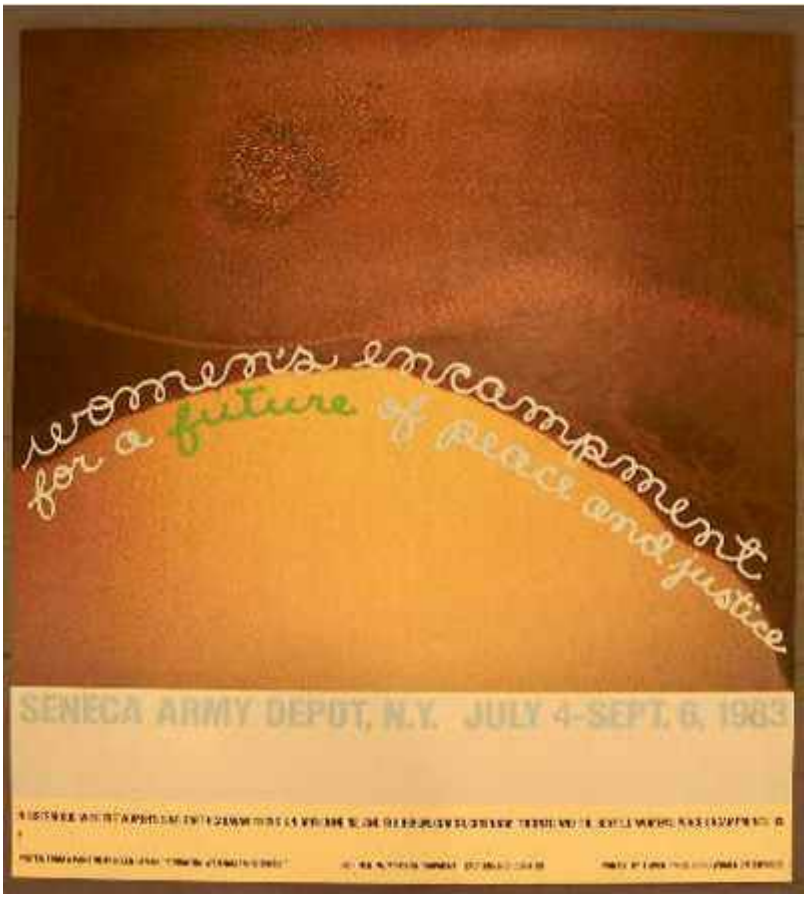
Other local sites include the former Separations Process Research Unit at the Knolls Atomic Power Labs in Niskayuna -- now the site of its own troubled ongoing federal cleanup -- as well as the Allegheny-Ludlum steel plant in Watervliet, the Sacandaga Facility in Glenville, and Rensselaer Polytechnic Institute.'

410 National Institute for Occupational Safety and Health: **SEC Petition Evaluation Report Petition SEC-00102** / Monica Harrison-Maples, 2008. 20 pp.- http://www.cdc.gov/niosh/ocas/pdfs/sec/samlab/samer.pdf

411 Columbia University Pupin Hall - http://www.columbia.edu/cu/computinghistory/pupin.html

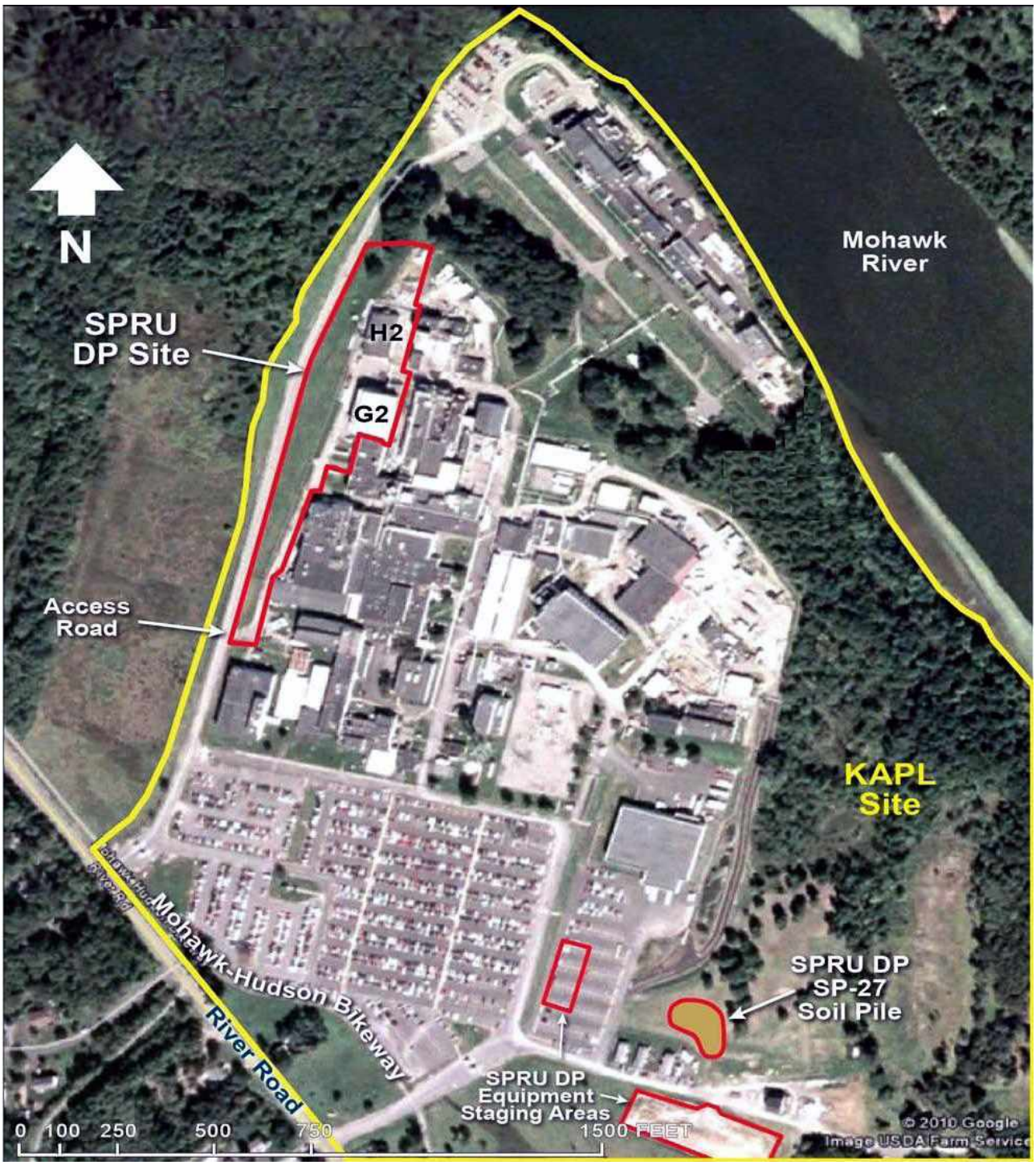
412 **Estimation of Contamination Volume at Seaway Area A, New York** / L. Durham and R. Johnson Environmental Assessment Division, Argonne National Laboratory, 1999. - 28 pp.

of Energy (DOE) guidelines. This soil came from an area used for disposal of radioactive residues from the nearby Linde Air Products site. This company processed uranium for the Atomic Energy Commission and the Manhattan Engineer District, predecessor agencies of the Department of the Energy (DOE). The Seaway site is located on River Road in Tonawanda, New York, just north of Buffalo. Between 1974 and 1982, the site was contaminated during the transfer of soil containing low-level radioactive residues from the Ashland 1 site to the Ashland 2 site. This contamination is primarily soil containing the radionuclides thorium-230, uranium-238, and radium-226. The original contamination resulted from activities involving radioactive material conducted under government contract at Ashland 1. At the time of the soil transfer, the Seaway site was a sanitary landfill operated by Browning-Ferris Industries (BFI). It is believed that contaminated soil was placed on top of existing municipal solid waste. The site is currently owned by the Seaway Industrial Park Development Company, Inc.



•NY **Seneca Army Depot** Romulus AWE - 1941-2000 - National Nuclear Weapons Stockpile Site[413] - According to the Center for Land Use Inter-pretation: 'Seneca is a munitions storage site in upstate New York, that is being cleaned up and converted to civilian use. The 11,000-acre base was an explosives, chemical weapons, and hazardous material supply depot, with 519 ammunition storage igloos and over 20 large warehouses. Weapons were also disposed of at Seneca, by detonation, incineration, and open burning. The contents of some dumping areas is still classified by the Army. Though most radioactive material, some of which dated back to the Manhattan Project, has been removed from the site, some portions of this base may never be totally cleaned up.' - Beginning July 4, 1983, and running for several years, antiwar and antinuclear activists mounted major protests at the facility, staging civil disobedience protests and establishing the *Seneca Women's Encampment for a Future of Peace and Justice*, the American Greenham Common.

413 **Ammunition and Explosives Storage for the Navy (1939-1989) and the Air Force (1946-1989)**, 2008. - 200 pp. - http://www.denix.osd.mil/cr/upload/af-navy-ammunition-storage-public-rfs_pg1-200_rev.pdf



•NY **Separations Process Research Unit** (at Knolls Lab.) Schenectady DOE - 1950-1965 - In 1950, the Atomic Energy Commission (AEC) constructed the Separations Process Research Unit (SPRU) as a pilot plant for developing and testing two chemical processes to extract both uranium and plutonium from irradiated fuel. This facility was operated by the Knolls Atomic Power Laboratory. Research and development was completed at SPRU in 1953 and the facility was closed. The technology developed at SPRU was transferred to the Hanford site. In March of 1965 the site was taken over by the Naval Nuclear Propulsion Program. Contractors: (Remediation) Accelerated Remediation Company, LLC (2007-2010), Washington Group International

(2008-2010).

•NY **Simonds Saw and Steel Co.**[414] Lockport AWE - 1948-1957 - Simonds Saw and Steel rolled uranium billets into rods for the AEC as part of the multi-site process overseen by the New York Operations Office for the production of uranium metal for fabrication into slugs for fueling Hanford production reactors.

414 Formerly utilized MED/AEC sites remedial action program : **Radiological survey of the former Simonds Saw and Steel Co., Lockport, New York** / prepared for U.S. Department of Energy, Assistant Secretary for Environment, Office of Environmental Compliance and Overview, Division of Environmental Control Technology, by Oak Ridge National Laboratory ; R. W. Leggett ... [et al.], 1979. - iv, 87 pp.

F**ormer Guterl Specialty Corporation Steel Site Groundwater Monitoring Data Release.** U.S. Army Corps of Engineers Buffalo District. Formerly Utilized Sites Remedial Action Program (FUSRAP). 2010. 5 pp. - http://www.lrb.usace.army.mil/fusrap/guterl/envsurv/guterl-annualgwdata2009-2010-10.pdf

Simonds also rolled thorium metal whose most likely use was irradiation in Hanford reactors for the weapons program. Simonds rolled between 25 million and 35 million pounds of uranium and between 30,000 to 40,000 pounds of thorium.

•NY **Staten Island Warehouse** New York AWE - 1942 - This warehouse was used for uranium ore storage from the Belgian Congo. From this warehouse, the ore was transported to various Manhattan Engineer District (MED) sites for long-term storage and/or processing. The ore was the property of the African Metals Corporation and the MED contractor purchased only the U3O8 content of the ore while African Metals retained ownership of the radium and precious metals in the ore.

•NY **Sylvania Products Corp.** Bayside AWE/BE - 1947-1962 - The Metallurgical Laboratory of the Sylvania Electric Company investigated uranium and thorium powder metallurgy. It also produced powdered metal slugs, developed bonding techniques, and plated uranium slugs with nickel. The work with slugs included the conversion of uranium metal to uranium hydride using hydrogen. A February 1948 AEC Monthly Summary of Activities indicates that the Lab's "initial program will involve determining the physical properties and the health hazards of beryllium and uranium powders and the applications of powder metallurgy to these metals and their alloys."

In 1948, the work required 315 pounds of raw beryllium metal. Beryllium was handled first in the regular metallurgical building and then, after the objections of the AEC medical division, in a special AEC metallurgical development laboratory.

•NY **Sylvania Corning Nuclear Corp.**[415] Hicksville AWE/DOE 1952-1966 - Under Atomic Energy Commission (AEC) contracts, the facility was used for research and development with radioactive materials, principally uranium and thorium. It was also licensed by the AEC to fabricate reactor fuel elements for the AEC, for Sylvania use, for sale, and for research purposes. The Sylvania Corning Plant/former Sylvania Electric Products Facility (a.k.a Sylcor) site is a 9.49 acres area divided into three (3) separate properties located at 70, 100, and 140 Cantiague Rock Road, Town of Oyster Bay, County of Nassau, State of New York, in the westernmost portion of Hicksville, Long Island approximately thirty (30) miles east of lower Manhattan. The site was utilized for the manufacture of Government and commercial nuclear elements (e.g., cores, slugs, fuel elements) for reactors used in research and electric power generation between 1952 and 1967. Operations at the site used natural,enriched, and depleted uranium, and to a lesser extent thorium. Site contamination consists of these radioactive materials as well as nickel and volatile organics.

•NY **Titanium Alloys Manufacturing**[416] Niagara Falls AWE - 1950-1956 - In the early 1950s, Titanium Alloys Manufacturing was under contract to the AEC to provide zirconium tetrachloride. In 1955, TAM was issued an AEC source material license to do work related to the conversion of thorium scrap to anhydrous tetrachloride. Correspondence from Oak Ridge indicates that it was not interested the company's thorium work. In 1956, this division reduced ores and other uranium compounds by arc melting in an induction furnace.

415 **So How Contaminated Is the Old Nuclear Plant?** / John Rather. New York Times, January 13, 2002.

United States Government Department of Energy: **Memorandum**. Date: July 8, 2004. Subject: Sylvania Corporation, Hicksville, NY and Bayside, NY. 2004. - 213 pp.

- http://energy.gov/sites/prod/files/maprod/documents/sylvania_corporation.pdf

'This PDF file contains copies of letters to the Department of Energy (DOE) that request documents that pertain to facilities located in Hicksville, NY, Bayside, NY, or to the Sylvania Corporation. The requests were made under the Freedom of Information Act, 5 U.S.C. 552.'

416 **Status of Upcoming SEC Petitions** / LaVon B. Rutherford, CHP. National Institute for Occupational Safety and Health Division of Compensation Analysis and Support. 2011. - 6 pp.

- http://www.cdc.gov/niosh/ocas/pdfs/abrwh/pres/secstat0811bw.pdf

•NY **Trudeau Foundation**[417] Saranac Lake BE 1950-1957 - The AEC Division of Biology and Medicine supported beryllium research studies at the Trudeau Foundation.

•NY **University of New York, Institute of Mathematical Sciences**[418] DOE 1956.

•NY **University of Rochester Atomic Energy Project & University of Rochester Medical Laboratory** Rochester AWE/DOE - 1943-1986 - Although much of the early theoretical and experimental work that led to development of the first nuclear weapon was accomplished outside the United States, American researchers

417 **Beryllium Granuloma of the Skin**. / Henry Lederer and John Savage. British journal of industrial medicine. Received for publication June 8, 1953.

'Gardner and his successor Vorwald (1950) at the Trudeau Foundation tested various beryllium compounds on a number of animal species.'

Pulmonary Disease in Workers Exposed to Beryllium Compounds: Its Roentgen Characteristics. / Lucien M. Pascucci, M.D. Radiology January 1948 50:23-36

'The late Dr. Leroy U. Gardner was intensely interested in the intriguing problem of detecting the agent responsible for the lung lesions in these patients. Among the possibilities which he had under suspicion and investigation, in addition to beryllium, were the diphtheroid, virus and fungus infections, sarcoidosis of unknown etiology, silicosis, and exposure to other elements such as phosphorus, zinc, manganese, and copper. While he was not prepared actually to condemn beryllium, he definitely felt that it was in some as yet unrecognized manner involved. It was on his suggestion, made several months before his death, that the roentgen study of these interesting and unusual cases was undertaken, with the purpose of describing the findings, attempting a correlation with the clinical course of the disease, and finally considering the differentiation from other similar pulmonary changes'.

418 **Annual summary report of research problems initiated at the Institute of Mathematical Sciences, Contract no. AT-(30-1)-1480, July (1956). -** http://www.archive.org/details/annualsummaryrep00newy

made a number of fundamental contributions as well. Prior to 1942, the University of Rochester was one of the institutions that contributed to early nuclear physics research in the United States. The university was responsible for more than a hundred projects in chemistry, physics, biology, medicine and psychology. During the Manhattan Project, it had major responsibility for the medical aspects of the bomb program. After the war, Rochester received an AEC contract to operate the Atomic Energy Project (AEP), which focused on the biomedical aspects of nuclear energy.[419] The University of Rochester also received funding to study the pathology and toxicology of beryllium as well as to study the analytical chemistry of micro-quantities.

•NY **Utica St. Warehouse**[420] Buffalo AWE - 1945 - Residues from Linde Air operations were stored and rebarreled at this location.Linde processed uranium ore that was sent to Electra Metallurgical and then on to Hanford. Approximately 355,000 lbs of radioactive material were stored on site in 1945. Most of the records for the warehouse are lost. Even the date it was demolished is unknown.

•NY **Utica Drop Forge & Tool Co.**[421] Utica DOE - Provided goods and/or services to the Fernald facility as subcontractor

419 **Nuclear Weapons Testing at the Nevada Test Site: The First Decade**. / John C. Hopkins and Barbara Killian. Defense Threat Reduction Agency, 2011. - 662 pp.
- http://www.dtic.mil/dtic/tr/fulltext/u2/a552638.pdf
'Program 72 – Biomedical Field Study of Plutonium Inhalation: This program studied environmental short-term and chronic rates of exposure by using two groups of animals: one exposed to the radioactive cloud and the other placed in the contaminated zone. J. N. Stannard of the University of Rochester directed this program.'

420 DOE: Memorandum/Checklist; **D. Levine to the File; Subject: Elimination Recommendation**; June 19, 1987. - 5 pp.

421 DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; August 29, 1994. - 3 pp.
- http://www.lm.doe.gov/Considered_Sites/Gleason_Works_-_NY_55/

•NY **West Valley Demonstration Project**[422] West Valley DOE - 1966-1973 - From 1966 to 1972, Nuclear Fuel Services, Inc., under contract to the State of New York, operated a commercial nuclear fuel reprocessing plant at the Western New York Nuclear Services Center. The plant reprocessed uranium and plutonium from spent nuclear fuel; sixty percent of this fuel was generated at defense facilities. Spent nuclear fuel reprocessing generated approximately 600,000 gallons of liquid high-level radioactive waste; this waste was stored on site in underground tanks. In 1980, the United States Congress passed the West Valley Demonstration Project Act (Public Law 96-368), which authorized the Department of Energy (DOE) to conduct a technology demonstration project to solidify the liquid high-level waste at the Western New York Nuclear Services Center. Under this act, DOE is also responsible for developing containers suitable for the permanent disposal of the solidified high-level waste at an appropriate Federal repository; transporting the containers to this repository; disposing of low level waste and transuranic waste generated by high level waste solidification; and decontaminating and decommissioning facilities used for the solidification. DOE is also responsible for dispositioning the spent nuclear fuel stored at the site. In 1982, DOE selected vitrification as the treatment process for high level waste. This process solidifies and stabilizes nuclear waste by mixing it with molten glass. Pretreatment of the high-level waste began in 1988 and was successfully completed in 1995. DOE expects to complete the West Valley Demonstration Project by 2005.

422 DOE: **Final Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center**. 2010. - 63 pp. - http://www.westvalleyeis.com/final%5CEIS-0226_F-Summary.pdf

DOE: **West Valley Demonstration Project Annual Site Environmental Report for Calendar Year 2010**. - 300 pp. - http://www.wv.doe.gov/Documents/2010_ASER.pdf

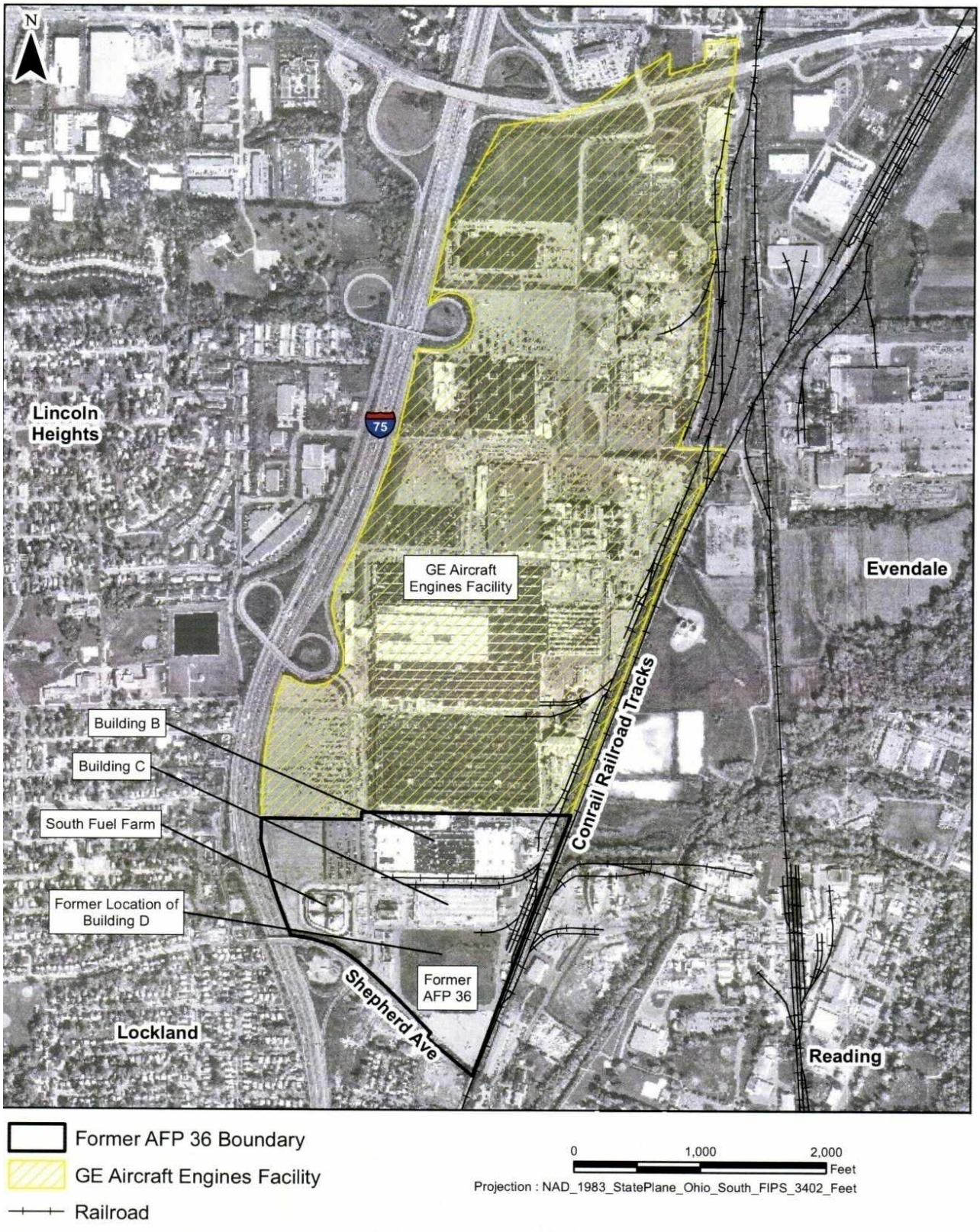
•NY **Wolff-Alport Chemical Corp.**[423] Brooklyn AWE - 1949-1950 - Wolff-Alport Chemical Corporation which operated from 1920 until 1954 was under contract with the AEC for the procurement of thorium containing sludge for stockpiling by the AEC. A March 1949 document mentions, "current contract expires June 30, 1949 and will probably be extended for another year. Cost is approximately $50,000 annually." This same document shows that almost 30,000 pounds of thorium oxalate sludge was provided the AEC that year. In 1940, the company began processing monazite sand to concentrate rare metals for use by industry. [Monazite sand is naturally occurring and found in North Carolina, South Carolina, Idaho, Colorado, Montana, and Florida in the US, and in Brazil, India, Australia, and South Africa. Monazite sand is a source of materials, such as rare metals, that are used in the manufacture of television and computer screens, fluorescent light bulbs, and highly efficient batteries, among other industrial applications. It also contains, Thorium, a radioactive material. packaged the thorium and sold it to the government for military uses.] The monazite sand contained small amounts of thorium, a radioactive material.[424]

423 **Information on Radiation Survey at the Former Wolff-Alport Chemical Corporation 1127-1129 Irving Avenue, Queens, NY September 5, 2007**. New York City Department of Health and Mental Hygiene. - 3 pp. - This auto body shop located at 1127 Irving Ave. on the Brooklyn/Queens border in Ridgewood was once the site of the Wolff-Alport Chemical Corporation. The New York City Department of Health is currently investigating radioactive contamination at and in the immediate vicinity of the site, where Wolff-Alport processed materials during the 1940s and 1950s that produced radioactive byproducts. Source: Ridgewood Times.

DOE **Letter; Fiore to Solon; Subject: Notification of No DOE Authority for Remedial Action at Wolff-Alport Chemical Corp.**; 9/29/87. Attachment: FUSRAP Summary Report and Designation/Elimination Analysis for Wolff-Alport Chemical Corp. Brooklyn, NY; 1987. - 8 pp.

424 **Ridgewood Site Is Radioactive Health Dept. Probes Former Chemical Factory** / Robert Pozarycki. Ridgewood Times, December 23, 2010.

The process of extracting the rare metals produced a concentrated thorium residue. This residue was considered a waste product, so the company dumped it into the sewer system. It is possible that small amounts of thorium remain in the sewers, buildings and soil around the building. In 1947, the federal government ordered Wolff-Alport to stop dumping the thorium into the sewer.


N
Lincoln Heights
75
GE Aircraft Engines Facility
Evendale
Conrail Railroad Tracks
Building B
Building C
South Fuel Farm
Former Location of Building D
Former AFP 36
Shepherd Ave
Lockland
Reading
Former AFP 36 Boundary
GE Aircraft Engines Facility
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•OH[425] **Air Force Plant 36**[426] Evandale AWE - Former AFP 36 is currently used to support the activities of the adjacent GE Evendale Plant. Plant facilities have served as aircraft engine test cells (Building B), storage (Building C-east), a machine shop and solid radioactive waste storage facility (former Building D), and nuclear engine research and test facilities (Buildings C-west and D).
Former AFP 36, originally known as the Wright Aeronautical Engine Plant, was built in the early 1940s for use as an aircraft engine production plant. After World War II, some of the US. Air Force (USAF) property was sold to Autolite, who later sold the facilities to GE. GE later purchased additional property contiguous to the Former AFP 36 to form the present GE Evendale Plant. In June 1989, the GE Evendale Plant grew to encompass the Former AFP 36 when the USAF sold this property to GE.[427]
•OH **Ajax Magnethermic Corp.**[428] Youngstown AWE - 1958-1962 - The Ajax-Magnethermic Corp. was involved in induction heat treatment of various forms of uranium for National Lead Company of Ohio[429] (Fernald) and also for General Electric (Hanford). The company fabricated an induction heating unit for NLO in 1961.

425 **US Department of Labor notifies former Ohio nuclear weapons employees of energy workers compensation program**. OWCP News Release: [10/13/2011].
WASHINGTON —The U.S. Department of Labor is notifying former workers of 25 facilities located in Ohio about benefits that may be available to them under the Energy Employees Occupational Illness Compensation Program Act administered by the department's Division of Energy Employees Occupational Illness Compensation. Survivors of qualified workers also may be entitled to benefits.
Former employees of the following sites may be eligible for EEOICPA compensation and medical benefits if they worked at the facility during a period of covered employment: Ajax Magnethermic Corp. in Youngstown; Alba Craft in Oxford; Associated Aircraft Tool and Manufacturing Co. in Fairfield; B&T Metals and Battelle Laboratories–West Jefferson in Columbus; Baker Brothers in Toledo; Beryllium Production Plant (also known as Brush Luckey Plant) in Luckey; Horizons Inc., Du Pont-Grasselli Research Laboratory, McKinney Tool and Manufacturing Co., and Tocco Induction Heating Division in Cleveland; Brush Beryllium Co. in Lorain; Cincinnati Milling Machine Co., Kettering Laboratory–University of Cincinnati, Magnus Brass Co., Mitchell Steel Co. and R.W. Leblond Machine Tool Co. in Cincinnati; Clifton Products Co. in Painesville; Copperweld Steel in Warren; Extrusion Plant (also known as Reactive Metals Inc.) in Ashtabula; Gruen Watch in Norwood; Herring-Hall Marvin Safe Co. in Hamilton; Vulcan Tool Co. in Dayton; Piqua Organic Moderated Reactor in Piqua; and Tech-Art Inc. in Milford.
426 **Former US. Air Force Plant 36 Environmental Restoration Program Optimization (ERP-O) Report** August 13, 2009. 62s. - http://www.afcee.af.mil/shared/media/document/AFD-091013-091.pdf
Schalk, Charles W.: **Descriptions of selected digital spatial data for former Air Force Plant 36, Evendale, Ohio.** U.S. Department of the Interior, U.S. Geological Survey ; Branch of Information Services, 2000. - iii, 39 pp - http://pubs.usgs.gov/of/2000/0091/report.pdf
427 **Former US. Air Force Plant 36: Environmental Restoration Program Optimization (ERP-O) Report**. August 13, 2009. - 62 pp.
428 **DOE Letter; J.Wagoner to Mayor Ungaro**; Subject: Site Information and Status; April 4, 1995. - 2 pp.
- http://www.lm.doe.gov/Considered_Sites/Ajax-Magnethermic_Corp_-_OH_43/OH_43-1.pdf
'DOE studied the historical records of the former Ajax Magnethermic Corp. site, and it determined that it did not have the authority to perform remedial action at the site. This conclusion is dervied from the fact that the, facility was licensed to handle nuclear materials.'
429 Ohio Department of Health. Bureau of Radiation Protection: **Historical Radiological Sites in Ohio, Comprehensive List,** 2007. - 66 pp.
- http://www.odh.ohio.gov/assets/feee5cf3e8ca4105b45206ed80073ced/ohio%20historical%20sites.pdf

•OH **Alba Craft Laboratory**[430] Oxford AWE/DOE - 1952-1957- From 1952 to 1957, Alba Craft provided a variety of machine shop services on natural uranium metal for National Lead Company of Ohio (Fernald).

Early work at Alba Craft included general and developmental machining of threaded reactor fuel slugs for use at the Savannah River Site. Subsequent production-scale operations consisted of hollow drilling and turning of slugs for the Savannah River and Hanford plutonium-production reactors.

•OH **American Steel Foundries** [431]Cincinnati DOE - Provided goods and/or services to the Fernald facility as subcontractor.

430 DOE: **Long-Term Surveillance and Maintenance Requirements for Remediated FUSRAP Sites**. 2011. - 146 pp. - http://www.lm.doe.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=7978&libID=8084
Postremediation Dose Assessment for the Former Alba Craft Laboratory Site, Oxford, Ohio. / S. Kamboj, M. Nimmagadda, and C. Yu. Argonne National Laboratory. 1996. - 28 pp
- http://www.osti.gov/bridge/purl.cover.jsp?purl=/257389-HNDnL4/webviewable/

431 DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; August 29, 1994. - 3 pp.
- http://www.lm.doe.gov/Considered_Sites/Gleason_Works_-_NY_55/

AEC removed some contamination at the site in 1957. DOE conducted additional remediation of the site and the vicinity properties under FUSRAP in 1994 and 1995. DOE certified that the site conformed to applicable cleanup criteria in 1996 and released all properties for unrestricted use.

•OH **Associated Aircraft Tool and Manufacturing Co.**[432] Fairfield AWE/DOE - 1956 - From February to September 1956, Associate Aircraft Tool and Manufacturing Company machined hollow uranium slugs for the Hanford and Savannah River plutonium-production reactors under a subcontract from National Lead Company of Ohio (Fernald). 'From December 1994 to June 1995, Bechtel National, Inc., the project management contractor for FUSRAP, defined the extent of contamination and per-

432 DOE: **Long-Term Surveillance and Maintenance Requirements for Remediated FUSRAP Sites**. 2011. - 146 pp. - http://www.lm.doe.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=7978&libID=8084

ORNL: **Results of the Radiological Survey at the Former Associate Aircraft Tool and Manufacturing Company Site, Fairfield, Ohio**. / M. E. Murray, R. F. Carrier, and R. A. Mathis. 1993. - 46 pp. - http://www.lm.doe.gov/Fairfield/OH_23-3.pdf

formed remedial design engineering and remedial action at the Fairfield site. ThermoAnalytical (now Thermo NUtech) served as the radiological support subcontractor for sampling and analysis activities, and Oak Ridge National Laboratory was the independent verification contractor. Natural uranium isotopes were found to be the only material contributing significantly to contamination at the site. Supplemental limits were applied to residual uranium-238 that was left in place in soil beneath a concrete slab in a bay built in 1994 on the east end of the building.'[433]

•OH **B & T Metals**[434] Columbus

AWE/DOE - 1943 - During the early stages of nuclear weapons production, uranium reactor fuel was produced by a variety of metallurgical techniques including extrusion, casting, and machining. In February 1943, DuPont, acting as an agent of the Manhattan Engineer District, contracted B&T Metals to extrude rods from uranium metal billets for the Hanford reactor in Washington State. B&T Metals extruded an estimated 50 tons of uranium between March 1943 and August 1943.

433 U.S. Department of Energy Office of Legacy Management: **Fact Sheet**. Undated. - 2 pp.

434 DOE: **Long-Term Surveillance and Maintenance Requirements for Remediated FUSRAP Sites**. 2011. - 146 pp. - http://www.lm.doe.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=7978&libID=8084

•OH **Baker Brothers**[435] Toledo AWE - 1943-1944 - Between June 1943 and July 1944, DuPont and the University of Chicago subcontracted the Baker Brothers company to machine roll metal rods into uranium slugs that were used for fuel in the world's first production reactors located in Oak Ridge, TN and Hanford, WA.

435 **Derivation of Guidelines for Uranium Residual Radioactive Material in Soil at the Former Baker Brothers, Inc., Site, Toledo, Ohio** / M. Nimmagadda, S. Kamboj, and C. Yu. Environmental Assessment Division, Argonne National Laboratory. 1995. - 30 pp.

DOE: **Long-Term Surveillance and Maintenance Requirements for Remediated FUSRAP Sites**. 2011. - 146 pp. - http://www.lm.doe.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=7978&libID=8084

An industrial laboratory and office complex a few miles outside of downtown Columbus that is the main lab and headquarters for Battelle Laboratory Columbus, a nonprofit R&D lab with over 7,500 employees at several locations. Battelle partners with companies to develop new technologies, and has been involved in numerous commercial projects, including the application of the product "bar-code," and the invention of the photocopier. But the labs work has been, and is still, primarily with the Department of Energy and its predecessor. Source: CLUI Land Use Database.

•OH **Battelle Columbus Laboratories**[436] Columbus AWE - AWE 1943-1986; BE 1943-1961; DOE 1986-2000 - From 1943 to 1986, Battelle Memorial Institute performed atomic energy research and development as well as beryllium work for the Department of Energy and its predecessor agencies. The Battelle Laboratories have two separate locations in Columbus - King Avenue and West Jefferson. Battelle's

436 **Decommissioning of Hot Cell Facilities at the Battelle Columbus Laboratories** / Patrick Weaver et al. WM'03 Conference, February 23-27, 2003, Tucson, AZ. - 5 pp.
- http://www.wmsym.org/archives/2003/pdfs/351.pdf

Decontamination of Battelle-Columbus Laboratories' plutonium facility / Freas D.G.; Madia, W.J. American Nuclear Society winter meeting, Washington, DC, USA, 14 Nov 1982.

DOE: Finding of no significant impact, decontamination and decommissioning of Battelle Columbus Laboratories in Columbus and West Jefferson, Ohio. Undated. - 78 pp.
http://www.osti.gov/bridge/servlets/purl/6421112-Th2j9A/6421112.pdf

Scotti, V.G. : **Postirradiation examination at Battelle--Columbus Laboratories**. Trans. Amer. Nucl. Soc., Suppl., v. 19, no. 2, pp. 13-14.

RH-TRU Waste Shipments from Battelle Columbus Laboratories to the Hanford Nuclear Facility for Interim Storage / Jim Eide et al. WM'03 Conference, February 23-27, 2003, Tucson, AZ. - 6 pp.
- http://www.wmsym.org/archives/2003/pdfs/334.pdf

research supported the government's fuel and target fabrication program, including fabrication of uranium and fuel elements, reactor development, submarine propulsion, fuel reprocessing, and the safe use of reactor vessels and piping.

•OH **Battelle Memorial Institute**[437] Columbus AWE/BE/DOE - Battelle Memorial Institute and Bechtel Corporation also operates the National Renewable Energy Laboratory's South Table Mountain Complex.[438]

•OH **Beryllium Production Plant**[439] (Brush) Luckey BE/DOE - BE 1949-1959; DOE 1949-1961 - From 1942 through 1945, National Lead operated a magnesium processing facility on the Luckey site for the US. government. In 1949, the Atomic Energy Commission (AEC) built a beryllium production facility at the site. The government built the plant to replace the production that was lost when the Brush Beryllium Lorain plant was destroyed by fire. The Brush Beryllium Company (now Brush Wellman) under contract to the AEC, produced beryllium pebbles at this site until 1958. Records indicate that the facility produced between 40,000 and 144,000 pounds of beryllium. In 1959, the AEC contracted with Brush to close down the facility. The site was sold to the Vulcan Materials Company in 1961. In 1951, AEC sent approximately 1,000 tons of radioactively contaminated scrap metal to the Luckey site. This material was to be used by the Diamond Magnesium Company to resume magnesium processing at the idle facility.

According to the Midwest Hazardous Substance Research Center, Michigan State University, the site covers approximately forty acres of land in Luckey. The primary contaminants have been identified as beryllium, uranium-238, thorium-230, thorium-232, radium-226, and their naturally occurring decay products. Other contaminants may be present in the forms of sludge, inorganic chemicals, and heavy metals. Some of the soil samples collected at the site contained low concentrations of organic compounds, including benzene, toluene, xylene, and polycyclic aromatic hydrocarbons (PAHs).

•OH **Brush Beryllium Co.**[440] Cleveland AWE/BE - 1942-1943 & 1949-1953 - The Brush Cleveland facility conducted research on a process for producing uranium metal

437 National Institute for Occupational Safety and Health: **Site Profile for Battelle Memorial Institute, King Avenue and West Jefferson Sites, Columbus, Ohio** / Vincent A. King, Jack Fix, and Sallie D. Robinson. 2010. - 124 pp.

438 DOE: **Site-Wide Environmental Assessment FINAL National Renewable Energy Laboratory's South Table Mountain Complex**, 2003. - 280 pp. - http://www.nrel.gov/ehsq/pdfs/43459.pdf

439 **Luckey Site, Luckey, Ohio Feasibility Study Report.** U.S. Army Corps of Engineers Louisville District. 2003 - 202 pp

440 DOE: **FUSRAP Elimination Report for the Former Brush Beryllium Company, Cleveland, Ohio**; November 14, 1985. - 13 pp.

- http://www.lm.doe.gov/Considered_Sites/B/Brush_Beryllium_Co_-_Clevland_-_OH_02/OH_02-2.pdf

Merril Eisenbud Papers: A Finding Aid to the Collection in the Library of Congress / Prepared by Karen Linn Femia with the assistance of Dan Oleksiw. Manuscript Division, Library of Congress. - Washington, D.C., 2003. Finding aid encoded by Glenn R. Gardner, 2010. - 8 pp.

- http://memory.loc.gov/service/mss/eadxmlmss/eadpdfmss/2010/ms010186.pdf

(1942-1943) through magnesium reduction of molten green salt (uranium tetrafloride). The facility later conducted research and development with uranium (1949-1953) and extruded thorium billets into slugs which were placed in Hanford production reactors (1952-1953). The Brush Cleveland facility also produced beryllium metal and beryllium oxide for the MED (1943-1946) and later for the AEC (1947-1965?).

•OH **Brush Beryllium Co.**[441] Elmore AWE/BE - 1957-2001 - Brush Beryllium plant in Elmore, OH, was built in 1953. It began producing beryllium for the AEC in 1957 after operations at the Brush Luckey, OH, facility ended. (Prior to 1957 it produced beryllium for the commercial market only.) The plant supplied beryllium to the Y-12 plant in 1990 and Brush purchase orders show that shipments from its Elmore location continued to Los Alamos and Sandia through April 2001.

•OH **Brush Beryllium Co.** Lorain AWE/BE - 1949-1950 - The Lorain plant produced beryllium metal and beryllium oxide for the MED and the AEC. The plant was destroyed by fire in 1948.

•OH **Cincinnati Milling & Machine Co.**[442] Cincinnati AWE - 1963 - The Cincinnati Milling Machine Co. built electro-chemical machining units. In September 1963, the company tested the feasibility of electro-chemical machining of uranium.

•OH **Clifton Products Co.**[443] Clifton BE

•OH **Clifton Products Co.** Painesville BE - 1942-1952 - Clifton had at least six large contracts with the AEC to supply beryllium products. By 1949, at least 8 beryllium-related deaths had occurred at Clifton.

441 **Risks of beryllium disease related to work processes at a metal, alloy, and oxide production plant** / Kathleen Kreiss, Margaret M Mroz, Boguang Zhen, Herbert Wiedemann, Barbara Barna. Occupational and Environmental Medicine Division, National Jewish Center for Immunology and Respiratory Medicine, University of Colorado Health Sciences Center, Denver, USA. Occupational and Environmental Medicine, 1997 August; 54(8): 605–612.
- http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1128986/pdf/oenvmed00092-0077.pdf

Residual radioactivity in the vicinity of formerly utilized MED/AEC sites / F. F. Haywood and W. A. Goldsmith. Health and Safety Research Division, Oak Ridge National Laboratory, undated. - 14 pp.

442 DOE: Memorandum; Williams to the File; Subject: **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; August 29, 1994. - 3 pp.
- http://www.lm.doe.gov/Considered_Sites/C/Cincinnati_Milling_and_Machining_Co_-_OH_25/OH_25-2.pdf

443 **Merril Eisenbud Papers: A Finding Aid to the Collection in the Library of Congress** / Prepared by Karen Linn Femia with the assistance of Dan Oleksiw. Manuscript Division, Library of Congress. - Washington, D.C., 2003. Finding aid encoded by Glenn R. Gardner, 2010. - 8 pp.
- http://memory.loc.gov/service/mss/eadxmlmss/eadpdfmss/2010/ms010186.pdf

•OH **Copperweld Steel**[444] Warren AWE - 1943-1946 - The Copperweld Steel Company of Warren, Ohio, straightened and outgassed a large number of uranium rods for the Hanford and Oak Ridge reactors between May and August of 1943.

444 National Institute for Occupational Safety and Health: **Site Profiles for Atomic Weapons Employers that Worked Uranium and Thorium Metals Appendix AS – Copperweld Steel Co.** 2007. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/b-6000-apas-r0.pdf

Source: Tremley Point Industrial History. / Robert J. Baptista 2009

•OH **Du Pont-Grasselli Research Laboratory**[445] or **Grasselli Laboratories Standard Oil Company of Ohio** Cleveland AWE - 1943-1945 - The Grasselli Laboratory participated in the development the slug canning and coating processes for the Hanford site.

445 **Elimination Report for the Former Du Pont-Grasselli Research Laboratory Cleveland Ohio**. US. Department of Energy. Office of Environmental Restoration, 1985. - 14 pp.

•OH **Extrusion Plant**[446] Ashtabula DOE - 1962-. - From 1962 to 1988, Ashtabula (formerly known as **Reactive Metals, Inc.**) received uranium billets from Fernald's Feed Materials Production Center and the Weldon Springs Plant and extruded them into feed stock for fabrication of fuel and target elements to be used in nuclear materials production reactors. In 1988, the need for Cold War weapons production diminished and DOE began closing the Extrusion Plant. By April of 1993 the DOE and RMI had formed a partnership to clean the site as part of decontamination and decommissioning. DOE contracted with RMI Environmental Services (RMIES), a division of the RMI Titanium Company, to manage the cleanup project. RMIES has since changed its name to EARTHLINE Technologies. Reactive Metals Inc. of Ashtabula, Ohio was the corporate successor of the Bridgeport Brass Company of Adrian, Michigan, which performed similar extrusion work from 1954 to 1961. The semi-production extrusion press used at Adrian was transported and installed at Ashtabula. In addition to its work for the DOE and its predecessor agencies, Ashtabula performed work for the Department of Defense and a number of commercial entities under a Nuclear Regulatory Commission (NRC) license.

446 National Institute for Occupational Safety and Health: **Summary of Extrusion Plant Site Information for Dose Reconstruction** / Robert Hysong, Robert Vogel, Cindy W. Bloom, and Shelby Gubin, 2007.- 73 pp.- http://www.cdc.gov/niosh/ocas/pdfs/tbd/extruplant-r0.pdf

DOE: Audit report: **Cost sharing at the Ashtabula environmental management project**. 2003. - 15 pp. - http://energy.gov/sites/prod/files/igprod/documents/CalendarYear2002/ig-0558.pdf

Letter Report on Environment, Safety & Health Issues at the Ashtabula Environmental Management Project, INS-L-01-05. 2001. - 12 pp. - http://energy.gov/sites/prod/files/igprod/documents/CalendarYear2001/insl0105.pdf

DOE: Audit report: **Remediation and closure of the Ashtabula environmental management project**, 2002. - 19 pp. - http://www.orau.gov/DDSC/projects/DOE/ig-0541.pdf

Ashtabula River Area of Concern - http://www.epa.gov/greatlakes/aoc/ashtabula.html

•OH **Feed Materials Production Center**[447] Fernald DOE - 1951-. - The Feed

447 **A bill to amend the Energy Employees Occupational Illness Compensation Program Act of 2000 to provide compensation for certain persons injured in the course of employment at the Feed Materials Production Center (commonly referred to as "Fernald") or the Piqua Organic Moderated Reactor in Ohio**. Bill Summary & Status. 111th Congress (2009 - 2010) S.1800
- http://thomas.loc.gov/cgi-bin/bdquery/z?d111:S.1800:

EPA Superfund Record of Decision: **Feed Materials Production Center**, (USDOE) Operable Unit 3, aka Fernald Environmental Management Project, Fernald, OH 9/24/1996. - 144 pp

Estimation of radon exposures to workers at the Fernald Feed Materials Production Center 1952-1988 / Hornung RW, Pinney SM, Lodwick J, Killough GG, Brewer DE, Nasuta J. J Expo Sci Environ Epidemiol. 2008 Sep;18(5):512-23. Epub 2008 Jan 9. SourceCincinnati Children's Environmental Health Center, Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio,

National Institute for Occupational Safety and Health: **Fernald Environmental Management Project** – Occupational Environmental Dose. 2006. - 110 pp.

Followup on audit of depleted uranium metal production at the Fernald Environmental Management Project, Fernald, Ohio. USDOE Office of Inspector General, Oak Ridge, TN (United States). Eastern Regional Audit Office1992. - 14 pp.

Harley, N. H., R. Hirsch, and M. Gilbertson.: **Progress Report. Measurements of Radon, Thoron, Isotopic Uranium and Thorium to Determine Occupational & Environmental Exposure & Risk at Fernald Feed Materials Production Center**. New York University School of Medicine, New York, NY, 2002.
- 13 pp. - http://www.osti.gov/em52/2002projsum/74050.pdf

Sedam, A. C.: **Occurrence of uranium in ground water in the vicinity of the US Department of Energy Feed Materials Production Center, Fernald, Ohio**. Geological Survey, Columbus, OH., 1984

National Institute for Occupational Safety and Health: **Technical Basis Document for the Fernald Environmental Management Project (FEMP) – Site Description** / Samuel L.T. Chu. 2004. - 83 pp.
- http://www.cdc.gov/niosh/ocas/pdfs/tbd/frnld2.pdf

Review of the NIOSH Site Profile for the Fernald Environmental Management Project (Feed Materials Production Center). S. Cohen & Associates. Jefferson, Maryland. - 170 pp.
- http://www.cdc.gov/niosh/ocas/pdfs/abrwh/scarpts/sca-t1-10-r0.pdf

Ritz B.: Cancer mortality among workers exposed to chemicals during uranium processing. Department of Epidemiology, School of Public Health, University of California. J Occup Environ Med. 1999 Jul;41(7):556-66.

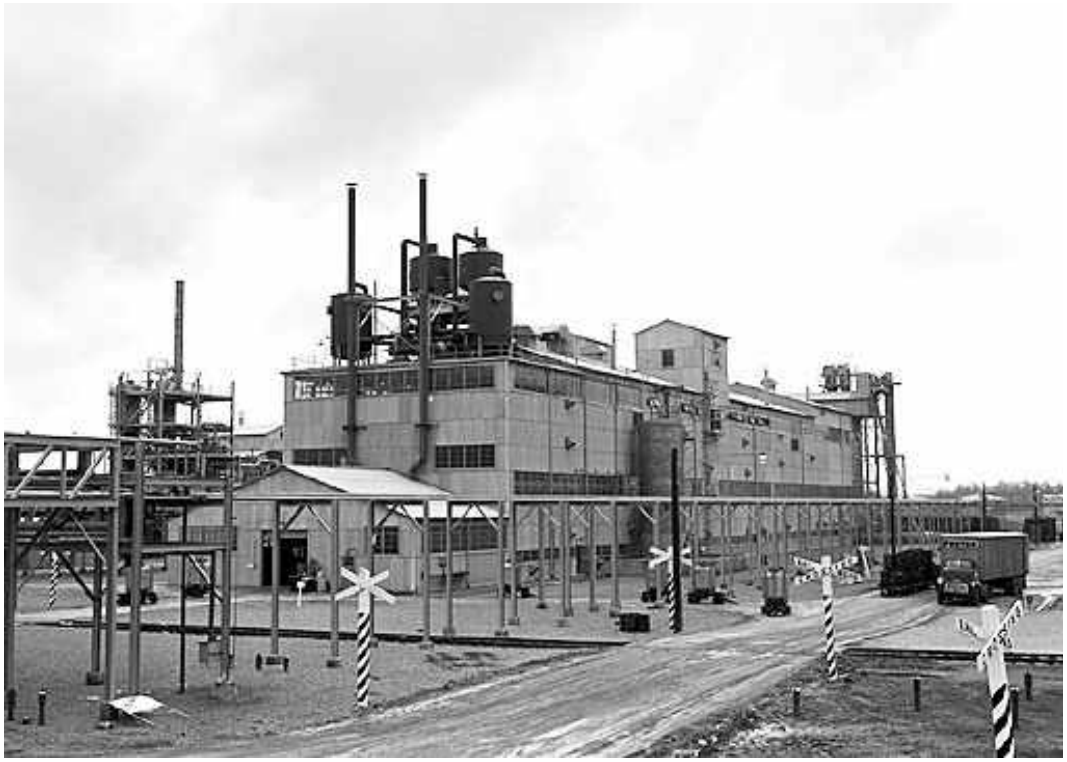
'Data provided by the Comprehensive Epidemiology Data Resource allowed us to study patterns of cancer

Materials Production Center (FMPC) at the Fernald site was established by AEC in 1951 to convert depleted uranium, natural uranium, and low-enriched uranium compounds into uranium metal and to fabricate uranium metal into feed stock for fuel and target elements for reactors that produced weapons-grade plutonium and tritium.

The Fernald Plant, operated by National Lead of Ohio (NLO), along with the Weldon Spring Plant in Missouri, were feed materials plants built by the AEC in the 1950s to supply fuel to the increasing number of nuclear reactors located at Hanford and Savannah River. Production operations at the Fernald site continued until July 10, 1989, when they were suspended by the Department of Energy (DOE). DOE formally shut down the facility on June 19, 1991. During its production mission, the Fernald site produced over 225 million kilograms (500 million pounds) of high-purity uranium products to support United States defense initiatives.

mortality as experienced by 3814 uranium-processing workers employed at the Fernald Feed Materials Production Center in Fernald, Ohio.'

Plant 1 operations began in December 1953. The plant was used to weigh, sample, classify and sort (by uranium content) incoming raw material from off-site sources and process residues from on-site operations.



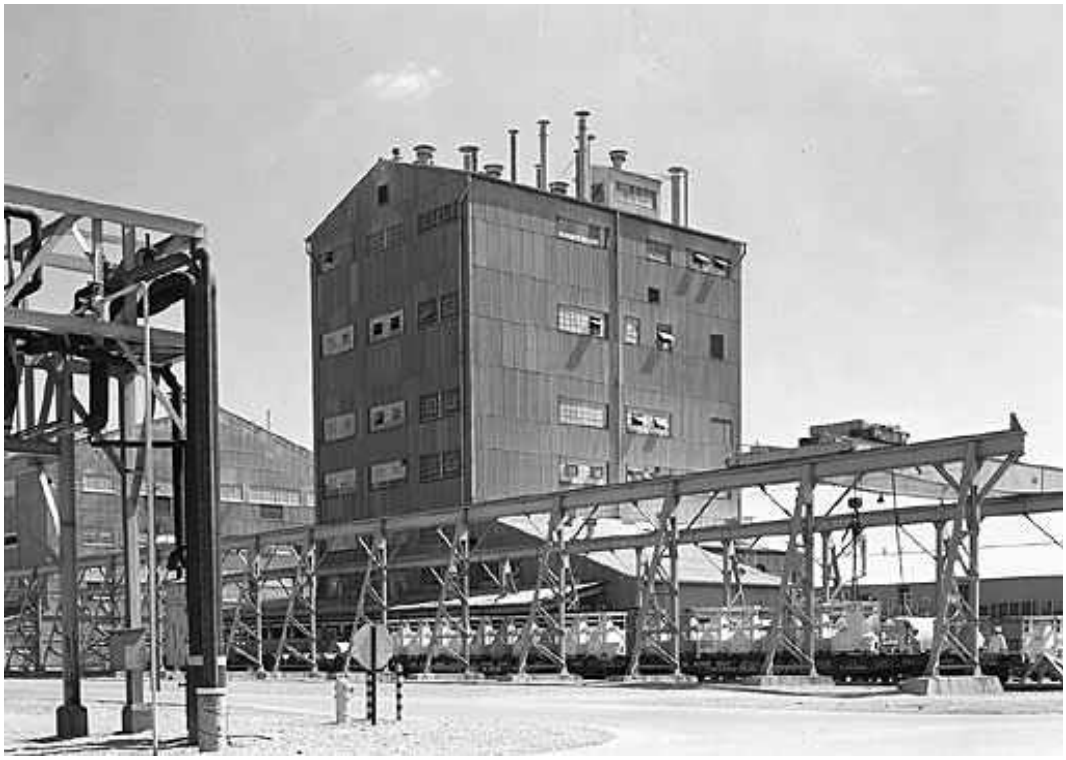
Plants 2 & 3 operations began in December 1953. The plants were used to convert impure uranium feed material and recycled residue to high purity uranium trioxide following a three-step procedure (digestion, extraction, denitration) involving chemical and thermal processes.

Plant 4 operations began in October 1953. The plant was used to convert uranium

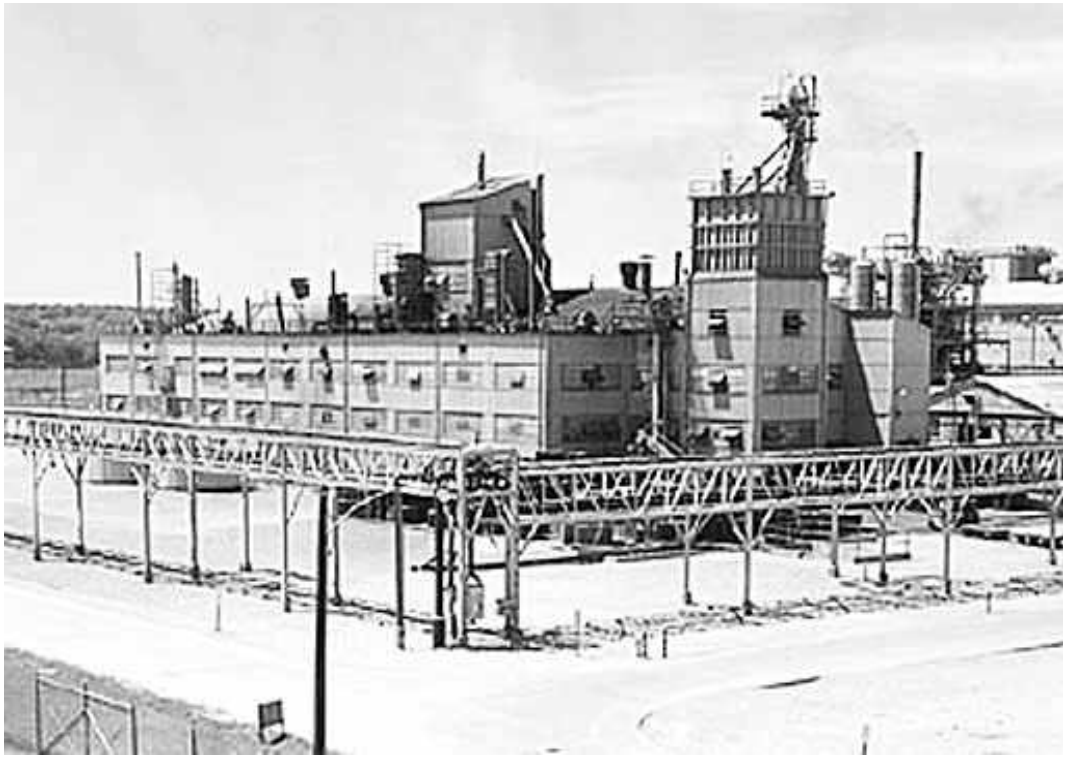
trioxide to uranium dioxide, called brown oxide, by reducing it with hydrogen. The brown oxide was reacted with anhydrous hydrogen fluoride to produce uranium tetrafluoride, called green salt.

Plant 5 operations began in May 1953. The plant contained large furnaces that were used to convert green salt to uranium metal derbies by a thermite reduction process using magnesium metal granules.

Plant 6 operations began in the summer of 1952. The plant was used to fabricate ingots into finished uranium cores.



Plant 7 operations began in June 1954. The plant was used to convert uranium hexafluoride to green salt using the same process as the Pilot Plant. The green salt was used in Plant 5 to produce uranium metal. After only two years of operation, the AEC directed the shutdown of Plant 7 because a similar processing plant was operating in Paducah, Ky.



Plant 8 operations began in November 1953. The plant was used to convert scrap uranium metal and metal-bearing waste from off-site sources and Fernald operations into black oxide. The black oxide was then sent to Plant 1 as a feed material.

Plant 9 operations began in October 1954. Originally, it was used to produce thorium metal until 1956, when interest in thorium metal started to decline. Contractors: Fluor Fernald (1992-present); Westinghouse (1985-1992); National Lead of Ohio (1951-1985).

In 1994, a House subcommittee on oversight and investigations released documents indicating that workers were given virtually no reliable information about the health risks they faced. Among the documents, internal reports that listed uranium concentrations at Fernald hundreds of times - sometimes as high as 650 times - above government limits. Then between 1983 and 1985, the trial confirmed that Fernald managers implemented a "fudge factor" for measuring the buildup of radioactive-dust levels on workers' dosage badges. Designed to correct misleading readings, the correction was so large that some workers actually had negative radiation readings.
Over 50 articles containing allegations of mismanagement and safety violations at the Department of Energy's (DOE) Fernald site in Ohio appeared in the Cincinnati Enquirer last year. Located about 18 miles from Cincinnati, the Fernald site is undergoing the cleanup of contamination from its former uranium metal production activities. DOE has entered into an initial 5-year, $1.9 billion contract with Fluor Daniel Fernald to clean up the site. The contract to continue the cleanup will be up for a 1- to 3-year renewal in November 1997. DOE estimates that it will take an additional 13 years and about $2.4 billion to complete the cleanup. The seriousness of the allegations prompted both DOE and Fluor Daniel Fernald to create two ad-hoc groups to investigate the situation.[448]

448 **Fernald: History repeats itself** / Tim Bonfield. The Cincinnati Enquirer, Feb. 11, 1996.
- http://www.enquirer.com/fernald/stories/021196c_fernald.html
GAO: **Department of Energy: Management and Oversight of Cleanup Activities at Fernald** (Letter Report, 03/14/97, 95 pp.
- http://www.gpo.gov/fdsys/pkg/GAOREPORTS-RCED-97-63/pdf/GAOREPORTS-RCED-97-63.pdf
and - http://www.enquirer.com/fernald/gao_fernald_report.html

'1994 Fernald workers class-action suit is settled for $15 million, the first legal victory by any group of atomic workers.'[449]

DOE 'gave Fluor Daniel Fernald a $2.2 billion contract to clean up the former uranium processing plant 18 miles northwest of Cincinnati. There are 20 million pounds of radioactive waste in two underground silos at Fernald.'[450]
The Fernald Community Alliance which will' 'Preserve the history of the land, people, culture and the Cold War for the benefit of current and future generations and to promote the Fernald Preserve as an asset to the community has a Fernald Living History Project started in 1997.'[451]
Watchdog organization for Fernald Facility: Fernald Residents for Environmental Safety and Health 1984-.
• OH **Foote Mineral Company**,formerly the **Vanadium Corporation of America** [452], Cambridge, Ohio DOE now part of Union Carbide and Carbon Corporation.
•OH **General Electric Company**[453] Cincinnati/Evendale AWE/BE/DOE - BE 1951-

449 **Fernald Chronology**. Prepared by Ohio EPA
- http://epa.ohio.gov/swdo/divisions/FFS/Fernald/FernaldSiteInfo/chronology.aspx
and **Annual report to the Public on the Fernald Closure Project** Prepared by: Ohio Environmental Protection Agency. Office of federal facilities oversight. State of Ohio. Ohio Environmental Protection Agency. Ohio Department of Health Ohio Emergency Management Agency.Prepared and Published by: Ohio Environmental Protection Agency. Office of Federal Facilities Oversight. Dayton, Ohio
450 **Taxpayers bilked in Fernald cleanup** - http://www.enquirer.com/fernald/
451 - http://www.fernaldcommunityalliance.org/interviews.html
The End of Secrecy - http://www.lm.doe.gov/land/sites/oh/fernald_orig/50th/secr.htm
452 J. Leonard Replogle
He was also head of the Vanadium Corporation of America, with Charles M. Schwab,[1919]. In August 1942, the U.S. Army Corps of Engineers established the Manhattan Engineer District (MED), also known as the Manhattan Project, to develop atomic weapons and to procure the raw materials, principally uranium, necessary for their production. The MED contracted the Vanadium Corporation of America and the U.S. Vanadium Corporation (owned by Union Carbide) to procure and process uranium bearing ore.
45300161: General Ele National Institute for Occupational Safety and Health: **SEC Petition Evaluation Report Petition SEC-ctric Company in Evendale, Ohio** / Michael Kubiak. 2010. - 21 pp.

1970; DOE 1961-1970 - The Evendale Plant's major mission is to build aircraft engines. The AEC used this facility to work with a variety of radioactive materials, including uranium and thorium. This facility was also involved in the refining or fabrication of beryllium or beryllium oxide.

•OH **Gruen Watch** Norwood AWE - 1956 - The Gruen Watch Co. conducted cold shaving and stamping and hot stamping washer tests for National Lead Company of Ohio (Fernald) in May and June 1956.

•OH **Harshaw Chemical Co.**[454] Cleveland AWE - 1942-1955; Residual Radiation 1956-October 2009 - Harshaw Chemical of Cleveland, Ohio refined black oxide and sodium diuranate to orange oxide and then to brown oxide for the Manhattan Project during World War II. The final result was a "green salt", which the Manhattan Project used to produce uranium hexafluoride for enrichment into weapons grade fuel for nuclear weapons at the gaseous diffusion plants. Harshaw also produced uranium hexafloride during the war and this production activity was expanded in 1947. Harshaw production was reduced in 1951 and by May of 1953 the green salt plant was

- http://www.cdc.gov/niosh/ocas/pdfs/arch/sec/geer.pdf

National Institute for Occupational Safety and Health: **SEC Petition Evaluation Report Petition SEC-00161: General Electric Co. in Evendale, Ohio** / Michael Kubiak, 2011. - 36 pp.

- http://www.cdc.gov/niosh/ocas/pdfs/sec/geohio/geer-161-r1.pdf

454 Formerly Utilized Sites Remedial Action Program (FUSRAP): **Former Harshaw Chemical Company Site Cleveland, Ohio**. U.S. Army Corps of Engineers, Buffalo District. 2011. 2 pp.

- http://www.lrb.usace.army.mil/fusrap/harshaw/#Documents

National Institute for Occupational Safety and Health: **An Exposure Matrix for the Harshaw Chemical Company, Cleveland, Ohio** / Janet L. Westbrook, Cindy W. Bloom, and Eugene W. Potter. 2007. - 114 pp.

National Institute for Occupational Safety and Health: **SEC Petition Evaluation Report Petition SEC-00066: Harshaw Harvard-Denison Plant** / Cindy W. Bloom, James Mahathy, Janet L. Westbrook, Kenneth Fleming, and Michael Kubiak. 2006. - 24 pp.

- http://www.cdc.gov/niosh/ocas/pdfs/sec/harshaw/harshawer.pdf

Radioactive industrial site stands in way of completing Cleveland's Towpath Trail. / Michael Scott, The Plain Dealer. Tuesday, January 26, 2010.

- http://blog.cleveland.com/metro/2010/01/radioactive_industrial_site_st.html

dismantled and the hexafluoride plant was placed on standby. The contract for removal of AEC equipment continued until September 30, 1955. This designation is limited to the Harshaw facility located at 1000 Harvard Avenue, Cleveland and generally referred to as the Harvard-Denison plant.

Harshaw Chemical continued to produce most of the UF_6 feed for the K-25 uranium enrichment plant at its Cleveland, Ohio plant after the war. However, in December 1947, the F2 Plant at K-25 became operational, allowing the plant to produce its own feed by initially converting UO_3 to UO_2 to UF_4 to UF_6 and later UO_2 to UF_6. Harshaw expanded its UF_6 production in 1947, and was placed on standby by May 1953. When the Paducah and Portsmouth Gaseous Diffusion Plants were built and started up in 1954 and 1956, they included feed operations similar to that at K-25. The Oak Ridge, Portsmouth and Paducah feed plants were shut down in 1962, and the conversion of U 3 O 8 to UF 6 for gaseous diffusion plant feed was taken over by the privately-owned Allied Chemical Co. Plant in Metropolis, Illinois. Thereafter, UF_6 feed came from commercial sources, existing stocks, and partially-depleted UF6 tails stored at the enrichment plants.

Harshaw Chemical Company was acquired by Kewaunee Oil Company in 1964. Kewaunee Oil was later acquired by the Gulf Oil Company in 1976. Kaiser Chemical Company acquired Harshaw interests in 1982.

•OH **Herring-Hall Marvin Safe Co.**[455] Hamilton AWE/DOE - 1943-1951; Residual Radiation 1952-1993; - Intermittently from the 1943 to 1951, the Herring-Hall-Marvin Safe Company machined natural uranium metal slugs from rolled stock under subcontract to DuPont and the University of Chicago.

455 DOE: **Long-Term Surveillance and Maintenance Requirements for Remediated FUSRAP Sites**. 2011. - 146 pp. - http://www.lm.doe.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=7978&libID=8084

DOE: **Results of the radiological survey at the former Herring-Hall-Marvin Safe Company (3rd floor), 1550 Grand Boulevard, Hamilton, Ohio** (HO001) / 1994. - 20 pp.

•OH **Horizons, Inc.**[456] Cleveland AWE - 1952-1956; Residual Radiation 1957-October 2009 - Starting in 1952, Horizons, Inc. was under contract with the AEC for the production of granular thorium metal and conducted some thorium research work for Savannah River.

•OH **Kettering Laboratory**, University of Cincinnati Cincinnati BE - 1947 - 1950 - The AEC funded a Kettering Laboratory researcher's investigation of the biological effects of beryllium and its compounds. Kettering was also working on analytical methodology for beryllium for the AEC.

•OH **Magnus Brass Co.** Cincinnati AWE - 1954-1957 - The site machined various forms of uranium metal under subcontract to the National Lead Company (Fernald). The work was performed at two locations: Reading Road (from December 1954 through November 1955) and West 7th Street (from December 1955 through December 1957).

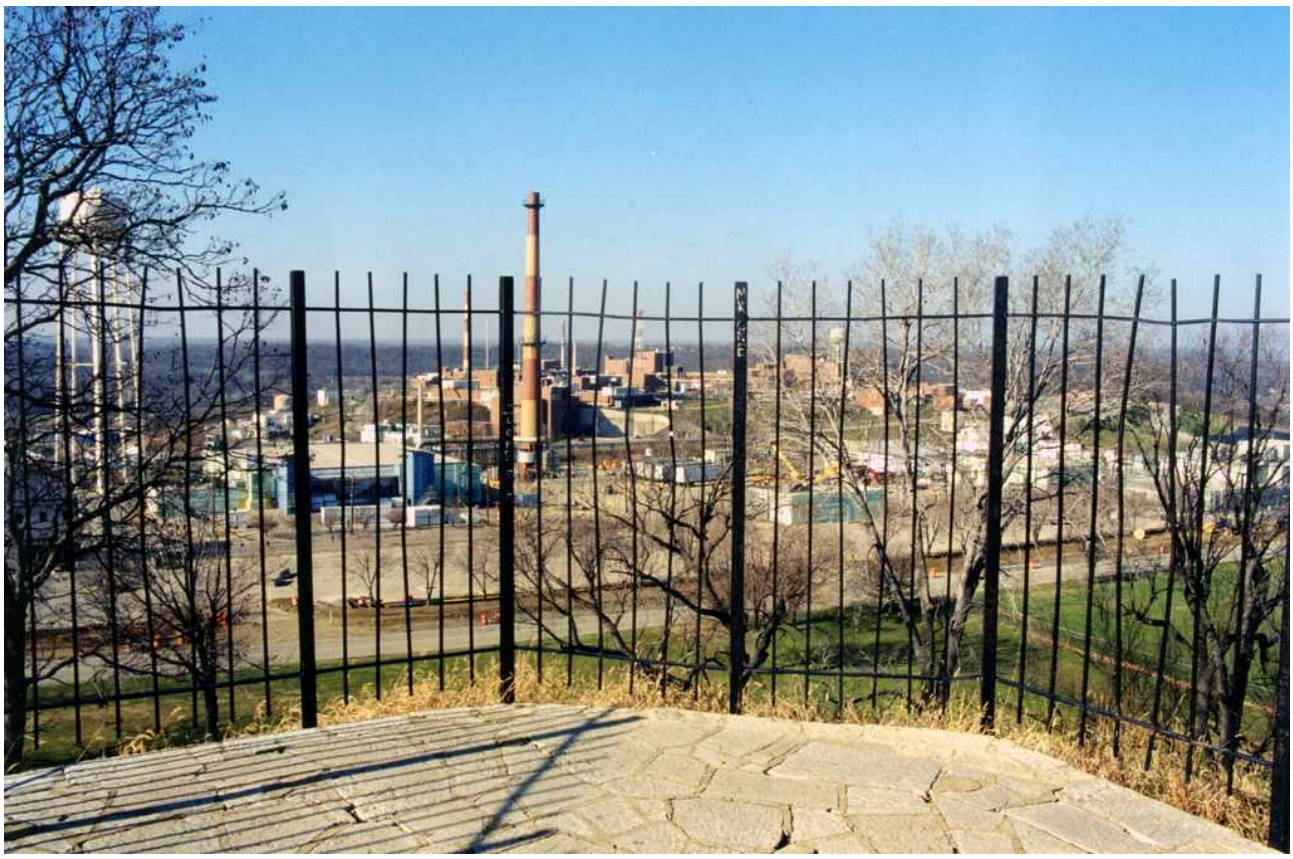
•OH **McKinney Tool and Manufacturing Co.** Cleveland AWE - 1944 - Between May and August of 1944, McKinney Tool & Manufacturing of Cleveland, Ohio, turned and ground unbonded slugs to provide fuel for the first nuclear reactors, including the three Chicago piles; the Oak Ridge X-10 reactor; and the Hanford B, D, and F production reactors and 305 test pile.

•OH **Mitchell Steel Co.** Cincinnati AWE - 1954 - In 1954, Mitchell Steel Company may have participated in the machining of a sample lot of four hollow extrusion uranium billets from ingots for National Lead of Ohio (Fernald).

•OH **Monsanto Chemical Co.**[457] Dayton AWE - In 1943, the Manhattan Engineer District (MED) began the Dayton Project to investigate the chemistry and metallurgy of polonium. Monsanto was chosen for the project because of its earlier work at its Scioto Research Laboratory (also in Dayton). Work for the MED was initially performed at Monsanto's facility on Nicholas Road in 1943 (Unit I). As the project expanded, it moved into a location on West First Street (Unit III) with all operations being transferred to Unit III by October 1944. By 1944 it was clear that even this space was inadequate, and so the former Runnymeade Playhouse was converted to a laboratory and referred to as Unit IV, to be operated in conjunction with Unit III. When space became too tight in the combined areas of Units III an IV, preparations were made to move the operations to the present day Mound facility in Miamisburg. Processing began at Mound in February 1949 and shortly thereafter Units III and IV were dismantled and decontaminated.

457 National Institute for Occupational Safety and Health: **SEC Petition Evaluation Report Petition SEC-0049: Monsanto Chemical Compan**y. / Donald Stewart, Elizabeth Gilley, Ron Kathren, and Vernon Shockley, 2006. - 46 pp. - http://www.cdc.gov/niosh/ocas/pdfs/sec/monsanto/monsantoer.pdf

Site Inspection Report Dayton Unit IV - Runnymede Playhouse. City of Oakwood. Montgomery County, Ohio. Department of the Army. Buffalo District, Corps of Engineers. Buffalo, New York. 2004. - 414 pp. - http://www.lrb.usace.army.mil/fusrap/dayton4/day4-si-2004-12.pdf



Owned by the Department of Energy and operated for many years by Monsanto and EG&G, the Mound Plant produced detonation devices for nuclear weapons and conducted research on nuclear fuels and isotope separation, starting in 1947. The primary activity at this plant is now decontamination of the buildings and grounds, in preparation for the expected full conversion to commercial use, by 2006. Around $90 million has been spent annually on these remediation efforts. The Mound Plant is named for a large Indian mound, adjacent to the plant. Source: CLUI Land Use Database.

•OH **Mound Plant**[458] Miamisburg DOE - 1947-. - In 1943, the Manhattan Engineer District began the Dayton Project to investigate the chemistry and metallurgy of polonium. Between 1943 and 1948, this work was performed at locations around Dayton, all of which turned out to e too small for the job. As such the plant became operational February 1949. The Mound Plant's first mission was to manufacture polonium-beryllium initiators for atomic weapons. As part of this process, the site extracted polonium-210 from irradiated bismuth slugs and machined beryllium parts. Mound stopped producing initiators after the Pinellas Plant in Florida began producing

458 **Mound Lab Workers** 3 Nov 2010.avi - http://www.youtube.com/watch?v=gpqMI6pqJ0g
National Institute for Occupational Safety and Health: **Mound SEC Issues – for SEC Petition SEC-00090. Starting Date for SEC Petition: 1 February 1949; Ending Date: 17 August 2007 ("Present")**, 2011. - 24 pp. - http://www.cdc.gov/niosh/ocas/pdfs/dps/mounddp110211.pdf
National Institute for Occupational Safety and Health: **Mound Site – Site Description**. / Jeff Vollmer, 2009.- 30 pp. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/mound2-r0-pc2.pdf
National Institute for Occupational Safety and Health:**Mound Site – Occupational Medical Dose**. / Faisal Algutifan, Vernon E. Shockley and Ronald L. Kathren, 2009. - 18 pp.
- http://www.cdc.gov/niosh/ocas/pdfs/tbd/mound3-r1-pc3.pdf
Review of the NIOSH Site Profile for the Mound Laboratory Site, S. Cohen & Associates, Vienna, Virginia. 2006. - 192 pp. - http://www.cdc.gov/niosh/ocas/pdfs/abrwh/scarpts/sca-t1-12-r0.pdf
Sample report: **Mound Laboratory Progress Report for September 1962.** 1963. - 30 pp.
- http://www.osti.gov/bridge/servlets/purl/4551552-YWF5Bf/4551552.pdf

accelerator-type neutron generators in 1957. In 1954, Mound began developing and producing weapons components containing tritium, and in 1969, the plant began recovering and purifying tritium from dismantled nuclear weapons. During the 1950s and 1960s the Mound Plant also developed and produced a variety of nonnuclear weapons components including detonators, cable assemblies, firing sets, ferroelectric transducers, and explosive timers. In 1995, Mound discontinued weapons component production. The Mound Plant has also performed non weapons work. The site developed and manufactured radioisotope thermal generators and conducted research in the following areas: radioactive waste decontamination; the properties of uranium, protactinium-231, and plutonium-239; and separation of stable isotopes and noble gases. Mound continues to produce thermal generators which are used for remote power applications including space probes.

•OH **National Lead Company of Ohio** DOE, later NL Industries.

•OH **National Smelt & Refining**[459] Cleveland, Ohio DOE

•OH **Ohmart Corp.**[460] Cincinnati DOE - provided goods and/or services to the Fernald facility as subcontractor.

•OH **Painesville Site** Painesville AWE/DOE - The Painesville Site, located in

459 DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; December 23, 1993. - 1 p.
- http://www.lm.doe.gov/Considered_Sites/Sutton_Steele_and_Steele_Co_-_TX_09.aspx
'In each case, the potential for radiological contamination above applicable guidelines is small. In each case the- amounts of radioactive materials handled was small. Based on these considerations, these sites are hereby eliminated from further consideration under the Formerly Utilized Sites Remedial Action Program.'

460 DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; August 29, 1994. - 3 pp.
- http://www.lm.doe.gov/Considered_Sites/Gleason_Works_-_NY_55/

Painesville, Ohio, was a former magnesium production facility, operated by the Diamond Magnesium Company under contract to the Federal Government. From 1951 to 1953, Diamond Magnesium received approximately 1,650 tons of radioactively contaminated scrap steel from the Lake Ontario Storage Area (now the Niagara Falls Storage Site), to be used in the magnesium production process.

•OH **Ohio State University**[461] Columbus DOE - Provided goods and/or services to the Fernald facility as subcontractor

•OH **Piqua Organic Moderated Reactor**[462] Piqua DOE 1963-1969 - From 1963 to 1966, the Piqua Nuclear Power Facility was operated as a demonstration project by the City of Piqua. The facility contained a 45.5-megawatt (thermal) organically cooled and moderated reactor. In 1966, the AEC discontinued facility operations and terminated its contract with the city. The AEC dismantled and decommissioned the reactor between 1967 and 1969.

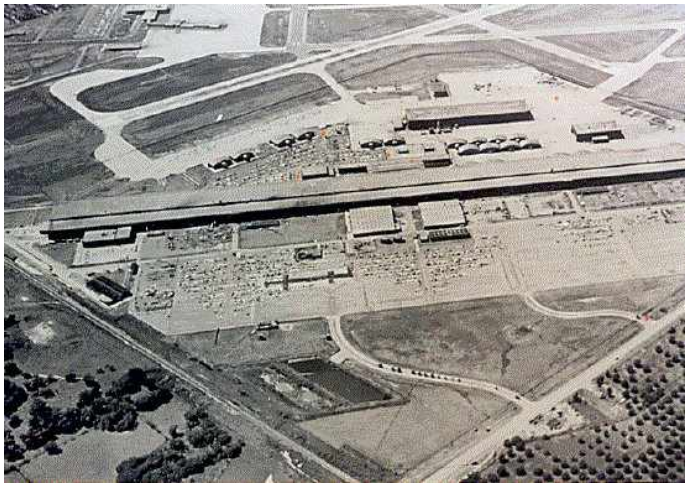
•OH **Portsmouth Gaseous Diffusion Plant**[463] Piketon DOE – 1952-1988

461 DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; August 29, 1994. - 3 pp.
- http://www.lm.doe.gov/Considered_Sites/Gleason_Works_-_NY_55/

462 **SEC Petition Evaluation Report Petition SEC-00126: Piqua Organic Moderated Reactor** / Louise Buker, Roger Halsey, Karin Jessen, Dan Mantooth, Eugene W. Potter. National Institute for Occupational Safety and Health, 2009. - 89 pp. - http://www.cdc.gov/niosh/ocas/pdfs/sec/piqua/piquaer-126-r1.pdf

463 **Piketon: A troubled past**: Cold War factory created secret dump, set own rules
Dayton Daily News, Sunday, November 12, 2006
Rare skin disorder haunts man after radioactive release / Tom Beyerlein, Lynn Hulsey
Dayton Daily News, Sunday, November 12, 2006
'WHEELERSBURG — Larry Knapp was in the seat of a crane, removing old machinery from the atomic plant at Piketon Somebody yelled, "Take it up," and Knapp's crane pulled a giant uranium enrichment

•OH **R. W. Leblond Machine Tool Co**. Cincinnati AWE - 1961 - National Lead Company of Ohio (Fernald) contracted with Leblond Machine for the purchase of a rapid boring machine. In 1961, acceptances tests, using 17 tons of natural uranium, were conducted at Leblond Machine.
•OH **Tech-Art, Inc.** Milford AWE - 1952 - In 1952, National Lead Company of Ohio (Fernald) used Tech-Art to grind inserts as part of a study of Firth Sterling HF carbide profile inserts in conjunction with the machining development program. Additional documentation shows that Tech-Art possessed a subcontract with NLO for "[m]achine shop operations on Government owned materials at prescribed hourly rates of pay."
•OH **Tocco Induction Heating Div.**[464] Cleveland AWE - 1967-1968 - Tocco had a contract with National Lead of Ohio (Fernald) to develop induction heating coil equipment for heating uranium fuel cores. Tocco performed operational tests of these units at its Ohio facility, which took place during 1967-1968. The company received 2000 pounds of natural uranium machined fuel cores and 5600 pounds of depleted uranium machined fuel cores from NLO for testing.
•OH **Vulcan Tool Co.**[465] Dayton DOE - 1959 - After World War II, the company expanded by purchasing the Dayton Tool and Engineering Company. During the decades that followed, the company diversified its production. In addition to its production of tools and dies, Vulcan also became known internationally for its development of tube-cutting machinery. At the request of National Lead Company of Ohio (Fernald), Vulcan Tool Company conducted experiments involving the cutting of normal uranium slugs and tubes on a Brehm cutter in October 1959.
•OK **Air Force Plant 3**[466] Tulsa Oklahoma AWE - In 1951, as the Cold War with the Soviet Union intensified, the plant reopened and produced and modified aircraft until 1991. The plant also produced missile-guidance systems, space-vehicle components, electronic countermeasure devices, and stealth technologies during that time period. In the early 1960s McDonnell Douglas began to use the plant to perform maintenance on aircraft's, including the B-52, KC-135 and the F-4. In 1962, Rockwell International moved in to share the plant with McDonnell Douglas, leasing 30 percent of the plant to manufacture aerospace products. McDonnell Douglas



compressor from its moorings. One moment, he saw his co-workers 40 feet below; the next, nothing but a great yellow cloud — rising directly at him. Knapp panicked: He was caught in a radioactive release.'

464 DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; August 29, 1994. - 3 pp.
- http://www.lm.doe.gov/Considered_Sites/Gleason_Works_-_NY_55/

465 **Former Vulcan Tool Co. workers could be eligible for payments**. Dayton Daily News. Friday, October 14, 2011
'DAYTON — Former workers at the Vulcan Tool Co. in Dayton and the Piqua Organic Moderated Reactor in Piqua may be eligible for compensation and medical benefits under the Employees Occupational Illness Compensation Program Act administered by the U.S. Department of Labor.'

466 **Air Force Plant 3: Tulsa. Administrative Record Index**. Prepared and Maintained by: U.S. Department of the Air Force. Aeronautical Systems Center. Wright-Patterson AFB, Ohio. 2007. - 19 pp.
- http://www.wpafb.af.mil/asc/environmental/index.asp

Aircraft Company continued to operate the remaining 70 percent for maintenance of military and commercial aircraft as well as for the manufacture of aircraft components.

•OK **Altus AFB**[467] Altus AWE - Atlas F ICBM (SMS 577) base, 1962-1965. In April 1960, the Corps of Engineers, Tulsa District awarded the basic construction contract to Morrison-Knudsen and Hardeman and Associates. The two firms had submitted a combined bid of just over $20.9 million. The 12 missiles there constituted America's ICBM deterrent force during the Cuban Missile Crisis.
•OK **Eagle-Picher Industries, Inc.** Quapaw BE - 1988-1996 - Eagle-Picher's Quapaw, Oklahoma plant machined beryllium-alloy parts for the DOE's Y-12 facility in Oak Ridge, Tennessee, during the 1980s and the 1990s.

467 **Atlas missile site coordinates** - http://asuwlink.uwyo.edu/~jimkirk/atlas.html

Assessment of biogeochemical natural attenuation and treatment of chlorinated solvents, Altus Air Force Base, Altus, Oklahoma. Kennedy LG, Everett JW, Gonzales J. J Contam Hydrol. 2006 Feb 10;83(3-4):221-36. Epub 2005 Dec 27.

Hazardous-waste technical assistance survey, Altus Air Force Base, Oklahoma. Final report, 8 January-13 January 1989. / Zimmer, A.T.; Hedgecock, N.S. Air Force Occupational and Environmental Health Lab., Brooks AFB, TX (USA), 1989. - 58 pp.

Social-economic and wage characteristics of civilian employees, Altus Air Force Base, Oklahoma: A thesis approved for the department of economics / James M. L. Karns. Norman, Oklahoma. 1963. - 102 pp. - http://www.dtic.mil/dtic/tr/fulltext/u2/407993.pdf

•OK **Kerr-McGee**[468] Guthrie AWE - 1963-1973; Residual Radiation 1974-October 2009 - Kerr-McGee processed uranium for the AEC as part of the nuclear weapons production process. The Recycled Uranium reports show material being shipped from Kerr-McGee to both Fernald and Savannah River.

•OR **Albany Research Center**[469] AWE/DOE - 1987-1993 (remediation) & 1995-present - The Albany Research Center, now the National Energy Technology Laboratory, became part of the Department of Energy in 1995. In 2004 residual beryllium contamination associated with historic beryllium use at Albany Research Center was identified.

•OR **Oregon Metallurgical Corp.**[470] Albany DOE - Provided goods and/or services to the Fernald facility as subcontractor.

•OR **Wah Chang** Albany AWE - 1971-1972 - In 1971

468 National Priorities List : Deleted National Priorities List (NPL) Sites - by State, 2011.

469 Health Consultation: National Energy Technology Laboratory – Albany Albany, Oregon (formerly known as: Albany Research Center) United States Department of Energy EPA Facility. U.S. Department of Health and Hhuman Services. Public Health Service Agency for Toxic Substances and Disease Registry Division of Health Assessment and Consultation Atlanta, Georgia. 2006. - 36 pp. - http://www.atsdr.cdc.gov/HAC/pha/AlbanyResearchCenter/AlbanyResearchCenterHC10.25.06.pdf

470 DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Re-**

and 1972, Wah Chang was subcontracted to Union Carbide Corporation to melt uranium-bearing materials for the Oak Ridge Y-12 plant.

•PA **Aeroprojects, Inc.**[471] West Chester DOE - 1951-1973; Residual Radiation 1974-1976 - Beginning in 1951, Aeroprojects Inc. performed research and development for the AEC. The company's work included investigation of the use of ultrasonic energy in the areas of instrumentation, welding, filling of tubes with powders, extrusion, solidification and cleaning. Materials used by the company include alloys and compounds of aluminum, beryllium, mercury, thorium and uranium.

•PA **Aliquippa Forge**[472] Aliquippa AWE/DOE - 1947-1950; Residual Radiation 1951-

medial Action Program; August 29, 1994. - 3 pp.

- http://www.lm.doe.gov/Considered_Sites/Gleason_Works_-_NY_55/

471 ORNL Survey Report: R.D. Foley and K.S. Brown; **Results of the Radiological Survey at the ALCOA Research Laboratory, 600 Freeport Road, New Kensington**, Pennsylvania (ANK001); 1992.. - 10 pp.

- http://www.lm.doe.gov/Considered_Sites/Aeroprojects_Inc_-_PA_22/PA_22-3.pdf

472 National Institute for Occupational Safety and Health: **Technical Basis Document: Basis for the Development of an Exposure Matrix for Aliquippa Forge, Pennsylvania, Period of Operation: January 1, 1947 through February 28, 1950**. 2004. - 26 pp.

- http://www.cdc.gov/niosh/ocas/pdfs/tbd/aforge0a.pdf

Derivation of uranium residual radioactive material guidelines for the Aliquippa Forge site. / Monette, F. ; Jones, L. ; Yu, C.. Argonne National Lab., IL (United States). 1992. - 27 pp.

- http://www.osti.gov/bridge/servlets/purl/10173074-ItQu7D/10173074.pdf

DOE: **Site Description and History Aliquippa, Pennsylvania, Site**. 2011. - 2 pp.

DOE: ORISE Report (ORISE 93/A-5); **Radiological Survey of the Aliquippa Forge Site West Aliquippa, Pennsylvania**; December 1992 (Final Report). 1992. - 64 pp.

- http://www.lm.doe.gov/Considered_Sites/Aliquippa_-_PA_07.aspx

1987; 1989-1992 - In the late 1940s, Aliquippa Forge (previously Vulcan Crucible Steel Company) was a supplier of rolled uranium rods used in Hanford's reactors.

The AEC operated a rolling mill, two furnaces and cutting and extrusion equipment at Vulcan. Work at the site ended in 1950. Records show that the AEC was aware that some workers at this plant were breathing uranium dust at 200 times the safety limit.

Reviewing claims at nuclear work sites in Western Pennsylvania / The Pittsburgh Post-Gazette, Sunday, April 27, 2003. - http://www.post-gazette.com/healthscience/20030427nukesiteshealth9p9.asp

The Pittsburgh Reduction Company - established an aluminum producing plant on this site in 1891, however none of the structures from that plant survive. After 1900 no aluminum was produced in New Kensington. Instead aluminum PRODUCTS, especially cooking utensils, were manufactured here. This once successful venture ended when ALCOA closed the New Kensington works in 1971.

•PA **Aluminum Co. of America**[473] (Alcoa) New Kensington AWE - 1943-1945; Residual Radiation 1946-1991 - The Aluminum Company of America (Alcoa) site in New Kensington, Pennsylvania was one of 14 facilities in the early 1940s that produced nuclear fuel for the X-10 pilot plant reactor in Oak Ridge, Tennessee and the production reactors at Hanford, Washington. Alcoa used a unique welding process to "can" and seal uranium slugs produced by these other facilities.

473 National Institute for Occupational Safety and Health: **Site Profiles for Atomic Weapons Employers that Worked Uranium and Thorium Metals Appendix R – Aluminum Company of America – Pennsylvania** (Alcoa 1), 2007. - 10 pp.

•PA **Babcock & Wilcox** Parks Township AWE
•PA **Beryllium Corp. of America** Hazleton BE - 1957-1979 - The Manhattan Engineer District and the Atomic Energy Commission (AEC) contracted with the facility for the production of beryllium metal, beryllium oxide, and beryllium powder. The AEC contracted with the facility for the refining and fabrication of beryllium. Later the facility produced beryllium blanks for the Y-12 plant and Dow (Rocky Flats).
•PA **Beryllium Corp. of America** Reading BE - 1943 -1979 - In 1947, the Beryllium Corporation plant at Reading produced highly distilled and pure beryllium oxide on a small scale for the AEC. By 1960, the plant focused on alloy and oxide work. In 1961, the plant supplied beryllium parts to the Y-12 plant and produced beryllium powder for the AEC from government inventory beryllium ingots.
•PA **Birdsboro Steel & Foundry**[474] Birdsboro AWE - 1951-1952 - n 1951, eight assorted uranium billets weighing a total of 346 pounds, originating at Birdsboro, were received by the AEC's Lake Ontario Ordnance Works. In 1952, Birdsboro received 11.5 pounds of uranium wafers for processing.

474 National Institute for Occupational Safety and Health: **Site Profiles for Atomic Weapons Employers that Worked Uranium and Thorium Metals Appendix B – Birdsboro Steel & Foundry Company**, 2007. - 9 pp.- http://www.cdc.gov/niosh/ocas/pdfs/tbd/b-6000-apb-r0.pdf

•PA **Bettis Atomic Power Laboratory**[475] West Mifflin DOE - 1949-. - The newly formed Westinghouse Atomic Power Division bought the Bettis airfield tract in early 1949 and purchased adjacent properties in 1952. Bettis is part of the Naval Nuclear Propulsion Program which includes include the designing, developing, testing and monitoring operations of nuclear propulsion plants for naval surface ships and submarines. According to Steven L. Krahn, 'The Naval Reactors Program, more commonly known as "NR," was started by a small group of naval officers at Oak Ridge National Laboratory in 1946. Led by Hyman Rickover (a Captain apparently near retirement), this group was inspired by a concept: the possibility of using nuclear power to

475 **DOE Completes TRU Waste Cleanup at Bettis**

CARLSBAD, N.M., September 23, 2011 – The U.S. Department of Energy (DOE) has successfully completed cleanup of all Cold War legacy transuranic (TRU) waste at the Bettis Atomic Power Laboratory (BAPL) near Pittsburgh, Pa., permanently disposing of it at the Waste Isolation Pilot Plant (WIPP).

BAPL is the 20th site to be completely cleaned of legacy TRU waste. This milestone was achieved using approximately $640,000 of a $172 million investment from the American Recovery and Reinvestment Act to expedite legacy waste cleanup activities across the DOE complex.

- http://www.em.doe.gov/pdfs/BAPL9-23-11.pdf

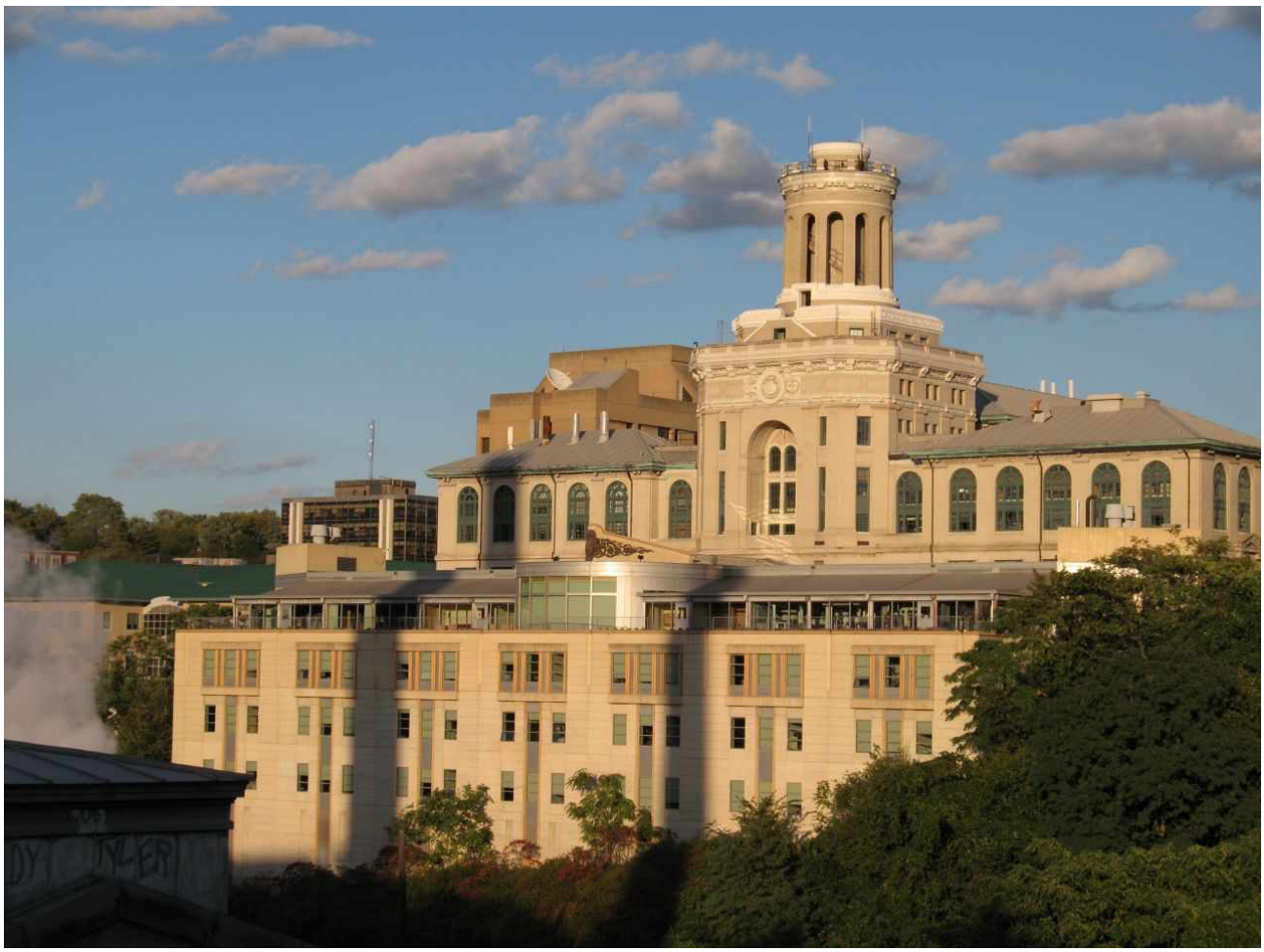
Naval Reactors Facility 2003 Environmental Monitoring Report, Bechtel Bettis, Inc.2003. **-** 84 pp.
- http://www.osti.gov/bridge/servlets/purl/835949-hU8lU7/native/

Naval Reactors (NR): A Potential Model for Improved Personnel Management in the Department of Energy (DOE) - http://www.fas.org/man/dod-101/sys/ship/eng/appndx-c.htm

propel a submarine. Within seven years of its inception, the organization that developed out of this concept would put into operation the nations' first power reactor (the Nautilus prototype). The following four years would see three more nuclear submarines and two reactor plant prototypes operating and another seven ships and two prototypes being built. To date, more reactors have been built and safely operated by the NR program than any U. S. program; this record of achievement is remarkable by any standard. It is now a joint program of the Navy and the Department of Energy (DOE). Contractors: Bechtel Marine Propulsion Corporation of the Bechtel Corporation and Westinghouse Electric Corporation.

•PA **C.H. Schnoor**[476] Springdale AWE/DOE - 1943-1951 - In 1943, C.H. Schnorr & Company began providing metal fabrication services in support of Manhattan Engineer District operations. C.H. Schnorr machined extruded uranium for the Hanford Pile Project.

476 DOE: **Long-Term Surveillance and Maintenance Requirements for Remediated FUSRAP Sites**. 2011. - 146 pp. - http://www.lm.doe.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=7978&libID=8084



•PA **Carnegie Institute of Technology** Pittsburgh AWE - 1942-1946 - During the Manhattan Project, Carnegie Institute of Technology was key participant in research on the phases of special metals and their alloys. It also worked on the development of methods for testing materials of construction and the construction of "necessary equipment."
•PA **Carnegie Mellon Cyclotron Facility** Saxonburg AWE
•PA **Carpenter Steel Co.** Reading AWE - 1943-1944 - Beginning in 1943, Carpenter Steel Corporation was one of the 14 private contractors and vendors that produced fuel for the Oak Ridge X-10 pilot plant reactor and the full-scale Hanford production reactors. As an alternative to extrusion, the Carpenter Steel Company of Reading, Pennsylvania experimented with rolled uranium rods in July 1944, but these proved to be inferior to the extruded product. The metal tended to form laps and seams on the surfaces of the rolled bars. Carpenter Steel has since changed its name to Carpenter Technology Corporation.
•PA **Chambersburg Engineering Co.** Chambersburg AWE - 1957 - In March 1957, a series of hot uranium forging tests were conducted at the Chambersburg Engineering company by the Metallurgical Department of National Lead Company of Ohio (Fernald)
•PA **Foote Mineral Co.** East Whiteland Twp. AWE - BE 1947; AWE 1942-1948 - Foote Mineral had a pilot plant at its East Whiteland Township location which processed monazite sands. Monazite sands are known to have a very high thorium

content. Because the AEC needed fairly large quantities of thorium, they were very interested in different methods of extracting it from monazite sands. Foote Mineral Company was also a major importer of beryl ore from Brazil. Under contract to the Atomic Energy Commission, Foote Mineral Company procured 500 tons of beryl ore in 1947.

•PA **Frankford Arsenal**[477] Philadelphia AWE - 'Formerly Used Defense Site plus-up funds received in 2007 were used to execute a Containerized/Hazardous, Toxic, Radioactive Waste project, which included the abandonment of several old monitoring wells, eligible underground storage tanks and 1600+ nickel cadmium batteries. The contaminants of concern were polychlorinated biphenyls, volatile organic compounds (VOCs) and semi-volatile organic compounds.'
•PA **Heppenstall Co.**[478] Pittsburgh DOE - 1955; Residual Radiation 1956-1989 - Under contract to the Mallinckrodt Chemical Co., the site was used to heat, press and water quench uranium "dingots". Approximately 100,000 pounds of normal uranium metal was shaped at Heppenstall over about a 6-month period. In 1956 the Heppenstall Steel Company of Pittsburgh merges with Midvale Company to become Midvale-Heppenstall Company.

477 **Frankford Arsenal** : Fact Sheet as of 1 January 2011. US. Army Corps of Engineers - Baltimore District, 2011. - 2 pp.
478 DOE: **Results of the radiological survey at the former Heppenstall Company site, 4620 Hatfield Street, Pittsburgh, Pennsylvania**. / Cottrell, W.D.; Crutcher, J.W.; Quillen, J.L. . 1991. - 20 pp. - http://www.osti.gov/energycitations/product.biblio.jsp?osti_id=6154854

This steel mill in Washington, PA was once Jessop Steel, but was purchased by Allegheny Ludlum in the 1990s.

•PA **Jessop Steel Co.**[479] Washington AWE - 1950-1954 - In the early and mid 1950s, the Jessop Steel Company was under contract to the AEC for metal fabrication with some work through DuPont. In the early 1950s, records indicate that uranium metal in nickel scrap was sent to Jessop to make stainless steel piping for Fernald. In 1954, tentative plans were made for Jessop to roll uranium for Fernald billet production.

•PA **Koppers Co., Inc.** Pittsburgh AWE - 1956-1957; Residual Radiation 1958-1996 - In conjunction with the Kennecott Copper Co., Koppers conducted pilot plant tests for the production of uranium hexafluoride. In 1956, Koppers was licensed receive 2000 pounds of refined source material for use in studies toward the preparation of uranium dioxide for reactor fuel elements and 6,150 pounds of refined source material for use in research and pilot plant investigations on feed material processing. In October 1957, they were authorized to receive 110 pounds of normal uranium hexafluoride. Most of the research works appears to have taken place at the Koppers Research Department in Verona, PA.

•PA **Landis Machine Tool Co.**[480] Waynesboro AWE - 1952 - In 1952, National Lead of Ohio (Fernald) personnel performed tests involving the machining of uranium slugs at Landis Machine Tool Company.

479 National Institute for Occupational Safety and Health: **Site Profiles for Atomic Weapons Employers that Worked Uranium and Thorium Metals Appendix BL – Jessop Steel Co.**, 2007. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/b-6000-apbl-r0.pdf

480 National Institute for Occupational Safety and Health: **Site Profiles for Atomic Weapons Employers that Worked Uranium and Thorium Metals Appendix BP – Landis Machine Tool Co.**, 2007. - 9 pp.

•PA **Letterkenny Army Depot** [481]Chambersburg AWE - The Letterkenny Army Depot was established in 1942 for ammunition storage. Since 1947, activities at the Letterkenny Army Depot expanded to include the testing, maintenance, and overhaul of wheeled and tracked vehicles and missiles; the storage and transportation of industrial chemicals and petroleum; and storage, maintenance, demilitarization, and modification of ammunition. Following the election of President Eisenhower, Letterkenny Army Depot had new missions and orders to follow making it a permanent military installation. Its new mission was technology research, weapons housing and deconstruction, and industrial waste disposal.

•PA **McDaniel Refractory Co.** Beaver Falls BE - 1942-1949 - The Manhattan District History indicates that the McDanel Refractory was used to fabricate oddly shaped beryllium crucibles or beryllium crucible stopper rods for the Manhattan Project.

•PA **Nuclear Materials and Equipment Corp.**[482] Apollo AWE/BE - BE 1960-1968; AWE 1957-1983 - The Nuclear Material and Equipment Company (NUMEC) began operations at the Apollo and Parks Township facilities in the late 1950s. The Atlantic Richfield Company (ARCO) purchased the stock of NUMEC in 1967. In 1971, Babcock & Wilcox (B&W) purchased NUMEC and is the current owner of the Apollo and Parks Township facilities. NUMEC processed unirradiated uranium scrap for the AEC in the 1960s. This facility also provided enriched uranium to the naval reactors program and included a plutonium plant, plutonium plant storage area, highly enriched uranium

481 EPA: **Superfund Record of Decision: USA Letterkenny** (PDO), PA, 1991. - 28 pp.

Public health assessment addendum for Letterkenny Army Depot, USA Letterkenny Southeast Area, Chambersburg, Franklin County, Pennsylvania, Region 3. CERCLIS No. PA6213820503 and USA Letterkenny, Property Disposal Office Area, Chambersburg, Franklin County, Pennsylvania. CERCLIS No. PA2210090054. Final report, 1993. - 142 pp.

482 National Institute for Occupational Safety and Health: S**ite Profile for Nuclear Materials and Equipment Corporation, Apollo and Parks Township, Pennsylvania**. / Dennis L. Strenge, Paul J. Demopoulos, and William E. Joyce, 2010. - 89 pp. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/numec-r1-p1.pdf

National Institute for Occupational Safety and Health: **SEC Petition Evaluation Report Petition SEC-00080: Nuclear Materials and Equipment Corporation (NUMEC) facility, Apollo, Pennsylvania**. / James K. Alexander and Timothy J. Vitkus. 2007. - 23 pp.
- http://www.cdc.gov/niosh/ocas/pdfs/sec/numec/numecer.pdf

fuel facility, metals and hafnium complex and a uranium hexafluoride storage area. The facility also fabricated plutonium-beryllium neutron sources. The B&W Apollo facility ceased manufacturing nuclear fuel in 1983.

•PA **Nuclear Materials and Equipment Corp.** Parks Township AWE/BE - BE 1960-1968; AWE 1957-1980 - The Nuclear Material and Equipment Company (NUMEC) began operations at the Apollo and Parks Township facilities in the late 1950s. The Atlantic Richfield Company (ARCO) purchased the stock of NUMEC in 1967. In 1971, Babcock & Wilcox (B&W) purchased NUMEC and is the current owner of the Apollo and Parks Township facilities. The primary function of the NUMEC Parks Township facility was the fabrication of plutonium fuel, the preparation of high-enriched uranium fuel, and the production of zirconium/hafnium bars. The Parks Township facility ceased fuel fabrication activities in 1980.

•PA **Penn Salt Co.** Philadelphia AWE - 1953-1956 - Pennsylvania Salt experimented with samples of fluoride containing byproducts from AEC operations to determine if they could be used for hydrogen fluoride production or to extract uranium from the material. The extremely toxic hydrogen fluoride (HF) developed by the Pennsylvania Salt Company in Easton, PA was an essential component of the separation process that produced uranium hexafluoride for the atomic bombs.[483]

483 **The Unusual Death of a Navy Radiologist D-Day Plus 66 Years** / Kenneth C. Davey - http://www.6thbeachbattalion.org/navy-radiologist.html
The fluoride deception / Christopher Bryson. Seven Stories Press, 2004 - 374 pp.

•PA **Philadelphia Naval Yard** Philadelphia AWE - The Abelson's thermal diffusion plant at the Philadelphia Naval Yard, 1944-? The Philadelphia plant was testing a uranium isotope separation process.

•PA **Shippingport Atomic Power Plant** Shippingport DOE - 1984-1995 - Shippingport Atomic Power Station, located in Shippingport, Pennsylvania, was one of the first large-scale nuclear power plants in the world. Naval Nuclear Propulsion program.

•PA **Superior Steel Co.**[484] Carnegie AWE - 1952-1957 - Superior Steel produced uranium strip and rolled uranium slabs for use by the Savannah River Laboratory. In 1955, for example, they hot rolled twenty-five tons of uranium into strip.

484 DOE: T.E. Myrick and C. Clark; Preliminary Site Survey Report for the Former Superior Steel Mill at Carnegie, Pennsylvania; April 1981. - 20 pp.
- http://www.lm.doe.gov/Considered_Sites/S/Superior_Steel_Co_-_PA_03/PA_03-4.pdf

•PA **Teledyne Vasco Company** Latrobe facility, now **Allegheny Ludlum Corp. Latrobe**. Derry Township, Westmoreland County DOE - From the mid-1960's to 1990's the company has manufactured high-speed tools and specialty steels. Teledyne Vasco did not produce an end product; it fabricated various sizes of rod and wire components used by other companies to manufacture specialty products, such as surgical needles, aircraft landing gear, and missile tools. Finished manufactured products consist of molded ingots and pressed bars.

•PA **Tobyhanna Army Depot** AWE - Established Feb. 1, 1953 as Tobyhanna Signal Depot, today it is a facility for the repair, upgrade and integration of Command, Control, Computer, Communications, Intelligence, Surveillance and Reconnaissance (C4ISR) systems for all branches of the Armed Forces.

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•PA **US. Steel Co., National Tube Division**[485] McKeesport AWE 1959-1960 - Tests at the Christy Park Works, National Tube Division of the US Steel Corporation, conducted in 1959 and 1960, demonstrated that rotary piercing of uranium was possible. The tests were conducted for National Lead of Ohio (Fernald).

485 National Institute for Occupational Safety and Health: **Site Profiles for Atomic Weapons Employers that Worked Uranium and Thorium Metals Appendix CO – US Steel, National Tube Division**, 2007. - 10 pp. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/b-6000-apco-r0.pdf

•PA **Vitro Manufacturing**[486] or **Vitro Rare Metals Plant** Canonsburg AWE/BE - 1942-1959 - Starting in 1948, Vitro was under contract to recover uranium from scrap. In the period from 1954-1956, Vitro had a contract to process production quantities of radioactive material (UF4) for National Lead of Ohio (Fernald). Vitro continued to provide uranium to the Atomic Energy Commission under various contracts through 1959. Canonsburg was a major uranium milling facility and although the EEOICPA definition of an Atomic Weapons Employer excludes mining and milling, this site is covered because of its scrap processing activities performed under contract to the

486 Formerly utilized MED/AEC sites : remedial action program : **Radiological survey of the former Vitro Rare Metals Plant, Canonsburg, Pennsylvania**, 1978. - xv, 270 pp.

SEC Petition Evaluation Report Petition SEC-00134 / Vincent King, Joseph Guido, James Mahathy. National Institute for Occupational Safety and Health. 2008. - 33 pp.

'NIOSH does not have access to sufficient personnel monitoring, workplace monitoring, or source term data to estimate potential internal exposures to non-uranium radionuclides in disequilibrium with uranium during the period of AWE operations from August 13, 1942, through December 31, 1957.Consequently, NIOSH finds that it is not feasible to estimate, with sufficient accuracy, total internal exposures and resulting doses for the class of employees covered by this evaluation.'

Joel O. Lubenau: **Standard Chemical Company, Marie Curie and Canonsburg**. Jefferson College Times, March 2005. - http://www.canonsburgboro.com/Curie-WebPage/MCurie&StdChemical.htm

Decommissioning the Flannery Building for Unrestricted Use. / Robert Maiers, Division Chief, Decommissioning & Environmental Surveillance Division, BRP

- http://www.dep.state.pa.us/brp/Decom_and_Env_Sur/FlanneryBuildingDecommissioning.htm

Safety Evaluation Report, Flannery Building. The Pennsylvania Department of Environmental Protection, Bureau of Radiation Protection, 2003. - 44 pp.

- http://www.dep.state.pa.us/brp/Decom_and_Env_Sur/Final%20SER-%20Flannery%20Bldg.pdf

Atomic Energy Commission. A 1948 document indicates that General Electric shipped scrap containing beryllium to the Canonsburg site. The Canonsburg site is one of 24 former uranium mill sites designated for Department of Energy remediation by the Uranium Mill Tailings Radiation Control Act (UMTRA).

•PA **Westinghouse Atomic Power Development Plant**[487] East Pittsburgh AWE - 1942 -1944 - Westinghouse prepared uranium metal for Enrico Fermi's Stagg Field experiment and conducted development and pilot-scale production of uranium oxide fuel elements.

•PA **Westinghouse Nuclear Fuels Division**[488] or Westinghouse Commercial Manufacturing Cheswick AWE - 1971-1972 - The Westinghouse Nuclear Fuels Division received shipments of nuclear materials from the AEC nuclear weapons complex in 1971 and 1972. The Cheswick site received a shipment of enriched uranium from the AEC's Fernald plant in 1971. It also received a shipment of plutonium in 1972 from the West Valley facility. This plutonium originated out of Hanford. Because this material came from the nuclear weapons complex, the site qualifies as an Atomic Weapons Employer for these years.

487 **SEC Petition Evaluation Report : Petition SEC-00096 : Westinghouse Atomic Power Development Plant** / Daniel H. Stempfley. National Institute for Occupational Safety and Health, 2009. - 48 pp.

488 **Former Westinghouse workers qualify for nuclear payment** / Jennifer Gross, Valley news dispatch, Wednesday, January 15, 2003. Pittsburgh Tribune-Review
- http://www.pittsburghlive.com/x/valleynewsdispatch/s_112868.html#ixzz1dCJh89Tn

•PR **BONUS Reactor Plant**[489] Punta Higuera DOE - 1964-1968 - The Boiling Nuclear Superheat Reactor (BONUS) was licensed from April 2, 1964 to June 1, 1968. Full power Operation began in late 1965 and stopped in July 1967. The plant was Atomic Energy Commission/Department of Energy owned; it was not regulated by the Nuclear Regulatory Commission. Plutonium has been recovered from reactor fuel.
•PR **Puerto Rico Nuclear Center** Mayaguez DOE - 1957-1976 - The Puerto Rico Nuclear Center (also known as the Center for Energy and Environment Research) was established in 1957 as a nuclear training and research institution. The facility included a one megawatt MTR research reactor, which became operational in 1960. During the next ten years, the AEC supported training and research activities at an annual level of approximately $2 million. The MTR was shut down in 1971 and replaced a two megawatt TRIGA research reactor. Except for brief periods of time, TRIGA was never operated at power levels in excess of 1.2 megawatts. In 1976, the facility was renamed the Center for Energy and Environmental Research (CEER) and the mission was broadened to include research, development and training for both nuclear and non-nuclear energy technologies. The programs were transferred to the University of Puerto Rico at that time. The TRIAGA reactor was shut down on September 30, 1976 and a program for decommissioning and removal of the reactor was initiated. Contractors: University of Puerto Rico (1957-1976), BNI(1987), Cleveland Wrecking Caribe, Inc. (1987).
•RI **C.I. Hayes, Inc.**[490] Cranston DOE - 1964 - In 1964, C.I. Hayes Inc. handled

489 DOE: **BONUS, Puerto Rico, Decommissioned Reactor**. 2009. - 2. pp.
490 **Government May Compensate Radiation-Exposed Workers in Rhode Islan**d. Providence Journal, July 26, 2001.

uranium metal under subcontract to the National Lead Company.

•SC **Savannah River Site**[491] Aiken DOE - 1950-. - From 1950 until the late 1980s,

DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; August 29, 1994. - 3 pp.
- http://www.lm.doe.gov/Considered_Sites/Gleason_Works_-_NY_55/

491 DOR Savannah River Operations Office: **Savannah River Site (SRS) Cold War Built Environment. Historic Preservation Annual Summary Report. Fiscal Year (FY) 2008**. October 2008. - 14 pp.
- http://sro.srs.gov/hist_prsvn/srshpannualreport2008.pdf

Savannah River Site Cold War Historic Property Documentation. Narrative and Photography: 300/m area – fuel and target fabrication. Aiken County, South Carolina / Report prepared by: New South Associates. Mary Beth Reed and Mark T. Swanson. 2006. - 359 pp. ; New South Associates Technical Report 1189 - http://nationalregister.sc.gov/SurveyReports/HC02003.pdf

Savannah River Site Cold War Historic Property Documentation. Narrative and Photography:
700/A Area – site administration, safety, security, and support. Aiken County, South Carolina. / Report prepared by: New South Associates. Terri Gillett, Mary Beth Reed, Mark T. Swanson, Steven Gaither. 2007. - 450 pp. ; New South Associates Technical Report 1433.
- http://nationalregister.sc.gov/SurveyReports/HC02001.pdf

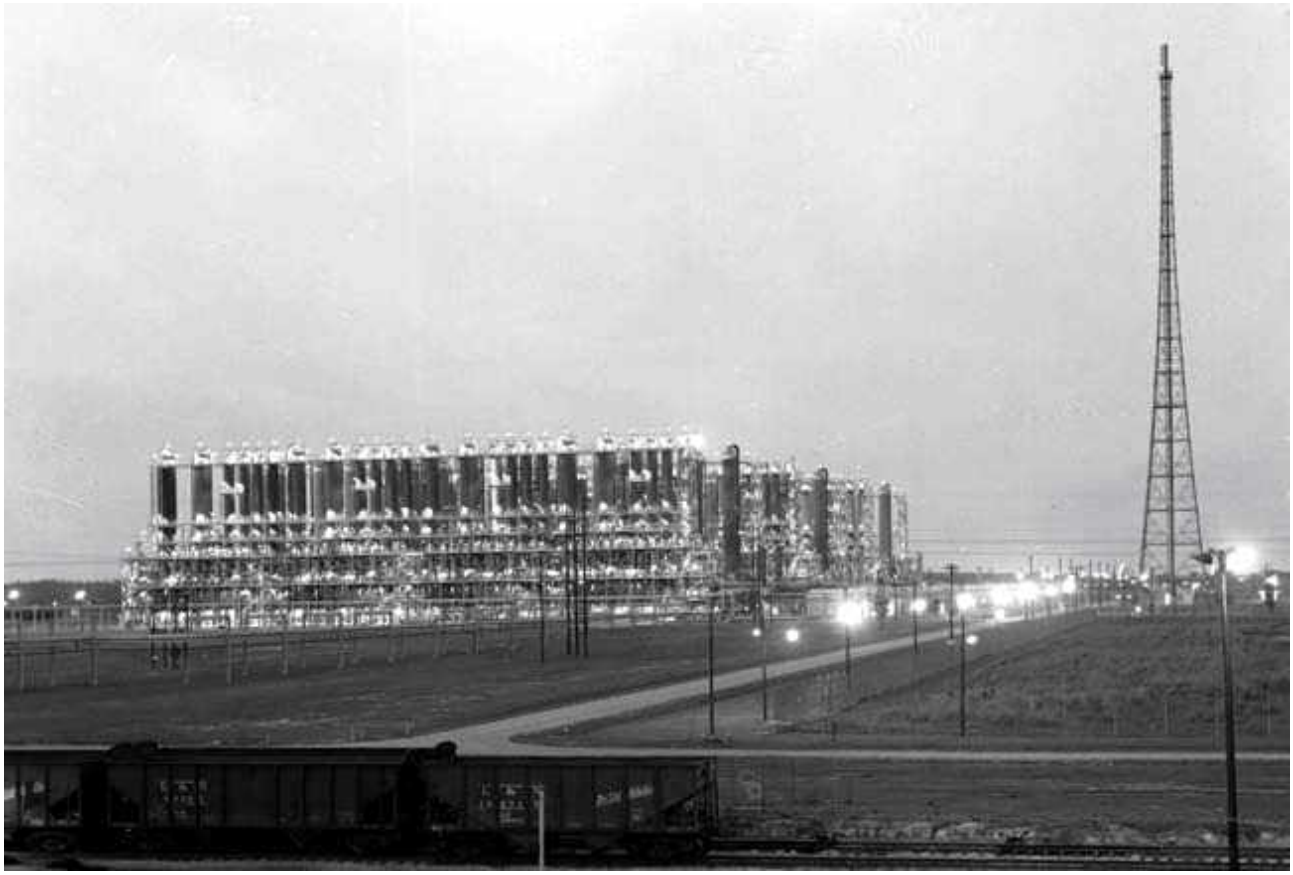
Savannah River Site Cold War Historic Property Documentation. Narrative and Photography: **CMX and TNX Savannah River's Pilot Plants**. Aiken County, South Carolina. / Report prepared by: Mark T. Swanson and Mary Beth Reed. 2006. - 270 pp ; New South Associates Technical Report 1329.
- http://nationalregister.sc.gov/SurveyReports/HC02004.pdf

Savannah River Site Cold War Historic Property Documentation. Narrative and Photography: **Reactor On: Thematic Study of Savannah River's five reactor areas**. Aiken and Barnwell Counties, South Carolina. / Report prepared by: Mary Beth Reed. Historians and Authors: Mark T. Swanson and Terri Gillett. 2010. - 930 pp. ; New South Associates Technical Report 1743.
- http://nationalregister.sc.gov/SurveyReports/HC02005.pdf

Savannah River Site Cold War Historic Property Documentation. Narrative and Photography: **You can't run a reactor if you can't get to it: a study of Savannah River site's infrastructure**. Aiken, Barnwell and

the Savannah River Site conducted multiple operations that played a vital role in the US. nuclear weapons complex. Of greatest importance were the production of plutonium and tritium. Many facilities were built at SRS to support these production efforts and to address their resulting environmental impacts. They include five nuclear reactors, two chemical separation plants (also known as canyons), a nuclear fuel and target fabrication facility, a heavy water plant, and waste management facilities.

Power Plant



In addition, SRS is the location of the Savannah River Technology Center and the Savannah River Ecology Laboratory. SRS remains a key Department of Energy facility with an important national security mission of maintaining the nation's nuclear weapons stockpile and ensuring future production capabilities. Throughout the course of its operations, the potential for beryllium exposure existed at this site, due to beryllium use, residual contamination, and decontamination activities. The High Level Waste Tanks at SRS are considered by DOE and South Carolina Department of Health and Environmental Control (SCDHEC) to be the greatest human health risk in South Carolina. Contractors: Westinghouse Savannah River Company (1989-present); E.I. du Pont de Nemours and Company (1950-1989), together with American Machine and Foundry, the Blaw-Knox Company, Gibbs & Hill, Inc., the Lummus Company, New York Shipbuilding, Voorhees, Walker, Foley & Smith.

•SD **Ellsworth Air Force Base, Rushmore Air Force Station**[492] Meade AWE - National Nuclear Weapons Stockpile Site.[493] When operations at the base resumed in 1947 Ellsworth Air Force Base was a new United States Air Force asset. The primary unit assigned to Rapid City Air Force Base was the new 28th Bombardment Wing flying the B-29 Superfortress. Shortly after additional runway improvements in July 1949, the 28th Bombardment Wing began conversion from, to the huge B-36 Peacemaker. In October 1960, Ellsworth came the activation of the 850th Strategic Missile Squadron that prepared the emplacement of Titan I intercontinental ballistic missiles, which arrived in 1962. The contractors for the Titan I project, Leavell-Scott & Associates, represented a consortium of eight partners. On August 21, 1961, construction began on the Minuteman IB facilities. The contract to build the 150 silos and associated launch control facilities was executed by Peter Kiewit Sons' Company of Omaha, Nebraska, using designs developed by Parsons-Stavens, Architect Engineer, in Los Angeles.

492 **Ammunition and Explosives Storage for the Navy (1939-1989) and the Air Force (1946-1989)**, 2008. - 200 pp. - http://www.denix.osd.mil/cr/upload/af-navy-ammunition-storage-public-rfs_pg1-200_rev.pdf

493 **Minuteman ballistic missile silo at Ellsworth Air Force Base - South Dakota.** - http://www.youtube.com/watch?v=uQ--xYlWgkM

•SD **Ore Buying Station at Edgemont**[494] Edgemont DOE - 1952-1956 - The ore buying station at Edgemont purchased uranium ore for the AEC. The American Smelting and Refining Company (ASRC) managed and operated the Edgemont station from November 1952 to January 1956. Lucius Pitkin replaced ASRC as the M&O contractor in February 1956. The Mines Development Corporation purchased the ore buying station on July 12, 1956. Contractors: American Smelting and Refining Company (1952-1956); and Lucius Pitkin, Inc. (1956).

494 **Correlation between gamma radiation levels and soil radium concentrations at the Edgemont uranium mill site**. / Wallace, R.G.; Reed, R.P.; Polehn, J.L.; Wilson, G.T. Tennessee Valley Authority, Muscle Shoals, AL (USA). Western Area Radiological Lab.; Tennessee Valley Authority, Chattanooga (USA); Silver King Mines, Inc., Edgemont, SD (USA). 1985. - 9 pp. ' The Tennessee Valley Authority's uranium mill in Edgemont, South Dakota, is being decommissioned. Approximately 4 million tons of contaminated tailings, building equipment, and contaminated soil and debris on the mill site will be removed to the disposal site located approximately 3 kilometers to the southeast.'

DOE: **Edgemont, South Dakota, Disposal Site**, 2010. - 9 pp

E**nvironmental evaluation of Mines Development, Inc. uranium and vanadium milling operations at Edgemont, South Dakota**. Environmental Protection Agency, Denver, CO (USA), 1973. - 64 pp.

Final Report: North Cave Hills Abandoned Uranium Mines Impact Investigation Prepared for: U.S. Department of Agriculture Forest Service – Region 1 / Prepared by: Dr. James Stone, PE, Dr. Larry Stetler. South Dakota School of Mines and Technology. 2007. - 217 pp.

- http://uranium.sdsmt.edu/Downloads/NCHUraniumMinesImpactReport04-18-17.pdf

Geology and Production: History of the Uranium Deposits in the Northern Black Hills, Wyoming – South Dakota / William L. Chenoweth. Wyoming Geological Association. 1988. - 263 .

Radiological assessment of the town of Edgemont / Jackson, P.O.; Thomas, V.W.; Young, J.A.. Pacific Northwest Lab., Richland, WA (USA). 1985. - 186 pp.

Watchdog: Defenders of the Black Hills - http://www.defendblackhills.org/

•Tennessee **Clarksville Facility**[495] Clarksville DOE - 1949-1967 - The Clarksville Modification Center was established in 1958 for the purpose of testing and modifying the components of nuclear weapons. The Center was located near Clarksville, TN, on a corner of the Ft. Campbell, KY, military reservation. Prior to 1958 some buildings were used by the AEC for storage. The Clarksville Modification Center was closed in September 1965 and its functions were transferred to Pantex and Burlington. In 1967 the AEC surrendered control of the area back to the Army. Contractors: Mason & Hanger-Silas Mason (1958-1965); Sandia Corporation was the storage contractor (1949-1967).

•TN **Clarksville Base**[496] or **Campbell Army Airfield** AWE - National Nuclear Weapons Stockpile Site. Stockpiling of the atomic bomb began slowly, with only 13 in the entire arsenal in 1947; 56 in 1948; 298 in mid-1950. The first four sites were of the main stockpile type, and were built before 1950. Site B was at Clarksville Base, adjacent to Campbell Air Force Base and Fort Campbell (Tennessee and Kentucky). Campbell AFB at Ft. Campbell, KY was transferred to the Army in 1959.

495 ORAU TEAM Dose Reconstruction Project for NIOSH: **Site Profile for Clarksville Base Weapons Storage Area and Modification Center with Supplementary Guidance for Medina Base** / Ronald J. McConn, Jr., Eva Eckert Hickey, Richard J. Traub, Jerome B. Martin, and Donald E. Bihl., 2006. - 69 pp.

496 **Ammunition and Explosives Storage for the Navy (1939-1989) and the Air Force (1946-1989)**, 2008. - 200 pp. - http://www.denix.osd.mil/cr/upload/af-navy-ammunition-storage-public-rfs_pg1-200_rev.pdf

•TN **Holston Army Ammunition Plant**[497] Kingsport, Sullivan – AWE - The Holston Army Ammunition Plant, also known as the Holston Ordnance Works, was constructed by Tennessee Eastman in Kingsport, Tennessee to manufacture explosives during World War II.[498] (Holston Defense Corp. in Kingsport, TN is a private company now categorized under Chemical Warfare Projectiles and Components.) BAE Systems' division Ordnance Systems, Inc. currently operates the plant under a 25-year facilities use contract. Among the many unique products produced here are the explosive powders used to trigger nuclear weapons.

497 The US. Army Materiel Command: **The Metal Book**. 2007. - 39 pp.

498 **Analysis of Wastewater for Organic Compounds Unique to RDX/HMX manufacturing and Processing** : Final engineering rept. 1974-1979 / Stidham, Billy R. Holston Defense Corp.,1979. - 169 pp. - http://handle.dtic.mil/100.2/ADA085765

Aquatic Field Survey at Holston Army Ammunition Plant, Kingsport, Tennessee. / Sullivan,J. H. , Jr. ; Putnam,H. D. ; Keirn,M. A. ; Swift,D. R. ; Pruitt,B. C. , Jr . 1977. - 268 pp.

Historic Properties Report, Holston Army Ammunition Plant, Kingsport, Tennessee./ Hess, Jeffrey A.. United States Army Materiel Development and Readiness Command . 1984. - 92 pp.

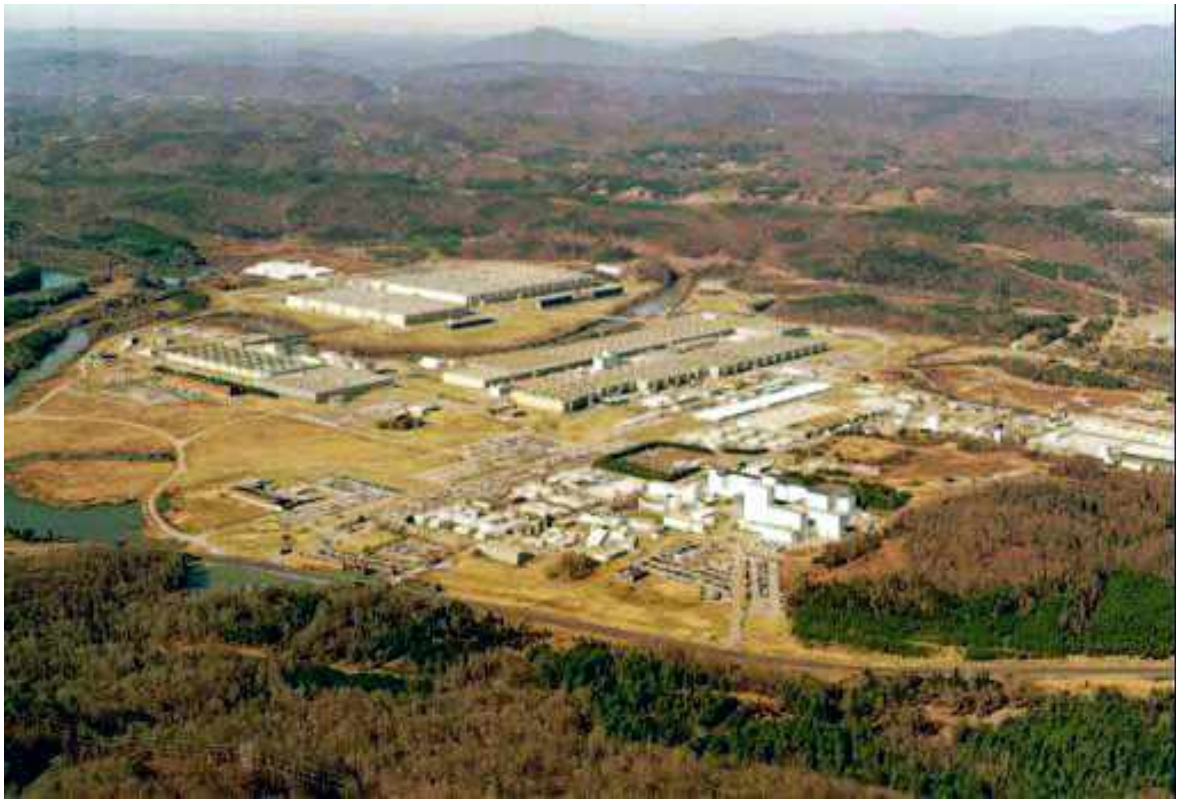
Holston Army Ammunition Plant, Supplemental Photographic Documentation of Archetypal Buildings, Structures, and Equipment for U.S. Army Materiel Command National Historic Context for World War II Ordnance Facilities. / White, William D., Jr. ; Krapf, Kellie A. 1995. - 231 pp. - http://handle.dtic.mil/100.2/ADA315283

•TN **Elza Gate Site**[499] or **Oak Ridge, Tennessee, Warehouses Site** DOE - Storage site for high-grade African uranium ore (pitchblende) and ore-processing residues for the Manhattan Engineer District in the early 1940s.

•TN **Manufacturing Sciences Corporation** BE - 1992-1994 - Manufacturing Sciences Corporation performed beryllium work for Los Alamos National Laboratory. 'MSC's manufacturing plant is a fully integrated manufacturing facility with the capacity to melt, cast, roll or machine products from many specialty metals such as

499 DOE: Long-Term Surveillance and Maintenance Requirements for Remediated FUSRAP Sites. 2011. - 146 pp. - http://www.lm.doe.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=7978&libID=8084

steel, aluminum, uranium, tantalum, and niobium. MSC remains the sole commercial facility in the world with the capability to cast, roll and machine products from depleted uranium (DU). While DU accounts for approximately half of MSC's annual sales revenue, the rolling and manufacturing of specialty metals is an important and growing component of our business.'



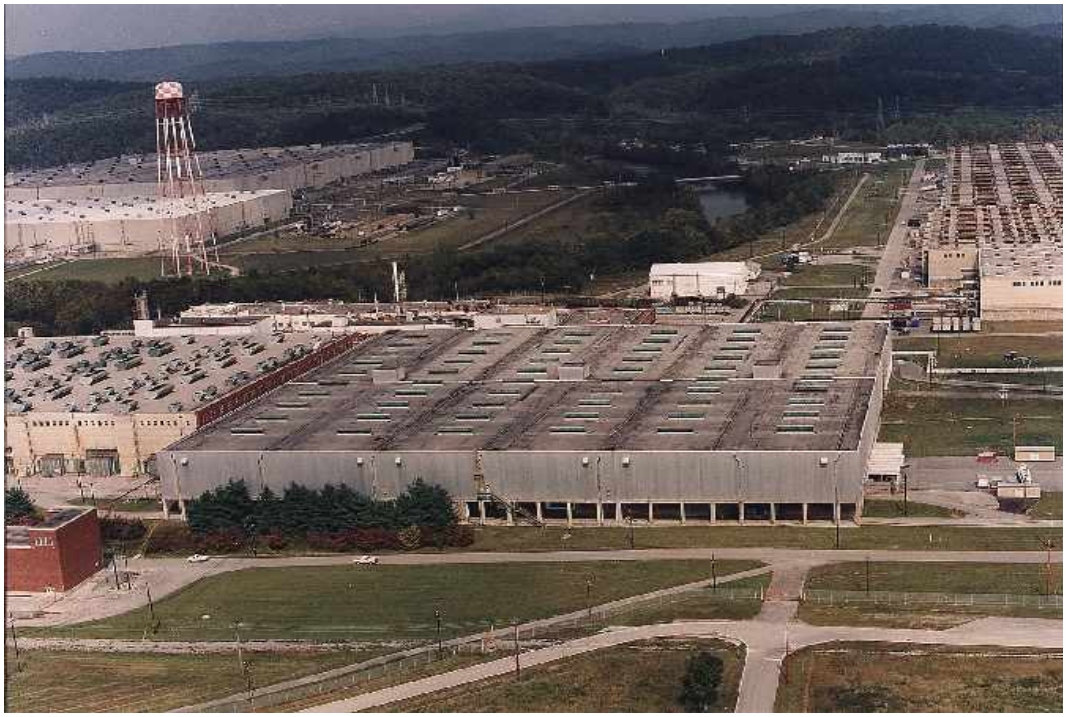
•TN **Oak Ridge Gaseous Diffusion Plant**[500] (K-25) Oak Ridge DOE - 1943-1987; 1988-. - The K-25 gaseous diffusion plant at East Tennessee Technology Park (ETTP) was built as part of the World War II Manhattan Project to supply enriched uranium for nuclear weapons production. Construction of the ETTP started in 1943 with the ETTP Building, the first diffusion facility for large-scale separation of uranium-235. The ETTP Building was fully operable by August 1945.

500 **A mortality study of employees of the nuclear industry in Oak Ridge, Tennessee**. / Frome EL, Cragle DL, Watkins JP, Wing S, Shy CM, Tankersley WG, West CM.. Radiat Res. 1997 Jul;148(1):64-80.
'An analysis was conducted of 27,982 deaths among 106,020 persons employed at four Federal nuclear plants in Oak Ridge, Tennessee, between 1943 and 1985. The main objectives were to extend the evaluation of the health effects of employment in the nuclear industry in Oak Ridge to include most workers who were omitted from earlier studies, to compare the mortality experience of workers among the facilities, to address methodological problems that occur when individuals employed at more than one facility are included in the analysis, and to conduct dose-response analyses for those individuals with potential exposure to external radiation... Results of the analyses using the adjusted doses suggest that the effect of missing dose ***is an upward bias in dose-response coefficients and test statistics***.'
Takedown of the West Wing at the K-25 Plant in Oak Ridge Is Complete. EM Update, Volume 2, Issue No. 2 • January 29, 2010. - http://www.efcog.org/library/newsletters/

Carbide and Carbon Chemicals Corp. (subsidiary of Union Carbide) K-25 Plant 1945.

Additional buildings involved in the enrichment process were operable by 1956. Along with the plants in Paducah, KY, and Portsmouth, OH, the site was used primarily for the production of highly-enriched uranium for nuclear weapons until 1964. From 1959 to 1969, focus shifted to the production of commercial-grade, low-enriched uranium. In 1985, declining demand for enriched uranium caused the enrichment process to be placed on standby. In 1987, the process was stopped permanently (K-29). The ETTP was also a host for centrifuge facilities constructed as part of a program to develop and demonstrate uranium-enrichment technology. Contractors: URS/CH2M Oak Ridge LLC (2011-present); Bechtel Jacobs (1998–2011); Lockheed Martin Energy Systems, Inc. (1994-1998); Martin Marietta Energy Systems, Inc. (1984-1994); Union Carbide & Carbon Corp. (1943-1984).

•TN **Oak Ridge Plant** (K-27)[501] - The K-27 Building was placed into service in 1945 as the first addition to the K-25 building gaseous diffusion cascade. It consists of nine building units (540 stages in 90 cells) occupying 383,000 ft2 with more than 1.1 million ft2 of total floor area. Although it has less area, K-27 is similar in structure and configuration to the K-25 Building. Both buildings were shut down in 1964.



•TN **Oak Ridge Plant** (K-29)

501 DOE Oak Ridge Environmental Management Program: **The Building K-27 Decontamination and Decommissioning (D&D) Project.** 2011. - 3 pp.

•TN **Oak Ridge Plant** (K-31)[502]

K-311-1 was constructed along with the rest of the K-25 Building in the 1943-1945 time frame. K-311-1 was equipped with Size 3 converters and Size 38 Allis Chalmers single-stage centrifugal compressors.The depleted flow from the bottom stage in K-311-1 passed through booster compressors and flowed to the K-601 Building where the depleted or 'tails' material was removed. In 1948, after the K-27 Building was completed, the decision was made to operate K-27 and K-25 in series rather than operate the two buildings as separate entities. Additional gaseous diffusion capacity was added at Oak Ridge as K-29, K-31, and K-33 were constructed and placed in service in the early 1950s. As a result of the additional process equipment added by these buildings, in-leakage of light gases to the cascade including light gases introduced into the cascade as a result of purging operations threatened to exceed the capacity of the existing K-312 Purge Cascade facilities in the K-25 Building. As a result, in 1954 K-311-1 was converted to a side purge cascade to remove light gases from the process gas stream as the stream entered K-25 from K-27. Low molecular weight gas in-leakage in

502 **Purge Cascade Process Description, Oak Ridge Environmental Management Accelerated Cleanup Project, Oak Ridge, Tennessee** / Shoemaker J.E.. East Tennessee Technology Park (ETTP), Oak Ridge, TN (United States). 2009.- 30 pp.
- http://www.osti.gov/energycitations/product.biblio.jsp?query_id=1&page=0&osti_id=984474
Office of Inspector General audit: R**eport on decontamination and decommissioning at the East Tennessee Technology Park**. 1998. - 15 pp.
- http://www.osti.gov/energycitations/product.biblio.jsp?query_id=1&page=0&osti_id=308004

K-33, K-31, K-29, and K-27 was removed by the K-311-1 Side Purge Facility and a relatively pure stream of UF6 then passed from K-311-1 into the upstream cells in K-25. In-leakage of light gases in the K-25 Building continued to be removed by the K-312 Purge Facilities. K-311-1 operated as a Side Purge Cascade from 1954 until the K-25 Building was shut down in 1964; at that time K-311-1 became the Oak Ridge Gaseous Diffusion Plant (ORGDP) Top (and only) Purge Cascade. The adjacent K-310-3 Unit was operated along with K-311-1 as the top purge cascade and K-310-2 was also operated at times to supplement cells in the K311-1/K-310-3 Purge Cascade. K-311-1 was shut down on February 14, 1977, after the newer, larger capacity K-402-9 Purge Cascade was placed in operation. K-310-3 continued to operate until the K-402-8 Coolant Removal Unit was placed in service, and K-310-3 was shut down on March 14, 1978. Since the K-311-1 and K-310-3 units continued to operate after K-25 shutdown, removal of equipment such as valves and piping for other projects did not occur in this area. As a result, these two units have not been exposed to atmospheric wet air over the years as much of the remainder of K-25 has been exposed. Any deposits or residual gases contained in K-311-1 or K-310-3 are not likely to be fully hydrolyzed.

•TN **Oak Ridge Plant** (K-33)

Source: Gloria Ingleman Collection

•TN **Oak Ridge Hospital**[503] Oak Ridge DOE - 1943-1959 - Originally a US Army Hospital for the Manhattan Project workers, this facility was operated for the AEC by Roane-Anderson Co. In 1959, ownership of the hospital was privatized and its Operation taken over by the Oak Ridge Hospital of the Methodist Church.

503 **The President's Advisory Committee**

In January 1994 President Clinton convened an Advisory Committee to investigate the accusations surrounding the human radiation experiments. In their final report presented to the president on 3 October, 1995, the Committee found that up to the early 1960s it was common for physicians to conduct research on patients without their consent.

The Committee's harshest criticism was reserved for those cases in which physicians used patients without their consent in experiments in which the patients could not possibly benefit medically. These cases included the 18 people injected with plutonium at Oak Ridge Hospital in Tennessee, the University of Rochester in New York, the University of Chicago, and the University of California at San Francisco, as well as two experiments in which seriously ill patients were injected with uranium, six at the University of Rochester and eleven at Massachusetts General Hospital in Boston. The plutonium and uranium experiments undoubtedly put the subjects at increased risk for cancer in ten or twenty years' time.

The Human Radiation Experiments: Final Report of the Advisory Committee on Human Radiation Experiments. Oxford University Press, New York, 1996.

National Security Archive. 1981 **Hearings on the Human Total Body Irradiation Program at Oak Ridge before the Subcommittee on Investigations and Oversight of the House Science and Technology Committee**, 97th Cong., 1st Sess. (Sept. 23, 1981).

The Human Radiation Experiments : How scientists secretly used US citizens as guinea pigs during the Cold War / Alan R Cantwell Jr., M.D. New Dawn No. 68 (September-October 2001.

SEC Petition Evaluation Report Petition SEC-00137 : Oak Ridge Hospital in Oak Ridge, Tennessee/ Lara Hughes. National Institute for Occupational Safety and Health, 2009. - 46 pp.

•TN **Oak Ridge Institute for Science Education** Oak Ridge DOE - 1946-. - Oak Ridge Associated Universities (ORAU) was established in 1946 to manage the Oak Ridge Institute for Nuclear Studies (ORINS). It is a private, not-for-profit consortium of 88 colleges and universities with a mission to provide and develop capabilities critical to the nation's technology infrastructure, particularly in the areas of energy, education, health, and the environment. In 1966, ORINS became known by the name of the operating contractor, ORAU. In the early 1990s, the name was changed to ORISE, the Oak Ridge Institute for Science Education. The South Campus Facility was originally established to study accidental irradiation of cattle during testing of the first atomic bomb near Alamogordo, New Mexico. This facility was also known as the Agricultural Research Laboratory and Farm and then as the Comparative Animal Research Laboratory (CARL). It was operated by the University of Tennessee for the Atomic Energy Commission until it was assigned to ORAU and ORISE in 1981.

•TN **Oak Ridge National Laboratory** [504](X-10) Oak Ridge DOE - 1943-. - During

504 **An Account of Oak Ridge National Laboratory's Thirteen Nuclear Reactors** / Murray W. Rosenthal. Oak Ridge National Laboratory, 2010. - 80 pp.- http://info.ornl.gov/sites/publications/Files/Pub20808.pdf

US. Department of Energy, Office of Environment, **Safety, and Health: Independent Investigation Of The East Tennessee Technology Park**, October 2000.

"Conservative estimates indicated that 35,000 pounds of uranium were released into the air from all sources. 4,300 pounds of uranium a month was unaccounted for or released to the environment. ETTP operates

the Manhattan project, the Oak Ridge National Laboratory (ORNL) site was used by the University of Chicago Metallurgical Laboratory to construct the first pile semiworks - a test plant that would move the plutonium product process from the research stage to large scale production. DuPont began construction of the test pile, the X-10 reactor in March 1943 and was ready for operations by January 1944. A research facility designated as the Clinton Laboratories was built during the war to support X-10 reactor activities and included chemistry, health and engineering divisions. After the war, the laboratory was transformed from a war production facility to a nuclear research center and changed its name to Oak Ridge National Laboratory in 1948. The Laboratory's research role in the development of nuclear weapons decreased over time, but the scope of its work expanded to include production of isotopes, fundamental hazardous and radioactive materials research, environmental research, and radioactive waste disposal. Throughout the course of its operations, the potential for beryllium exposure existed at this site, due to beryllium use, residual contamination, and decontamination activities. Contractors: University of Chicago (1943-1945); Monsanto Chemical (1945-1947); Union Carbide and Carbon Corp. (1948-1984); Martin Marietta Energy Systems (1984-1994); Lockheed Martin Energy Research Corp. (1994-1998); UT Battelle (2000-present).

•TN **Office of Scientific and Technical Information** (OSTI) Oak Ridge DOE 1957-. - OSTI was created to serve as a federal government repository for all technical

an incinerator which handles radioactive, hazardous and uranium-contaminated PCB wastes. ETTP generated transuranic elements (isotopes with atomic numbers greater than uranium) such as neptunium-237 and plutonium-239; fission products such as techneitum-99; PCBs; toxic metals; and volatile organic compunds such as trichloroethene (TCE) and present risk to the public".

DOE National Laboratory restructuring : hearing before the Subcommittee on Basic Research of the Committee on Science, US. House of Representatives, One Hundred Fourth Congress, first session, on H.R. 884 to authorize retirement incentives for certain employees of the national laboratories and H.R. 2301 to designate an enclosed area of the Oak Ridge National Laboratory in Oak Ridge, Tennessee as the "Marilyn Lloyd Environmental, Life and Social Sciences Complex." (1996).

National Institute for Occupational Safety and Health: **Oak Ridge National Laboratory – Site Description**. / Robert E. Burns, Jr., Kenneth Fleming. 2007. - 79 pp.
- http://www.cdc.gov/niosh/ocas/pdfs/tbd/ornl2-r2.pdf

Robinson, George O.: **The Oak Ridge story**; the saga of a people who share in history.
- Kingsport, Tenn., Southern Publishers, 1950. - 222 pp.

reports pertaining to the Department of Energy and its predecessor agencies.

•TN **Nuclear Fuel Services**[505] Unicoi County Erwin DOE - NFS manufactures nuclear fuel for the U.S. Navy's fleet of nuclear-powered aircraft carriers and submarines since the 1960s.

505 U.S. Public Health Service, Agency for Toxic Substances & Disease Registry: **Public Health Assessment for Nuclear Fuel services, Inc. Erwin, Unicoi County, Tennessee**. 2007. - 90 pp. - http://www.atsdr.cdc.gov/hac/pha/nuclearfuelservices/nuclearfuelservicespha052907.pdf

DOE: **Receipt and Processing of TRU Soils from Nuclear Fuel Services (NFS) in Erwin, Tennessee by the Transuranic (TRU) Waste Processing Center (TWPC) on the Oak Ridge Reservation, Tennessee**, 2010. - 2 pp.

'The United States Department of Energy Oak Ridge Office proposed activities include receipt of approximately 316 cubic meters of transuranic (TRU) soils from the Nuclear Fuels Services facility located in Erwin, Tennessee by the TRU Waste Processing Center (TWPC) located on the Oak Ridge Reservation, Tennessee for certification activities in preparation for shipment to Waste Isolation Pilot Plant (WIPP) for final disposal. The TWPC currently prepares wastes stored at the Oak Ridge National Laboratory for offsite disposal at WIPP and Nevada Test Site.'

In recent years it has also processed weapons-grade uranium into nuclear reactor fuel. It operates a 65-acre (260,000 m^2) gated complex in Erwin, Tennessee. NFS is a subsidiary of Babcock & Wilcox Nuclear Operations Group, Inc. (B&W NOG) of Lynchburg, Virginia.

•TN **S-50 Oak Ridge Thermal Diffusion Plant**[506] Oak Ridge DOE - The S-50 Plant at Oak Ridge was constructed in 1944 to enrich uranium feed material for the Y-12 electromagnetic facility using a liquid thermal diffusion process. The process was originally developed at the Naval Research Laboratory in Washington, DC, and tested on a pilot plant level at the Philadelphia Naval Shipyard. Located near the K-25 gaseous diffusion facility, the S-50 Plant operated for a limited period during 1944-

506 **SEC Petition Evaluation Report: Petition SEC-00060** / Christopher J. Miles, Michael pp. Kubiak. 2006. - 15 pp.

1945.

UNION CARBIDE —Y-12 BULLETIN

A Newspaper For Y-12 Employees of Union Carbide Corporation—Nuclear Division

VOL. 19 — NO. 24 OAK RIDGE, TENNESSEE Wednesday, June 16, 1965

6-12612 6-12610 6-12609

UTILITIES ADMINISTRATION serves the entire plant with comfort, convenience and the necessities functional to every job. In the far left is an air compressor. Compressed air, clean and very dry, is used in quantity for such purposes as breathing apparatus, for instrument systems and many controls throughout the plant.

The center photograph shows the Compressed Gas Cylinder filling system, highly automated, providing hundreds of compressed gas cylinders used by Y-12, ORNL and ORGDP. This system provides high pressure gases, such as helium, argon, and nitrogen, in cylinders and tube trailers, but yet incorporating the latest methods and procedures of safety for plant personnel protection. At right, E. B. Cox, service operator, is shown at the control cubicle of one of the many such refrigeration systems that exist in the plant. Between 25,000 and 30,000 tons of refrigeration are utilized for various systems within the plant.

Carbide Sets Plans In South America

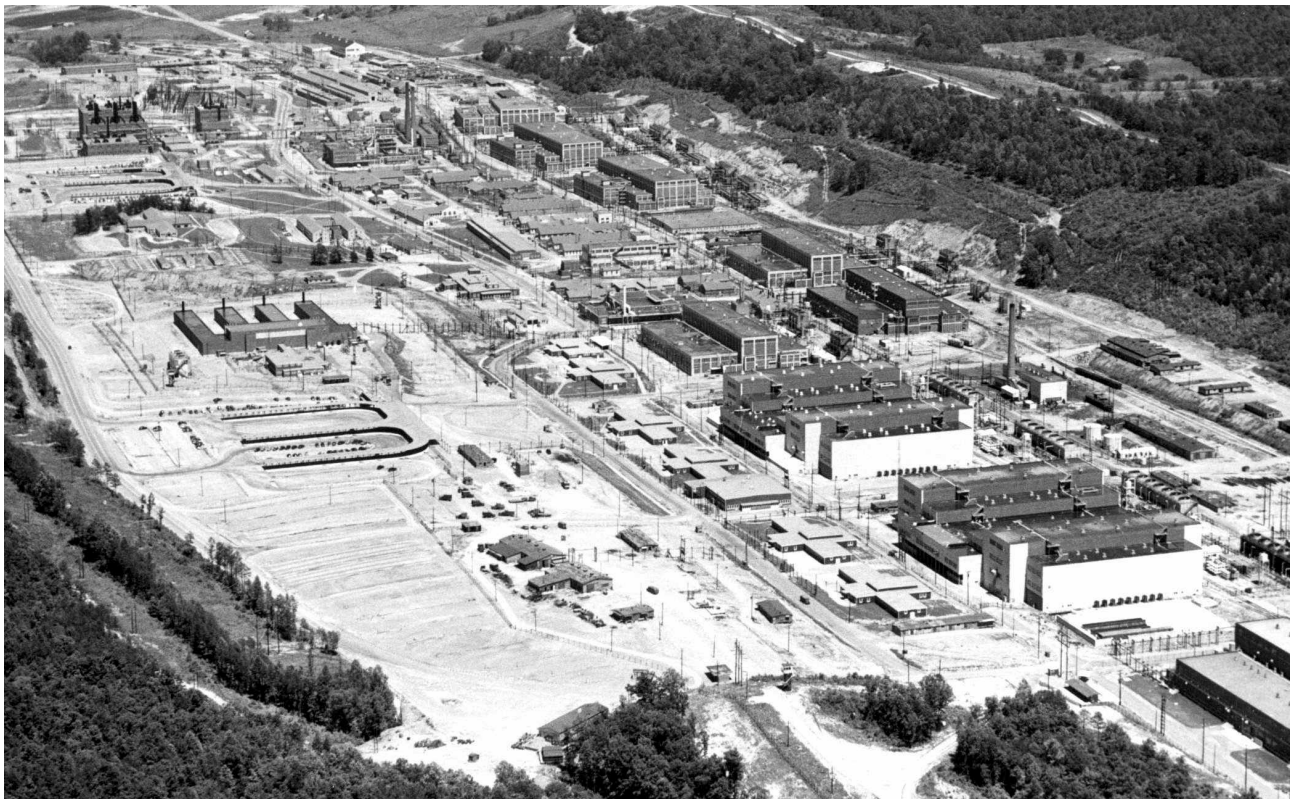
Union Carbide Corporation will

Bob Wilder Graduates In Statistics At UT

Utilities Provides Services For Most Y-12's Comforts, Needs And Conveniences

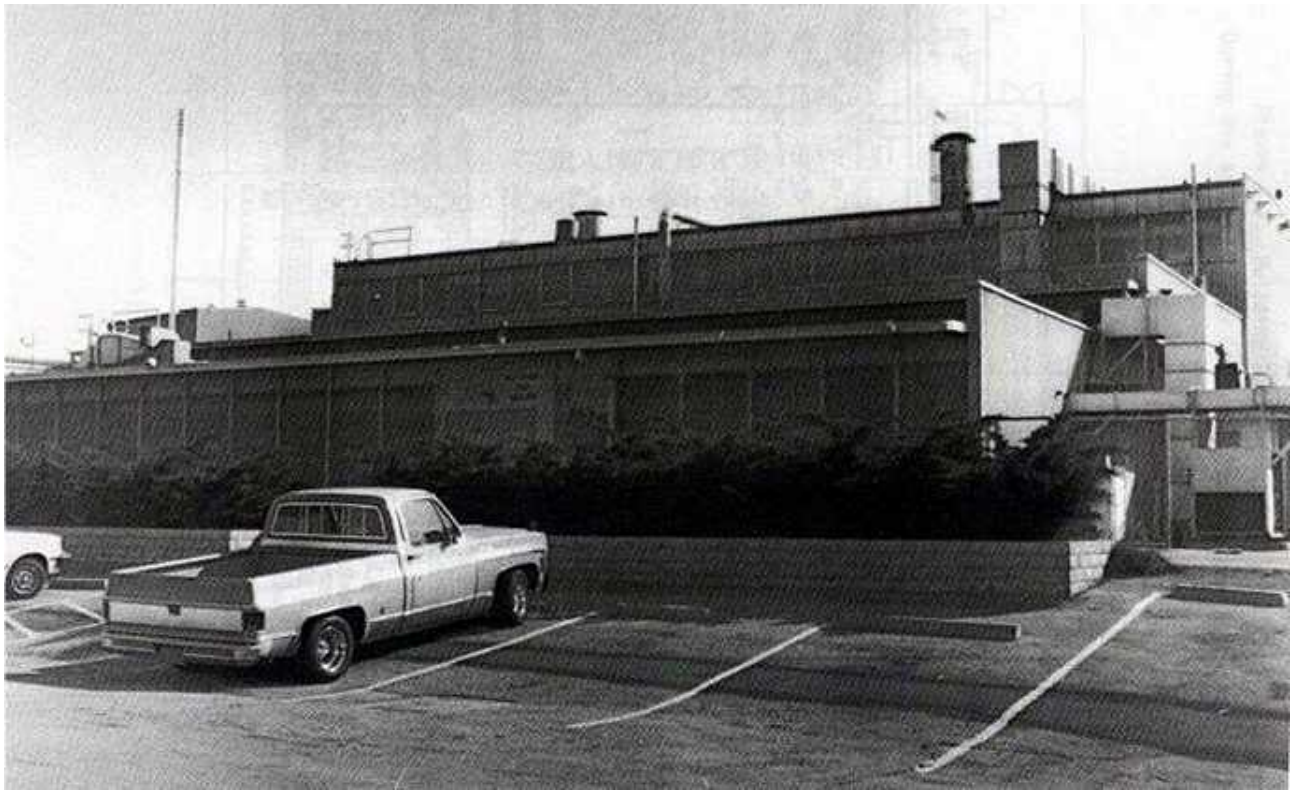
6-12611

The plant was closed in September 1945 because the thermal diffusion process was not as efficient as the gaseous diffusion. The S-50 plant was reopened in 1946 as part of the joint Air Force/AEC project to investigate the possibility of developing a nuclear-powered airplane. This project, known as Nuclear Energy for the Propulsion of Aircraft (NEPA), was housed at S-50 and the contractor was the Fairchild Engine and Aircraft Corporation. Fairchild's NEPA Division at S-50 conducted a number of experiments involving beryllium powder during the time period 1946-1951.



•TN **Tennessee Eastman Company** now **Eastman Chemical Company**, Kingsport AWE - Tennessee Eastman was hired by the Army Corps of Engineers to manage Y-12 during the Manhattan Project. The company operated the plant from 1943 to May 1947.

•TN **Union Carbide Nuclear Corporation**, Division of UCC later **Union Carbide Nuclear Corporation, Nuclear Division** AWE/DOE - Union Carbide developed raw materials and by-products during WW2; resumed butadiene studies to synthesize rubber; acquired the Bakelite Corporation and developed plastics. It began operating Oak Ridge facilities; Linde perfected uranium refining; Electro Metallurgical Company (later Union Carbide's Metals Division) created for wartime metallurgical research and uranium manufacturing; National Carbon (later Carbon Products) developed special carbon products; United States Vanadium (later part of Metals Division) mined uranium and constructed three plants for treating uranium ores; Union Carbide and Carbon research laboratories contributed to atomic weapons research



•TN **Uranium Carbide Fuel Pilot Plant**[507] Oak Ridge 1958-1996
•TN **Vitro Corp. of America** Chattanooga AWE/BE - BE 1959-1965; AWE 1957-1968 - Records indicate that "Vitro Corporation" of Chattanooga, TN performed some beryllium work for Y-12 during the period 1959-1965. A 1962 document also mentions that the AEC met with members of the beryllium industry, including representatives from "Vitro Chemical" (no address), but does not mention whether any contracts were involved in these discussions. The original owner of this site was Heavy Metals Inc. and possessed an AEC license to process uranium and thorium products beginning as early as 1957. Documentation indicates that the company provided price quotes to the AEC for thorium products as early as 1954, but there is no indication that it received a contract for that work. Vitro Chemical of Chattanooga, TN, a subsidiary of Vitro Corporation, took over the site at the end of 1959 and was under contract to the AEC to produce thorium metal, thorium fluoride and thorium oxide. The current owner, W.R. Grace, purchased the site in 1965 and continued operations until 1983, but records do not reveal any weapons-based link after 1968. The State of Tennessee took over licensing of this site in 1968. In 1953 Vitro acquired the Kellex Corporation, a company involved in the development of the nuclear bomb. The same year the company reorganised as the Vitro Corp. of America. One of Vitro's earliest customers was the United States Navy, a relationship which continued into the 1990s. In 1968 Vitro was acquired by Automation Industries Inc and renamed Vitro Engineering Corp. In 1978 Automation Industries and its Vitro subsidiary were acquired by General Cable Corp, which renamed the new company GK Technologies. In 1981 GK Technologies (including Vitro) was acquired by the Penn Central Corporation. Penn Central had emerged from bankruptcy without its failing rail businesses (acquired by

507 DOE: Site Summary – Building 4005. 2005. 5 pp.
- http://www.etec.energy.gov/library/D&D_page/4005_HSA.pdf

Federal government) and diversified into defense and other businesses. By the early 1990s Penn Central had begun to focus on financial services and in 1992 announced it was divesting Vitro. In 1993 Tracor completed its purchased of Vitro for $94 million. The Vitro acquisition almost doubled the size of Tracor. Vitro merged with Tracor Applied Sciences to form Tracor Systems Technologies, Tracor's largest subsidiary. In July 1998 the British electronics conglomerate GEC plc purchased Tracor. In November 1999 GEC merged its defense arm (including Tracor) with British Aerospace to form BAE Systems.

•TN **W. R. Grace**[508] Erwin AWE - 1958-1970 - The Davison Chemical Division of W.R. Grace Co. (later Nuclear Fuel Services)[509] processed unirradiated uranium scrap for the AEC, recovering enriched uranium from it for use in the nuclear weapons complex. Correspondence from 1963 also indicates that the company also worked with thorium, which was associated with their work for the civilian nuclear reactor industry and the naval reactors program.[510]

508 National Institute for Occupational Safety and Health: Technical Basis Document: **An Exposure Matrix for W.R. Grace and Company in Erwin, Tennessee** (Revised September 16, 2011) / Mutty M. Sharfi.
- http://www.cdc.gov/niosh/ocas/pdfs/tbd/wrgrace-r2.pdf

Toxic Nuclear Exposure: Erwin area plant faces contamination lawsuit

Tennessee residents file suit for damages allegedly caused by toxic nuclear exposure, June 13, 2011

PROVIDENCE, R.I. – Erwin, Tenn., area residents have filed a lawsuit alleging they suffered serious injury or property damage because of toxic radioactive substances in the environment from Nuclear Fuel Services (NFS) nuclear materials processing facility.'

- http://www.motleyrice.com/news/view/toxic-nuclear-exposure-erwin-area-plant-faces-contamination-lawsuit

509 **Tenn. Nuclear Fuel Problems Kept Secret** / Duncan Mansfield, the Guardian, London. Monday August 20, 2007.

KNOXVILLE, Tenn. (AP) - A three-year veil of secrecy in the name of national security was used to keep the public in the dark about the handling of highly enriched uranium at a nuclear fuel processing plant - including a leak that could have caused a deadly, uncontrolled nuclear reaction.

The leak turned out to be one of nine violations or test failures since 2005 at privately owned Nuclear Fuel Services Inc., a longtime supplier of fuel to the U.S. Navy's nuclear fleet.

The commission responded by sealing every document related to Nuclear Fuel Services and BWX Technologies in Lynchburg, Va., the only two companies licensed by the agency to manufacture, possess and store highly enriched uranium...Under the policy, all the documents were stamped ``Official Use Only,'' including papers about the policy itself and more than 1,740 documents from the commission's public archive.

510 **Residents file lawsuit against NFS Erwin nuclear fuel plant**

Attorneys from three states filed a class action lawsuit today (June 13) against Erwin's Nuclear Fuel Services, claiming emissions from NFS are to blame for high rates of cancer. The attorneys are fighting for their clients to get compensation for personal injury and property damage.

"No one wants to face the truth here and the truth is, I have highly enriched uranium on my property and I am 21 river miles downstream," says Park Overall who's one of the main advocates of the lawsuit against Nuclear Fuel Services. "I began to hear about all this cancer here, and we started to look into it. These chemicals and radioactive isotopes are related to particular cancers that we have too much of in the area." Overall says Monday's filing of the class action lawsuit is the biggest step so far for the Erwin Citizens Awareness Network (ECAN). ECAN is a group that's researched NFS's emissions dating back to 1954. (Tricities June 13, 2011)

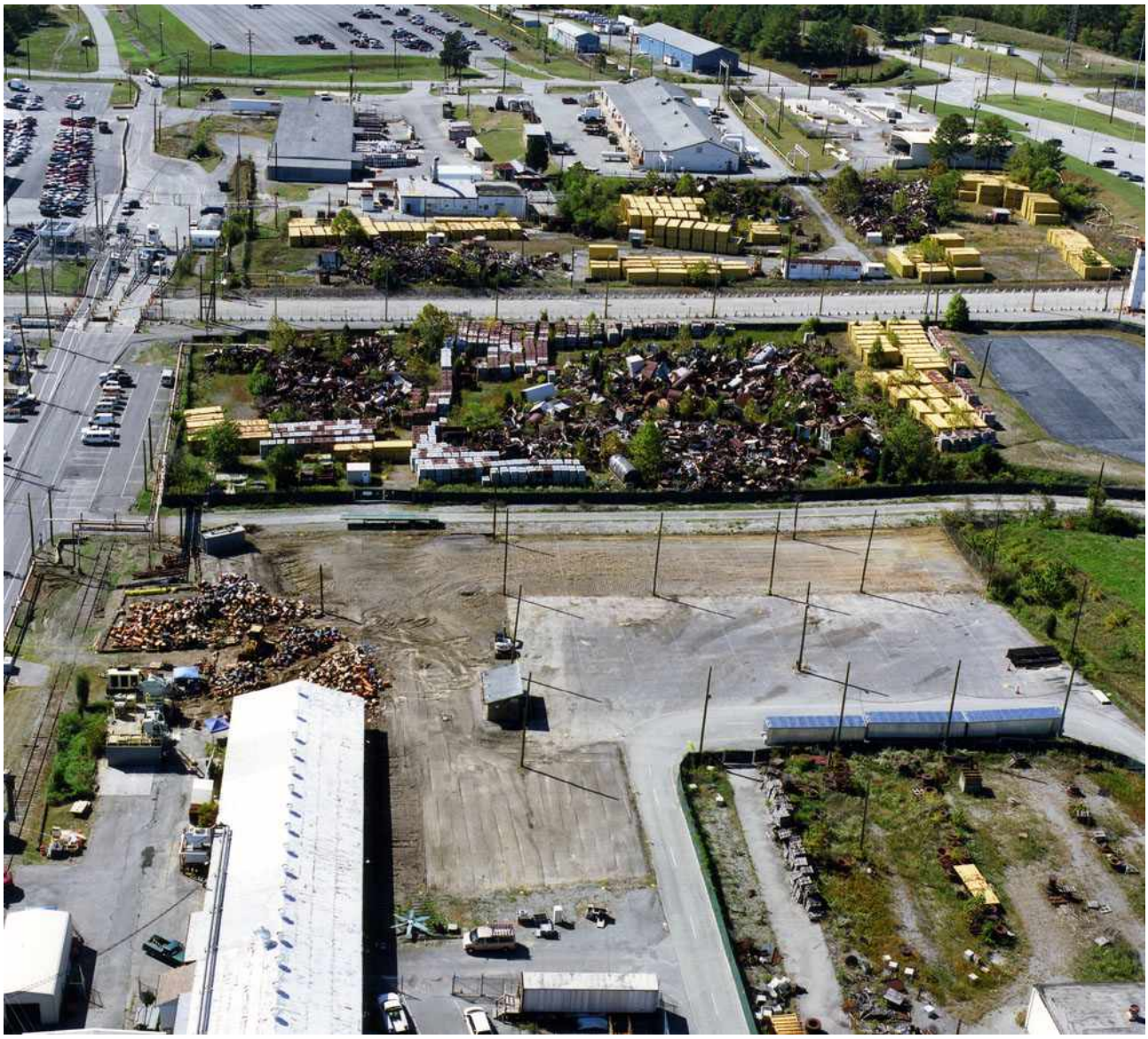
Adkins, et al. v. W.R. Grace & Company, No. 2:11-CV-00173 (E.D. Tenn.)

•TN **Watts Bar Nuclear Generating Station**[511] Spring City DOE – 1973-. - The Watts Bar Nuclear Generating Station is a Tennessee Valley Authority (TVA) nuclear reactor used for electric power generation and tritium production for nuclear weapons.

511 **Final Supplemental Environmental Impact Statement June 2007**: Completion and Operation of Watts Bar Nuclear Plant Unit 2.Rhea County, Tennessee. Tennessee Valley Authority, 2007. - 176 pp.

•TN **Y-12 Plant**[512] Oak Ridge DOE - 1942-. - Built in a rural section of East Tennessee, the Y-12 National Security Complex, previously known as the Oak Ridge Y-12 Plant, was part of the Manhattan Project. Its job was to process uranium for the first atomic bomb. Construction of Y-12 started in February 1943; enriched uranium production started in November of the same year. Construction, however, was not entirely finished until 1945.The first site mission was the separation of uranium-235 from natural uranium by the electromagnetic separation process. The magnetic separators were taken out of commission at the end of 1946 when gaseous diffusion became the accepted process for enriching uranium. Since World War II, the number of buildings at Y-12 has doubled. Its missions have included uranium enrichment, lithium enrichment, isotope separation and component fabrication. For more than 50 years, Y-12 has been one of the DOE weapons complex's premier manufacturing facilities. Every weapon in the stockpile has some components manufactured at the Y-12 National Security Complex. Contractors: BWXT (2000-present); Lockheed Martin Energy Systems (1994-2000); Martin Marietta Energy Systems (1984-1994); Union Carbide & Carbon Corp. (1947-1984); Tennessee Eastman Corp. (TEC) (1943-1947).

512 **Evaluation of Iodine-131 Releases from the Oak Ridge Reservation Public Health Assessment** / Prepared by: Site and Radiological Assessment Branch. Division of Health Assessment and Consultation. Agency for Toxic Substances and Disease Registry, 2008. - 123 pp. 'Due to a lack of information, ATSDR cannot determine whether people living off site could have been harmed from breathing elemental mercury from 1950 through 1963, swallowing water with inorganic mercury from East Fork Poplar Creek from 1953 to 1955, and eating fish with organic mercury during the 1950s and 1960s.'



•TN **Y-12 Plant Scrap Yard**[513] Oak Ridge DOE - There are reportedly about 1,000 containers of scrap, as well as large piles of contaminated materials that ultimately will be shipped to the Nevada Test Site or disposed at the CERCLA landfill a couple of miles from Y-12. The scrapyard was used for storage of materials from the 1970s until the mid-1990s.

513 **Cleanup of Y-12's Old Scrap Yard**. / Posted by Frank Munger on May 22, 2009.
- http://blogs.knoxnews.com/munger/2009/05/cleanup-of-y-12s-old-scrap-yar.html

•TX[514] **Air Force Plant #4 (General Dynamics) Texas**[515] Fort Worth, Tarrant County AWE - AFP4 has been in continuous operation producing aircraft since 1942. Over the years the plant has produced B-36 Peacemaker, B-58, F-111, and F-16 aircraft. General Dynamics (GD) operated the facility from 1953 until 1993 when Lockheed Martin took over the operation. Currently, Lockheed Martin is engaged in the production of the F-16 Fighting Falcon and other advanced tactical fighters. In the past, a Nuclear Aerospace Research Facility (NARF) involved in the experimental development of nuclear aircraft was located at AFP4. In 1974, this facility was demolished and the debris was removed and disposed of off site.

•TX **AMCOT**[516] Fort Worth[517], [518] AWE - 1961-1962 - The American Manufacturing Company of Texas (AMCOT) conducted specialized tube elongation and billet piercing

514 Texas Environmental Almanac, **Environmental Focus: Military Toxic Sites in Texas**.
- http://www.texascenter.org/almanac/MILITARYTOXIC.HTML

515 **Air Force Plant 4 Fort Worth, Texas: Administrative Record Index**. U.S. Department of the Air Force. Aeronautical Systems Center, Wright-Patterson AFB, Ohio, 2007. - 23 pp.
- http://www.wpafb.af.mil/shared/media/document/AFD-070815-027.pdf

516 **Formal Elimination Report for The Former American Manufacturing Company of Texas (AMCOT) in Fort Worth, Texas**. US. Department of Energy. Office of Environmental Restoration, undated. - 5 pp.

517 **High-Level Worries** : Environmentalists from Sustainable Energy and Economic Development Coalition are still fighting a dump that could bring in much more nuclear waste than originally thought / / Betty Brink. Fort Worth Weekly. Wednesday, 22 December 2010.

Radiological Survey of the former American Manufacturing Company of Texas, Fort Worth, Texas / W. C. Adams and J. R. Morton. Environmental Survey and Site Assessment Program. Energy/Environment Systems Division. Oak Ridge Institute for Science and Education. Oak Ridge, TN, 1995. - 56 pp.

518 **Air Force Plant 4. Fort Worth, Texas. Administrative Record Index**. Prepared and Maintained by: U.S. Department of the Air Force. Aeronautical Systems Center. Wright-Patterson AFB, Ohio. 2007. - 23 pp..

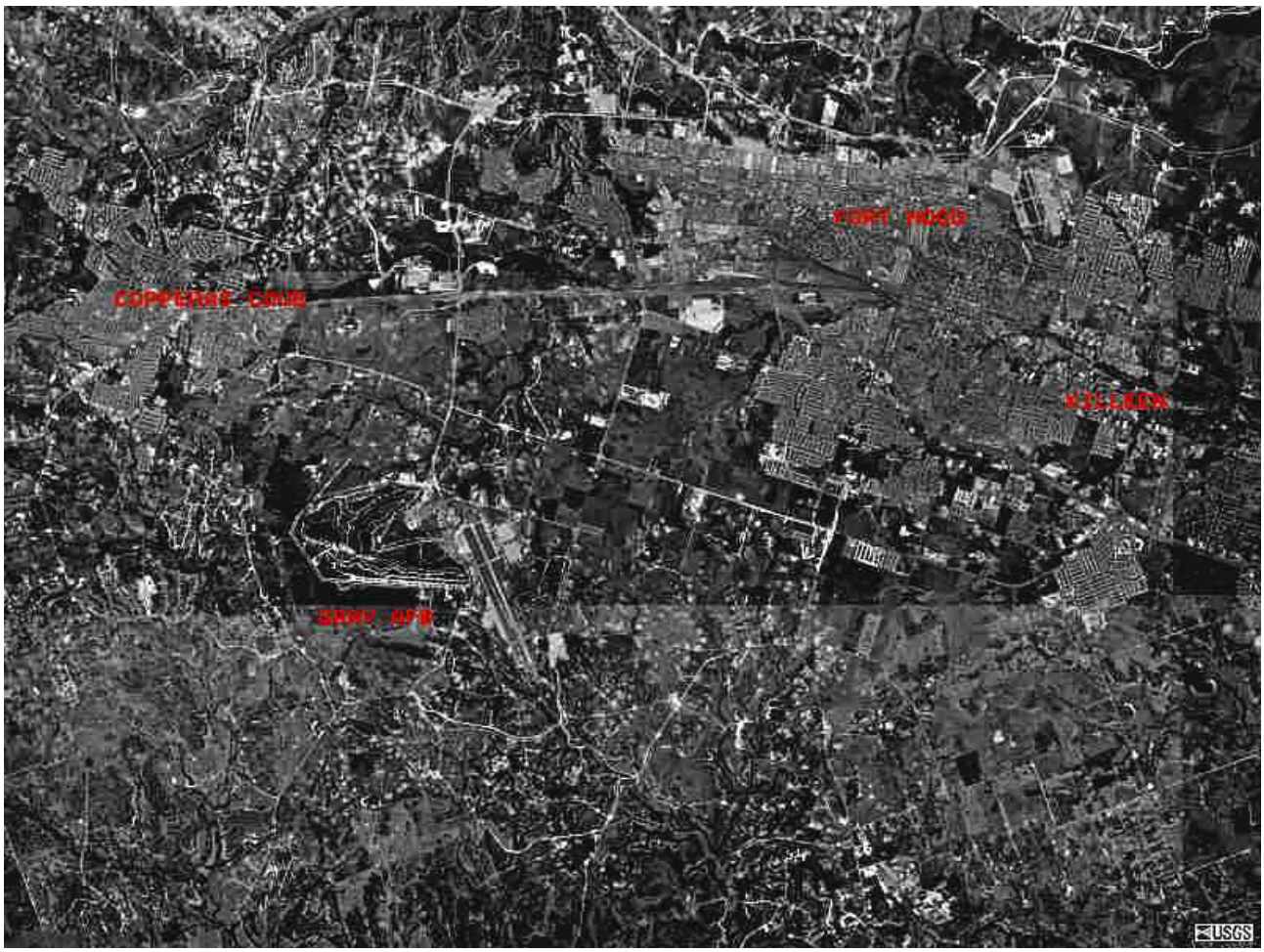
tests on uranium metal for National Lead Company of Ohio (Fernald). The tube elongation tests were conducted from July to September 1961 and involved approximately 7 tons of uranium. The billet piercing tests were conducted from June to September 1962 and involved approximately 23 tons of uranium.

•TX **Bossier Base**, Barksdale AFB[519] AWE - National Nuclear Weapons Stockpile Site. On November 1, 1949, Barksdale was reassigned to Strategic Air Command (SAC), and became home of Headquarters Second Air Force. The Bossier Base, now The East Reservation was formerly a Defense Atomic Support Agency.

519 **Ammunition and Explosives Storage for the Navy (1939-1989) and the Air Force (1946-1989)**, 2008. - 200 pp. - http://www.denix.osd.mil/cr/upload/af-navy-ammunition-storage-public-rfs_pg1-200_rev.pdf

•TX **Ft Hood, Killeen Base**[520] AWE - National Nuclear Weapons Stockpile Site. During the beginning of the cold war, Killeen Base was one of the Air Force's storage-and-assembly bases for nuclear weapons.

520 **Ammunition and Explosives Storage for the Navy (1939-1989) and the Air Force (1946-1989)**, 2008. - 200 pp. - http://www.denix.osd.mil/cr/upload/af-navy-ammunition-storage-public-rfs_pg1-200_rev.pdf



Gray Air Force Base near the AEC's Killeen Base (Site Baker), one of three National Stockpile Sites where nuclear weapons were stored at the time. Routine maintenance and assembly of nuclear weapons produced small quantities of contaminated wastes. These wastes were placed in lead-lined cylinders and stored in underground tubes.

• TX **General Medical and Radioisotope Research Laboratories** Houston 1952-.

•TX **Mathieson Chemical Co.**[521] Pasadena DOE - Olin Industries and Mathieson Chemical Company, which extracted uranium oxides,[522] merged in 1954 to form the Olin Mathieson Chemical Corporation, which, upon the death of Mr. Mathieson, dropped "Mathieson" and adopted the name Olin Corporation in 1969. Later The United Nuclear Corporation was formed in March 1961 as a joint venture between three existing companies: Olin Mathieson Chemical Corporation, Mallinckrodt Corporation of America, and Nuclear Development Corporation of America.

521 DOE: **FUSRAP Elimination Report for Mobil Mining and Minerals Company (The Former Mathieson Chemical Company) Pasadena, Texas.** Circa 1985. - 35 pp.

522 **New Evidence**. - http://www.cdc.gov/niosh/ocas/pdfs/sec/mathieson/mathccpetg-183.pdf

•TX **Medina Base**[523] San Antonio AWE - National Nuclear Weapons Stockpile Site -

523 National Institute for Occupational Safety and Health: **Site Profile for Clarksville Base Weapons Storage Area and Modification Center with Supplementary Guidance for Medina Base** / Ronald J. McConn, Jr., Eva Eckert Hickey, Richard J. Traub, Jerome B. Martin, and Donald E. Bihl, 2006. - 69 pp. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/clarkmed-r0.pdf

November 13, 1963, Atomic Energy Commission Storage Igloo, Medina Base, San Antonio, Texas

While three employees were dismantling the high explosive (HE) components of a nuclear bomb, they began burning spontaneously, triggering a large blast involving 120 pounds of HE. The explosion caused little contamination. **US Nuclear Weapons Accidents** : Selected Accidents Involving Nuclear Weapons -1950-1993/ Jaya Tiwari and Cleve J. Gray. Greenpeace.

- http://www.cdi.org/issues/nukeaccidents/accidents.htm

Ammunition and Explosives Storage for the Navy (1939-1989) and the Air Force (1946-1989), 2008. - 200 pp. - http://www.denix.osd.mil/cr/upload/af-navy-ammunition-storage-public-rfs_pg1-200_rev.pdf

Medina Base, also known as the Medina Annex, at Lackland AFB in San Antonio Texas was initially a National Stockpile Site (NSS) constructed between 1953 and 1955. Texas hosted two of the original National Stockpile Sites (NSS). Killeen Base ("Site B") at Fort Hood, Texas, was the first of the initial three (with Manzano Base and Clarksville Base) to receive weapons, in 1948. The second NSS was Medina Base at Lackland AFB, San Antonio. The original storage area was constructed between 1953 and 1955. In 1959, the AEC built a Modification Center at Medina Base for disassembling weapons and storage operations for the military ceased. Lackland AFB is part of Joint Base San Antonio, an amalgamation of the United States Army Fort Sam Houston, the United States Air Force Randolph Air Force Base and Lackland Air Force Base, which were merged on 1 October 2010.

•TX **Medina Facility** San Antonio DOE - 1958-1966 - The Medina Modification Center was established in 1958 for component testing, modification, repairs, and refinements. It operated until the early spring of 1966, at which point its functions were transferred to Burlington and Pantex. Contractor: Mason & Hanger-Silas Mason (1958-1966).

•TX **Pantex Plant**[524] Amarillo DOE

524 **Programmatic agreement among the US. Department of Energy/National Nuclear Security Administration/ Pantex site office, the Texas state historic preservation office, and the Advisory Council on Historic Preservation authorizing the Pantex plant. cultural resource management plan**. US. Department of Energy, National Nuclear Security Administration, Pantex Site Office. April 2004 - 74 pp.

National Institute for Occupational Safety and Health: **Pantex Plant Site Profile Review** / Prepared by pp. Cohen & Associates. 2008. - 136 pp.

Nebraska Firm Wins $65 Milllion Contract To Build Explosive Press At Pantex Nuclear Weapons Plant

•TX **Red River Army Depot**[525] AWE- including the Lone Star Army Ammunition Plant, Texarkana, Bowie County, TX Hawk, Chaparral and Patriot missiles site.Letterkenny Army Depot took over some of RRAD's missile systems.

•TX **Sutton, Steele and Steele Co.**[526] Dallas AWE - 1951; 1959 - In 1951, AEC and AEC contractor personnel conducted tests at Sutton, Steele, and Steele, Inc. which were aimed at devising means of recovering uranium from low grade wastes and residues. The tests were to determine the feasibility of separating fused dolomite from magnesium floride slag and uranium. In 1959, National Lead of Ohio (Fernald) personnel evaluated Sutton, Steele, and Steele's dry tabling equipment for the separation of normal uranium shot.

•TX **Texas City Chemicals, Inc.**[527] Texas City DOE - 1953-1955 - Texas City Chemicals produced uranium by recovery of U_3O_8 (triuranium octoxide) from a phosphate fertilizer production plant. The AEC contracted with Texas City Chemicals for the recovery of uranium which was ultimately used in weapons production. The TCC plant encountered numerous problems during start-up of the fertilizer plant, and

/ TexasBusiness.com Posted: Tuesday, May 24, 2011 12:03 am
'**Kiewit Building Group Inc.**, Omaha, Nebraska received a $65,180,000 firm-fixed-price, award-fee contract. The award will provide for the construction of a high-explosive pressing facility, Pantex Plant, Amarillo.'

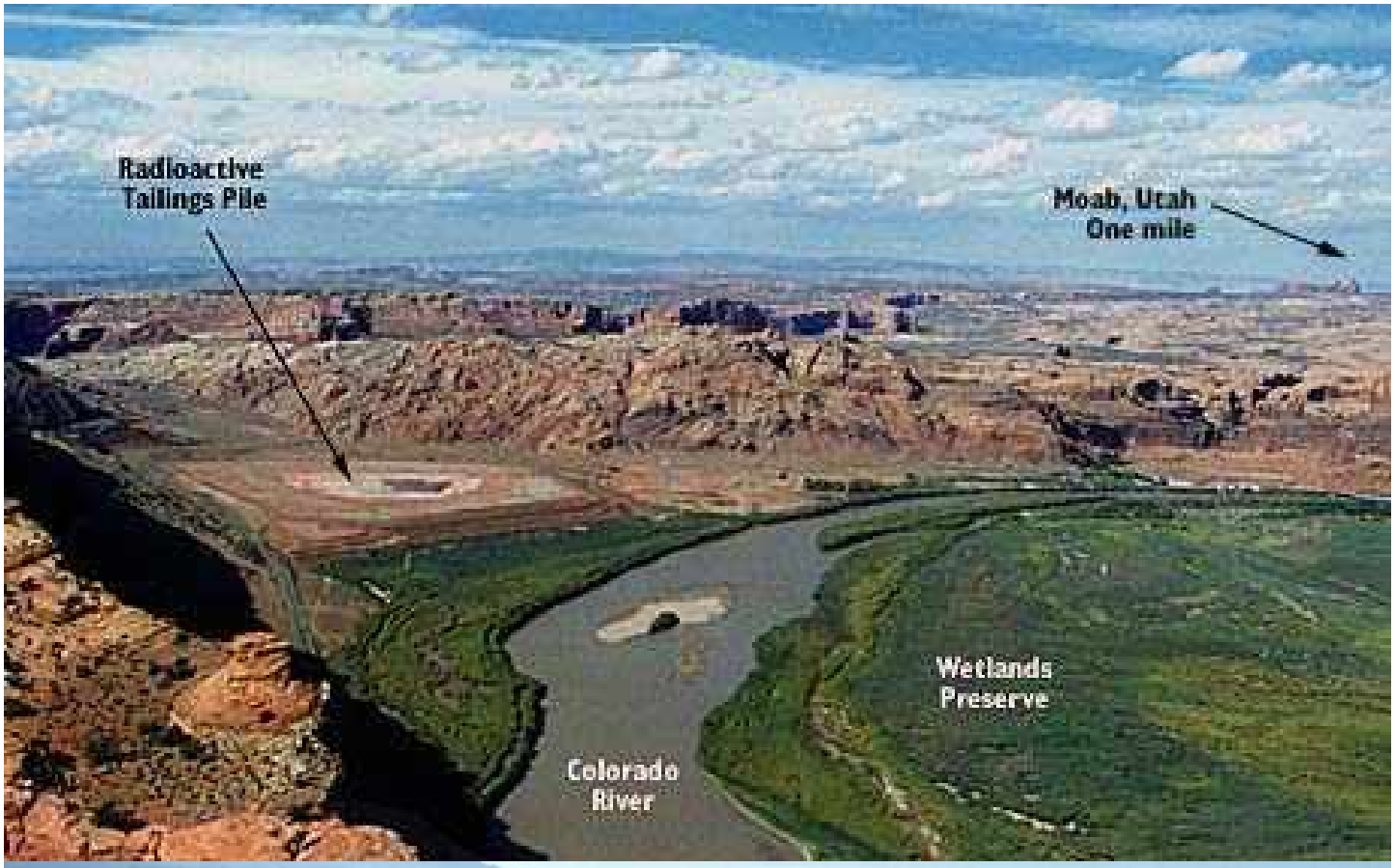
525 **Red River Army Depot, Texas (Army Recommendation**). United States Army. 2010. - 2 pp
- http://www.hqda.army.mil/acsim/brac/StateInstallationBreakdown/TXRedRiverAD.pdf

526 DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; December 23, 1993. - 1 p.
- http://www.lm.doe.gov/Considered_Sites/Sutton_Steele_and_Steele_Co_-_TX_09.aspx
'In each case, the potential for radiological contamination above applicable guidelines is small. In each case the amounts of radioactive materials handled was small. Based on these considerations, these sites are hereby eliminated from further consideration under the Formerly Utilized Sites Remedial Action Program.'

527 DOE: **Preliminary Survey of Texas City Chemicals, Inc**. (Borden Chemical Division of Borden, Inc.). Texas City, Texas. Health and Safety Research Division. Oak Ridge National Laboratory. Oak Ridge, Tennessee, 1980. - 9 pp.

SEC Petition Evaluation Report Petition SEC-00088: Texas City Chemicals, Inc. / Thomas P. Tomes. National Institute for Occupational Safety and Health, 2010. - 64 pp.

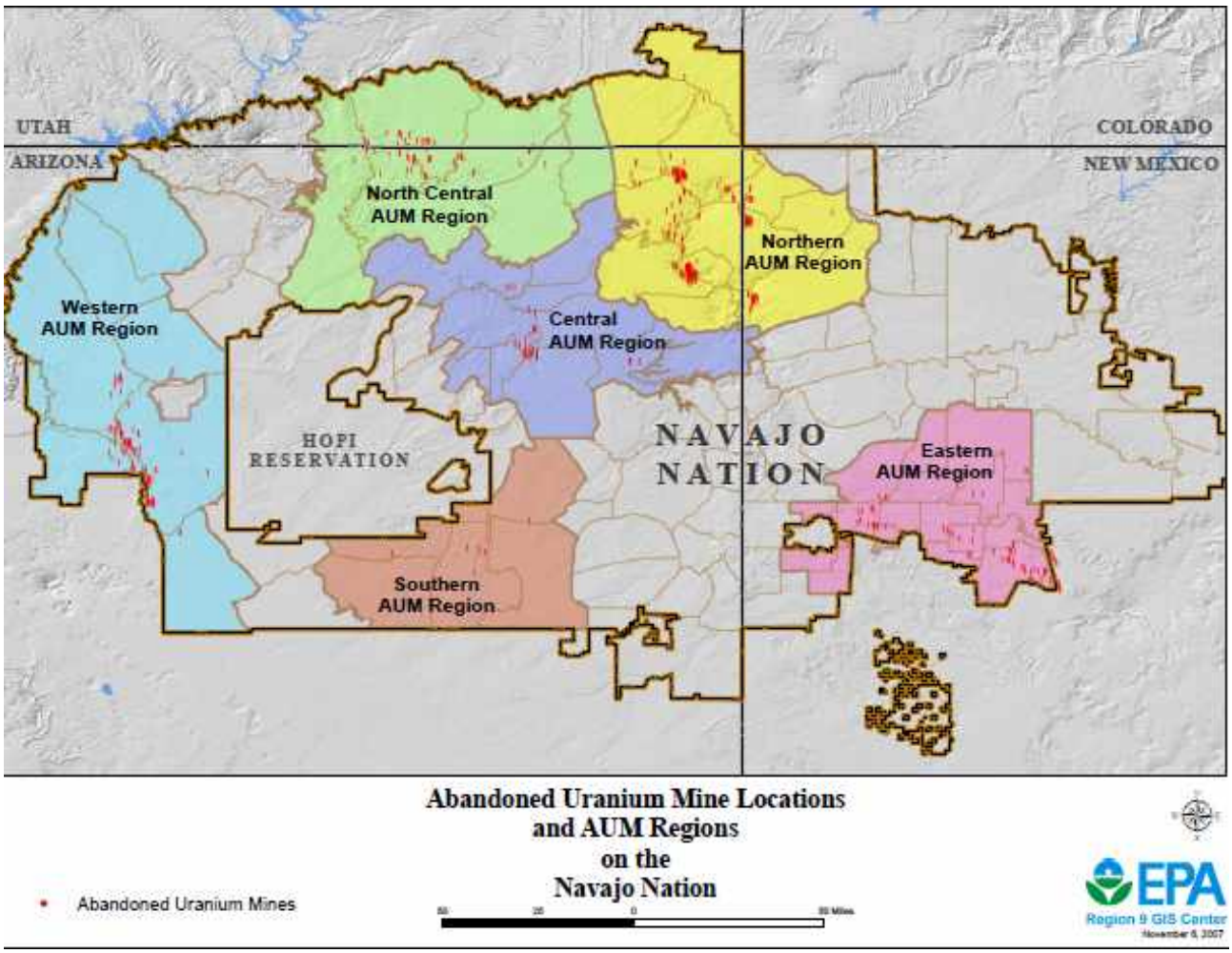
it produced a small amount of uranium for the AEC in the first few months of Operation; full-scale uranium production was never realized due to problems with the fertilizer plant. TCC was operating at a loss and it ceased operations and filed for bankruptcy in US. District Court sometime in 1956. The court allowed the Smith-Douglas Corporation to acquire and reorganize TCC and reopen the plant later that year. Smith-Douglas did not pursue uranium work with the AEC.



• UT **Atlas Mill**[528], Moab DOE

• UT **Mexican Hat Mill Site**[529] San Juan County, Utah DOE -1957-1963

528 **Uranium mining left a legacy of death** / Jerry D. Spangler and Donna Kemp Spangler. Deseret News, Tuesday, Feb. 13, 2001. 'Engineers say cleaning up the mill tailings at a single site, the defunct Atlas mill on the banks of the Colorado River just outside of Moab, could cost $300 million.'
Atlas Mill Reclamation Task Force. **Decommissioning of Moab, Utah, Uranium Mill Tailings**.
- http://www.wise-uranium.org/udmoa.html
529 DOE: **Long-Term Surveillance Plan for the Mexican Hat, Utah** (UMTRCA Title I), Disposal Site San Juan County, Utah. October 2007. - 59 pp.



- The former Mexican Hat uranium mill site is located on Navajo Nation[530] land 1.5 miles is northeast of the town of Halchita. The mill at the Mexican Hat Processing Site was constructed and operated from 1957 to 1963 by Texas-Zinc Minerals Corporation. Atlas Corporation purchased the mill in 1963, and operated it until it was closed in 1965. The mill was built on land leased from the Navajo Nation; control of the site reverted to the Navajo Nation after the Atlas Corporation lease expired in 1970. The former Mexican Hat Processing Site covered 235 acres. Much of the uranium ore processed at the Mexican Hat site came from the White Canyon area of Utah and contained a considerable amount of copper sulfide and other sulfide minerals. The ore was ground and treated by froth flotation. The flotation concentrates and tailings were acid

530 **Health and Environmental Impacts of Uranium Contamination in the Navajo Nation Five-Year Plan as requested by House Committee on Oversight and Government Reform.** June 9, 2008. - 46 pp.

The Navajo Uranium Mining Experience, 2003-1952 (listed chronologically from most recent to oldest) / Compiled by Chris Shuey, MPH Southwest Research and Information Center. Revised December 11, 2003 - http://www.sric.org/uranium/navajorirf.html

Abandoned Uranium Mines Project Arizona, New Mexico, Utah - Navajo Lands - 1994 - 2000: Project Atlas. U.S. Army Corps of Engineers Los Angeles District, U.S. Environmental Protection Agency, Region 9 Superfund Records Center, 2000.

Annual evaluation report on the Navajo Nation abandoned mined lands reclamation program, 1998-2010.

An Aerial Radiological Survey of Abandoned Uranium Mines in the Navajo Nation: Overview of Acquisition and Processing Methods Used for Aerial Measurements of Radiation Data for the U.S. Environmental Protection Agency Survey conducted in Arizona, New Mexico, Utah. / Thane J. Hendricks. Bechtel Nevada, Las Vegas, Nevada, 2001. - 31 pp. - https://www.hsdl.org/?view&did=453708

leached separately to recover both copper and uranium products. During its operation, the mill processed 2.2 million tons of ore and produced 5,700 tons of uranium concentrate. In addition to the milling operation, a sulfuric acid manufacturing plant operated at the site until 1970.

Source: The Center for Land Use Interpretation's Land Use Database

At the time of the remedial action, the concrete pad for the mill building and several associated buildings and structures (e.g., scale house, office building, and tanks) remained.

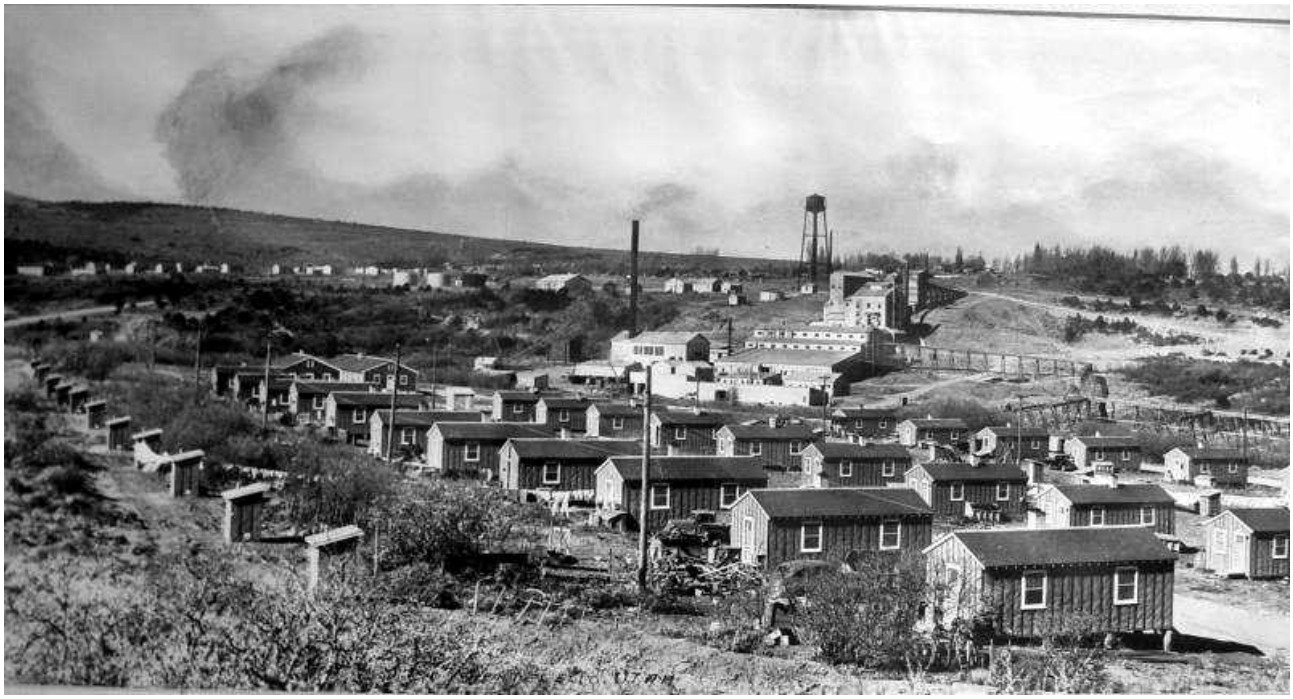
•UT **The Mill at Moab** Moab DOE 2001-. - The Moab[531] site is located about 3 miles northwest of the city of Moab in Grand County, Utah. The former mill site encompasses approximately 435 acres, of which about 130 acres is covered by the mill tailings pile. Through donation in 2011 of the adjacent private property to the south, the DOE property now consists of almost 500 acres. Other federally owned land now borders the site on the south. Sandstone cliffs border the site on the north and southwest. Under the National Defense Authorization Act for Fiscal Year 2001, Congress authorized the US. Department of Energy (DOE) to manage and reclaim the former uranium-ore processing site near Moab, Utah, under Title I of the Uranium Mill Tailings Radiation Control Act. DOE assumed ownership of the facility, now known as the Moab Project, on October 25, 2001. The US. Department of Energy has started a project to move 16 million tons of uranium tailings from the banks of the Colorado River, near the city of Moab, to a permanent disposal site 30 miles north, near the town of Crescent Junction.

531 **Geology of the Moab Region (Arches, Dead Horse Point and Canyonlands)** / Annabelle Foos. Geology Department, University of Akron. 1999. - 27 pp.
- http://www.nature.nps.gov/geology/education/foos/moab.pdf

Geology and Ore Deposits of the White Canyon Area San Juan and Garfield Counties, Utah / Robert E. Thaden, Albert F. Trites, JR., and Tommy I. Finnell. Geological Survey Bulletin 1125 Prepared on behalf of the U. S. Atomic Energy Commission. United States Department of the Interior, 1964. - 175 pp

Crescent Junction

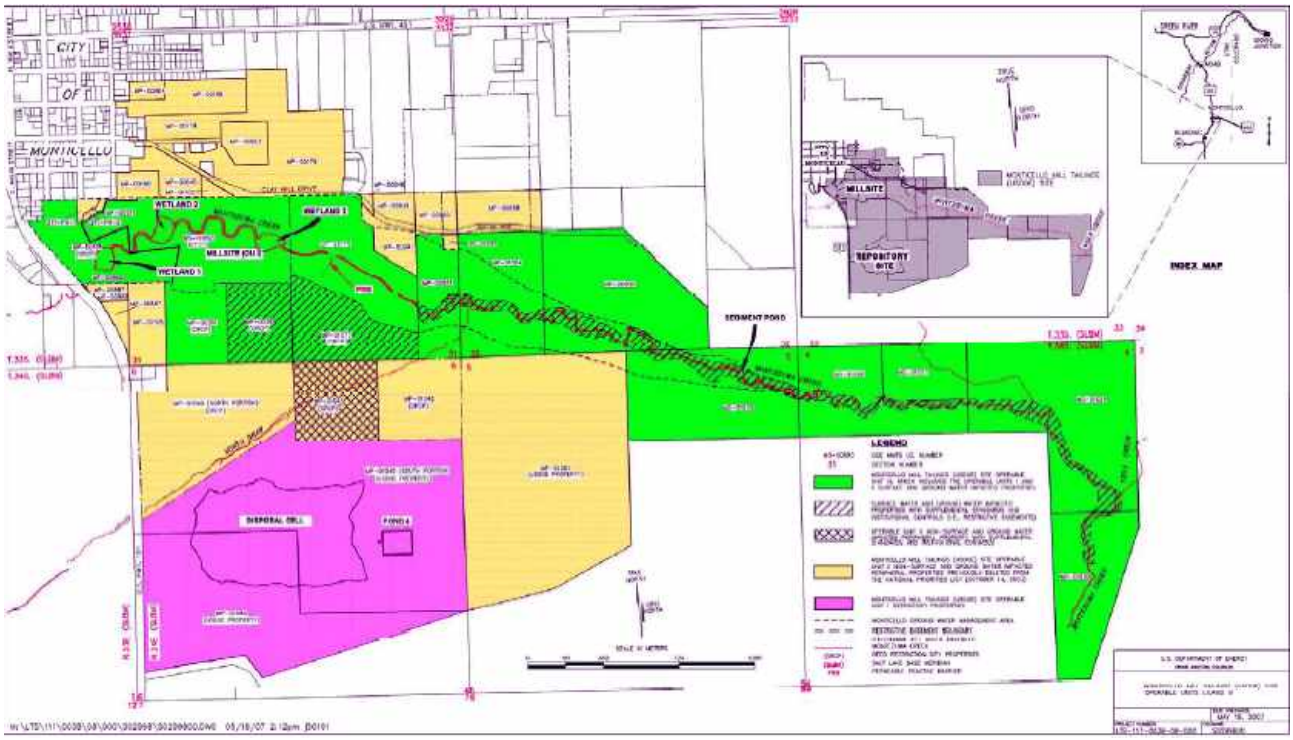
This project is called the Moab Uranium Mill Tailings Remedial Action (UMTRA) Project. DOE has established a newsletter called "Tailings Times" to keep the public informed of their ongoing activities at the Moab Site.



Source: ABC 4 News

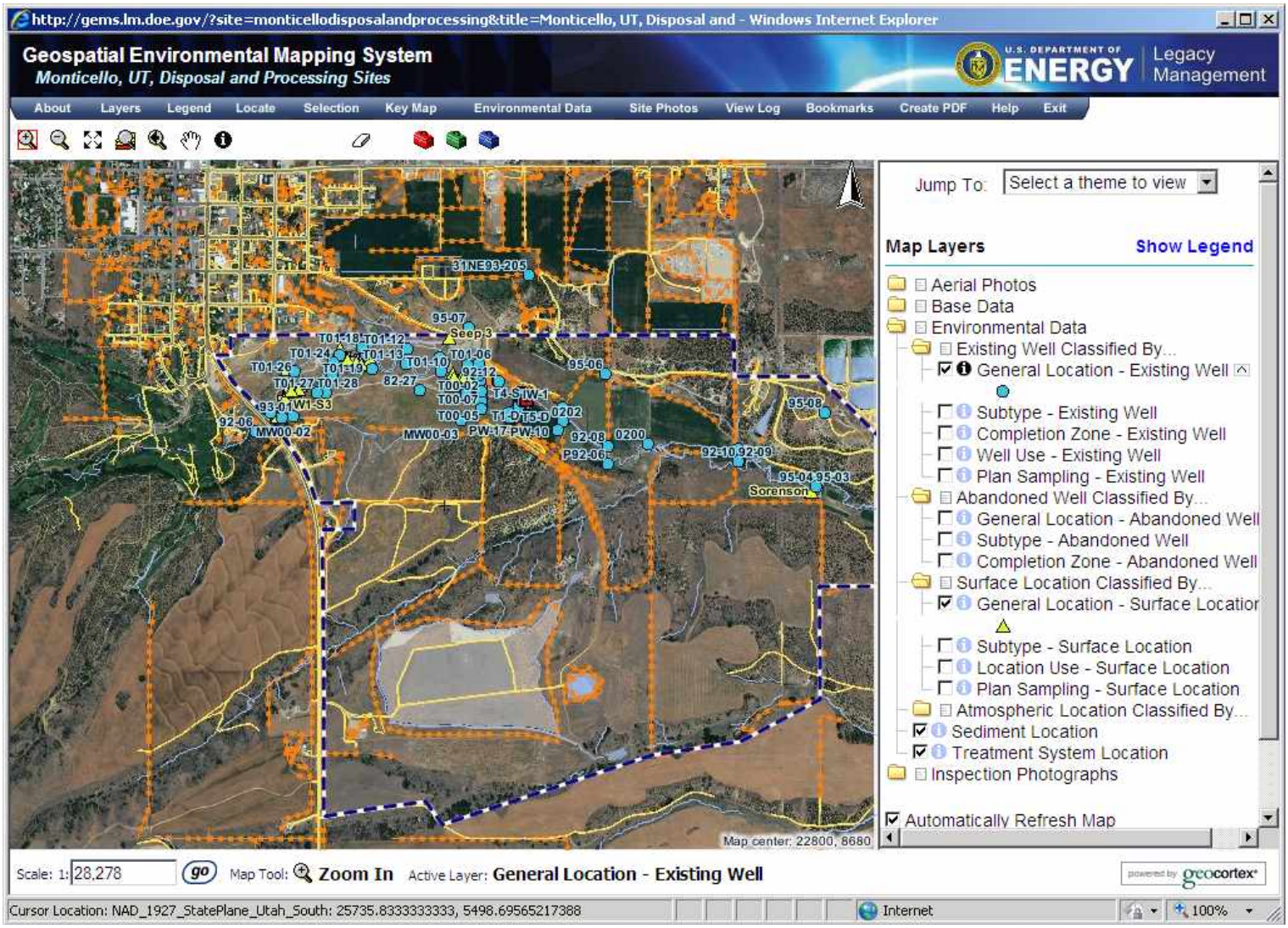
Currently, S.M. Stoller Corporation, under its prime contract with DOE, and its teaming partner MFG. Contractors: MACTEC-ERS (October 31, 2001, to July 2002);

S.M. Stoller, MFG Corporation, and Battelle. (July, 2002 – present).



•UT **Monticello Mill Tailings Site**[532] Monticello DOE - The Monticello Mill Tailings site, a former U.S. Department of Energy (DOE) processing facility, lies in the Montezuma Creek Valley, east of the Abajo Mountains in southeastern Utah. The former mill site, on 78 acres of land, is bordered by the City of Monticello.

532 **Third Five-Year Review Report for Monticello Mill Tailings (USDOE) Site, City of Monticello, San Juan County, Utah**. 2007. - 61 pp. - http://www.epa.gov/superfund/sites/fiveyear/f2007080001837.pdf

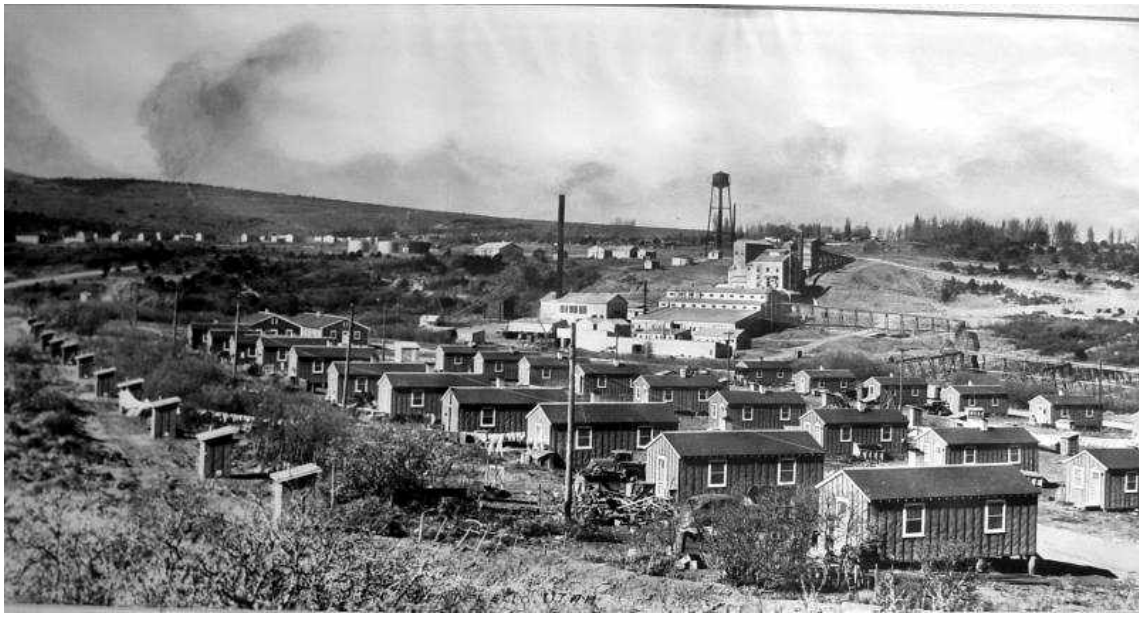


In 1942, the Defense Plant Corporation, a part of the Reconstruction Finance Corporation,[533] which included the Metals Reserve Company, Rubber Reserve Company, Defense Supplies Corporation, War Damage Corporation, U.S. Commercial Company, Rubber Development Corporation, Petroleum Reserve Corporation, constructed the Monticello mill at a former uranium and vanadium ore-buying station, which had been constructed in 1940.

533 The Reconstruction Finance Corporation was established, August 22, 1940, to finance and supervise construction and equipping of industrial facilities operated, for the most part, by private concerns sponsored by federal agencies administering defense and war programs. Dissolved, July 1, 1945. Functions, assets, and liabilities were merged with the RFC. The RFC Office of Defense Plants was established to liquidate DPC assets.'

National Archives: **Records of the Reconstruction Finance Corporation [RFC]: (Record Group 234) 1928-68**. - http://www.archives.gov/research/guide-fed-records/groups/234.html

Alfred Schindler Papers : Dates: 1934-1955.: Under Secretary of Commerce, 1945-1946. The Harry S. Truman Library and Museum. - http://www.trumanlibrary.org/hstpaper/schindlera.htm



Construction of the Monticello plant, in addition to the mill proper, included the development of an adequate water supply, installation of a power plant, and construction of two large housing projects for workers. The staff town site, on the hill opposite the mill to the south, consisted of a staff house for 12 men, a manager's house, and 14 four-room family dwellings. The other housing project consisted of 32 two-room family houses and a bunkhouse and boardinghouse for 32 men.
The purpose of the mill was to produce vanadium and uranium for military purposes.

•UT **Uranium Mill in Monticello**[534] Monticello DOE - 1941-1960 - The Vanadium

534 **Uranium mill blamed for cancer cluster in Monticello** / Brent Hunsaker. ABC 4 News. Updated: 5/07/2010.
'An extensive clean up was done at the mill site and on 425 vicinity properties.' The Monticello Utah Victims of Mill Tailings Exposure Committee - http://www.monticellovmte.com/home
U.S. Dept. of Health, office of epidemiology: Cancer Cluster Investigations, including: **An investigation of**

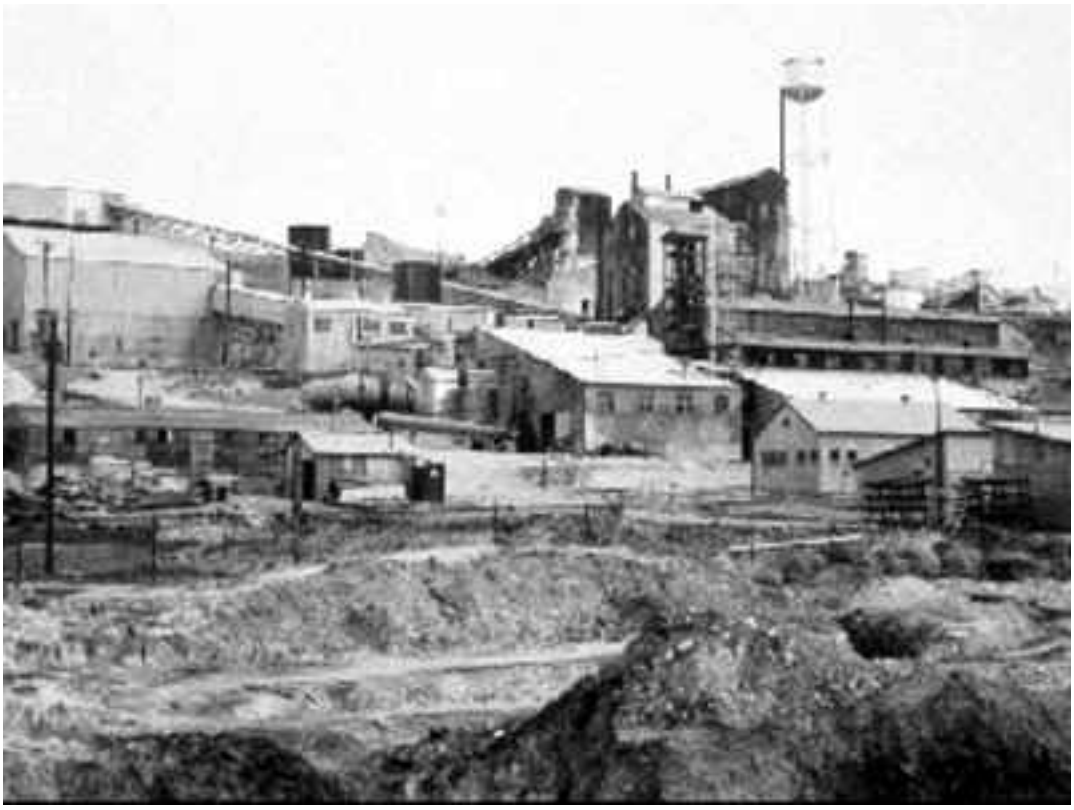
Corporation of America (VCA), later Foote Mineral Company , began construction of a vanadium mill in Monticello in 1941 in response to the increased demand for radioactive material brought about by World War II. In 1943, VCA began producing a uranium-vanadium sludge for the Manhattan Engineer District. It employed 200 workers until it closed in 1946. In 1948, the US. Federal Government purchased the mill and reopened it in 1949 as a converted uranium and vanadium processing plant. The AEC owned processing mill at Monticello recovered uranium and vanadium from AEC furnished ore. The Galigher Company became the Management and Operations (M&O) contractor for the mill in August 1949, one year after the AEC purchased it from the War Assets Administration. The National Lead Company, Inc., assumed responsibility for mill management and operations on April 1, 1956. The AEC shut down the mill and began decommissioning activities in 1960. Contractors: Galigher Company (1948-1956); and the National Lead Company, Inc. (1956-1960).
Watchdog: The Monticello Utah Victims of Mill Tailings Exposure Committee

•UT **Ore Buying Station at Marysvale**[535] Marysvale DOE - 1950-1957 - The ore buying station at Marysvale purchased uranium ore for the AEC. The American Smelting and Refining Company (ASRC) managed and operated the Marysvale station from March 1950 to January 1956. Lucius Pitkin replaced ASRC as the M&O contractor in February 1956. The AEC leased the land on which the ore buying station sat from a private owner. Contractors: American Smelting and Refining Company (1950-1956); and Lucius Pitkin, Inc. (1956-1957).

•UT **Ore Buying Station at Moab** Moab DOE - 1954-1960 - The ore buying station at Moab purchased uranium ore for the AEC. The American Smelting and Refining Company (ASRC) managed and operated the Moab station from May 1954 to January 1956. Lucius Pitkin replaced ASRC as the M&O contractor in February 1956. The AEC leased the site, which is located adjacent to a Uranium Reduction Company mill, from a private owner. A second ore buying station located on the property of the Uranium Reduction Company mill site is not covered under EEOICPA. Contractors: American Smelting and Refining Company (1954-1956); and Lucius Pitkin, Inc. (1956-1960).

cancer incidence in Monticello, Utah Monticello, San Juan, Utah. 2006. - 61 pp.
- http://health.utah.gov/enviroepi/activities/EPHTP/ephtcc.htm

535 **Marysvale Uranium Property (Terminated August, 2009)**.
- http://www.dnimetals.com/properties/utah_marysvale.htm



Source: Shades of hope for uranium's forgotten victims / Nathan Rice. The Daily Climate. 29 June 2010.

•UT **Ore Buying Station at Monticello**[536] Monticello DOE - 1948-1962 - The ore buying station at Monticello purchased uranium ore for the AEC. The American Smelting and Refining Company (ASRC) managed and operated the Monticello station from 1948 to January 1956. Lucius Pitkin replaced ASRC as the M&O contractor in February 1956. The AEC purchased the site in 1948 from the War Assets Administration. Contractors: American Smelting and Refining Company (1948-1956); and Lucius Pitkin, Inc. (1956-1962).

536 Recent Cancer Cluster Investigations : Follow up study of cancer incidence in Monticello City, Utah – 1973-2004 - http://health.utah.gov/enviroepi/activities/EPHTP/ephtcc.htm
An Investigation of Cancer Incidence in Mapleton, Utah, 1978 - 2001. Utah Department of Health. Office of Epidemiology. Environmental Epidemiology Program, 2006. - 61 pp.
An Investigation of Cancer Incidence in Cottonwood Heights, Utah
An Investigation of Cancer Incidence in Monticello, Utah
Analysis of the Spatial Proximity of Childhood Leukemia to High Traffic Roads in Utah
An Investigation of Cancer Incidence in Sunset and Clinton, Utah, 1973-1999.
Geospatial Analysis of Cancer Rates in Residents Living OverContaminated Shallow Ground Water Plumes in Davis And Weber Counties 1973-2001.

•UT **Ore Buying Station at White Canyon** White Canyon DOE - 1954-1957 - The ore buying station at White Canyon purchased uranium ore for the AEC. The American Smelting and Refining Company (ASRC) managed and operated the White Canyon station from October 1954 to January 1956. Lucius Pitkin replaced ASRC as the M&O contractor in February 1956. The AEC leased the land for the ore buying station from the Bureau of Land Management. Contractors: American Smelting and Refining Company (1954-1956); and Lucius Pitkin, Inc. (1956-1957).

•UT **Thiokol Promontory Complex** DOE - Thiokol Corporation builds the NASA space shuttle rocket motors at this sprawling isolated facility near the Promontory Mountains. Other defense and propulsions systems are developed, built, and tested here including ICBM rocket engines. The plant, once designated as "Air Force Plant 78" employs over three thousand people, who work in 450 buildings, clustered in the various industrial and test areas that are scattered throughout the bare hills of the 30 square mile complex.
In 2001 Thiokol's propulsion division was acquired by Alliant Techsystems,

•VA **Babcock & Wilcox Co.** Lynchburg DOE - 1959; 1968-1972 & 1985-2001 - Babcock and Wilcox Company's main plant at Mount Athos and the Lynchburg Research Center, also known as the Lynchburg Technology Center in Lynchburg, VA, performed work for a variety of Atomic Energy Commission (AEC) and DOE projects. Babcock and Wilcox Company's Nuclear Facilities Plant in Lynchburg, VA, participated in the AEC's Oxide Pellet Fabrication Program, which was managed by the New York Operations Office. Records indicate that shipments of enriched uranium were made to and from the Fernald facility during the years 1968-1972. The company

also recovered highly enriched uranium from weapons scrap received from the DOE's Oak Ridge facility between 1985 and 1996. In 1997 the Babcock & Wilcox Company facility in Lynchburg, VA became the BWX Technologies facility. From 1998 to 2000, the company fulfilled a contract for the recovery of enriched uranium from scrap materials containing beryllium. The Lynchburg plant also participated in a DOE-sponsored program called Project Sapphire, under which the plant had responsibility from 1995 to 2001 for downblending enriched uranium obtained from the government of Kazakhstan.[537]

•VA **Camp Patrick Henry** AWE - The U.S. Army continued to operate a Nike Missile site, designated N-85, on the complex until the late 1970s, when the base was shut down.

•VA **Radford Army Ammunition Plant** [538]AWE – Building 4343 is located within the Pilot B Area of the Rocket Manufacturing Area, which is situated within the Horseshoe Area. During the post-World War II period, Radford produced cast propellant for rockets such as the Honest John, Little John, Nike Atlas, and Nike Hercules rockets

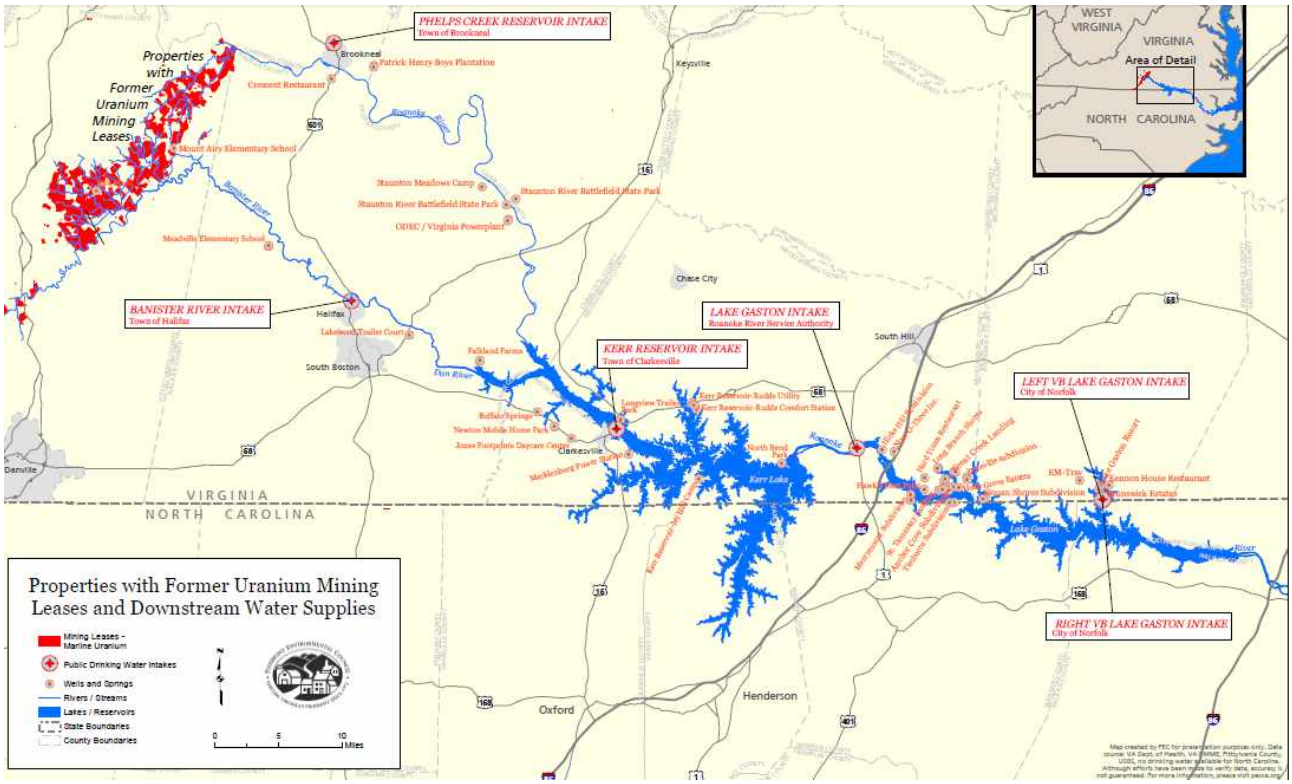
537 **Description of Project Sapphire**. / R. G. Taylor. Nuclear Criticality Safety Department. Health, Safety, Environment and Accountability Organization, 1995.- 9 pp

538 **Army Ammunition Production During the Cold War (1946 - 1989)**. U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland, 2009. - 202 pp.
- http://aec.army.mil/usaec/cultural/ammo-storage02.pdf

The World War II Ordnance Department's government-owned contractor-operated (GOCO) industrial facilities: Radford Ordnance Works. historic investigation / Ashley M. Neville, Debra A. McClane. 1996. - 118 pp. ; U.S. Army Materiel Command Historic Context Series Report of Investigations No. 6A).

Army Materiel Command**: Radford Army Ammunition Plant - 2001 Installation Action Plan**, 2001. - 88 pp. - http://www.globalsecurity.org/military/library/report/enviro/RFAAP_IAP.pdf

In 1956, this building was converted from a Fire Water Pump House to support Nike igniter grain cadmium plating operations. Also DU production at the plant. The Radford Army Ammunition Plant (RFAAP) is now operated by contractor Alliant Ammunition and Powder Company, L.L.C., a division of Alliant Techsystems (ATK), Inc.



•VA **Coles Hill Uranium Deposit**[539] Pittsylvania County

539 **Development of The Coles Hill Uranium Deposit Pittsylvania County, Virginia**. Presented by Patrick Wales, Project Manager for Virginia Uranium Inc. undated. - 27 pp.

•VA **Skiffes Creek Annex**[540], or **Yorktown Naval Weapons Station** - AWE National Nuclear Weapons Stockpile Site. In 1953, the Skiffes Creek Annex was commissioned with Guided Missile Service Unit No. 211. In 1958, the base was redesignated as a Naval Weapons Station. In the 1970s additional support facilities were constructed to support missile rework. Yorktown Naval Weapons Station in Virginia accommodated 120 W-80-0 nuclear munitions for Tomahawk SLCM's and 160 nuclear aerial bombs for deck-based naval aviation. These weapons were reportedly moved to Kings Bay in the late 1990s. Currently Yorktown does not accommodate nuclear weapons.

- http://www.nma.org/pdf/urw/wales.pdf

Nuclear Regulatory Commission, **Technical Report on the Coles Hill Uranium Property Pittsylvania County, Virginia,** 2007. - 49 pp. - http://pbadupws.nrc.gov/docs/ML0816/ML081630113.pdf

540 **Ammunition and Explosives Storage for the Navy (1939-1989) and the Air Force (1946-1989)**, 2008. - 200 pp. - http://www.denix.osd.mil/cr/upload/af-navy-ammunition-storage-public-rfs_pg1-200_rev.pdf

The Agency for Toxic Substances and Disease Registry:Public **Health Assessment for Naval Weapons Station York Town** (nwsy) York Town, Virginia, 2006. -106 pp.

•WV **Allegheny Ballistics Laboratory** AWE - ABL is located in Mineral County in the northeastern part of West Virginia, approximately 10 miles southwest of Cumberland, Maryland, along the West Virginia and Maryland border. ABL is a government-owned, contractor operated research, development, testing, and production facility for composite structures, ammunition, rockets motors, and armaments.

•WV **Alliant Techsystems Inc.** DOE - Alliant Techsystems Inc. is located at Allegheny Ballistics Laboratory.

•WV **Food Machining Corp.**[541] Nitro DOE - Provided goods and/or services to the Fernald facility as subcontractor.

541 DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; August 29, 1994. - 3 pp.
- http://www.lm.doe.gov/Considered_Sites/Gleason_Works_-_NY_55/

Ingalls Shipyard is one of the largest shipbuilding facilities in the United States. With over 10,000 workers, the yard is the state's largest private employer. Navy destroyers, cruisers, nuclear submarines, and numerous other types of vessels are built at this 800-acre shipyard, more than a square mile of intense heavy engineering, on the Mississippi Coast. Like many American Shipyards, it grew quickly during WWII, but unlike most others, it continued to grow after the war, peaking with 25,000 workers in 1977, as the Navy's busiest battleship building facility. It was operated by Litton Industries for many years, until Litton was acquired by Northrop Grumman in 2001. Northrop's other Gulf ship yard is the Avondale Yard, near New Orleans. Northrop also operates the largest shipbuilding yard in the US, at Newport News, Virgina. Source: CLUI Land Use Database.

•WV **Huntington Ingalls Industries** AWE - Huntington Ingalls Industries HII is an American shipbuilding company formed on March 31, 2011 as a spin-off of Northrop Grumman. Formerly known as Northrop Grumman Shipbuilding NGSB, it was created on 28 January 2008 by the merger of Northrop Grumman's two shipbuilding sectors, Northrop Grumman Ship Systems and Northrop Grumman Newport News. HII is the sole designer, builder, and refueler of nuclear-powered aircraft carriers in the United States. It is one of two nuclear-powered submarine builders. 70% of the current, active US Navy fleet has been built by HII's erstwhile units.

Facilities

•Newport News Shipbuilding, Newport News, Virginia Nuclear Aircraft Carriers,

Submarines, Overhaul
•Ingalls Shipbuilding, Pascagoula, Mississippi Surface Combatants, Amphibs, Coast Guard large cutters
•New Orleans, Louisiana Amphibs, Auxiliaries
•Virginia Beach, Virginia AMSEC, Fleet Support
•San Diego, California Continental Maritime, Fleet Repair & Support
•Gulfport, Mississippi Composite R&D, Composite Components
•Tallulah, Louisiana Components & Subassemblies

•VA **Naval Station Norfolk**[542] Norfolk Virginia AWE

542 DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; December 23, 1993. - 1 p.
- http://www.lm.doe.gov/Considered_Sites/Sutton_Steele_and_Steele_Co_-_TX_09.aspx
'In each case, the potential for radiological contamination above applicable guidelines is small. In each case the amounts of radioactive materials handled was small. Based on these considerations, these sites are hereby eliminated from further consideration under the Formerly Utilized Sites Remedial Action Program.'
Radiological survey of the Norfolk Naval Station, the Norfolk Naval Shipyard, and Newport News Shipbuilding. Final report. / Sensintaffar, E.L.; Blanchard, R.L. . Office of Radiation Programs, Washington, DC. 1988. - 29 pp.

•VA **Thomas Jefferson National Accelerator Facility** Newport News DOE - 1994- - The Thomas Jefferson National Accelerator Facility is a basic research laboratory built to probe the nucleus of the atom to learn more about the quark structure of matter. Contractor: Southeastern Universities Research Association, Inc. (1994-present) .

•VA **University of Virginia** Charlottesville AWE/DOE - 1942-1949; 1960s - The University of Virginia played an integral role in developing the process to use uranium in the development in nuclear weapons. The Naval Research Laboratory asked Dr. Jesse Beams, of UVA, about the possibility to using isotope separation by centrifuge for the enrichment process of uranium. He was able to successfully enrich uranium by the use of his high-speed centrifuge.

Later, the University of Virginia's Nuclear Reactor Facility, operated by the Department of Mechanical, Aerospace and Nuclear Engineering, housed the UVAR, a light-water-cooled and moderated research pool-type reactor which began Operation in 1960 and ceased operations in 1998.

•WA **Deep Creek Air Force Station**[543], Fairchild AFB[544] - National Nuclear Weapons Stockpile Site. The Deep Creek Operational Storage Site was located about 1 km immediately south of Fairchild AFB. A location 4 km West of Fairchild AFB is indeed "Deep Creek" but this was not the actual site of the nuclear weapons storage area. In 1956 the wing began a conversion that brought the B-52 Stratofortress to Fairchild, followed by the KC-135 Stratotanker in 1958. In 1961, the 92d became the first "aerospace" wing in the nation with the acquisition of the Atlas intercontinental ballistic missile.

543 **Ammunition and Explosives Storage for the Navy (1939-1989) and the Air Force (1946-1989)**, 2008. - 200 pp. - http://www.denix.osd.mil/cr/upload/af-navy-ammunition-storage-public-rfs_pg1-200_rev.pdf
United States Air Force Environmental Restoration Program: Final Record of Decision. **On-Base Priority One Operable Units Fairchild Air Force Base**. June 1993. - 63 pp.

544 Air Mobility Command Administrative Record for Fairchild AFB , 2010. - 188 pp. - http://amcadminrec.com/fairchild.html
' Below is a list of all the 2049 documents by AR File Number in sequential order in the Fairchild AFB AR. The entire AR index has been sorted by document date.'

•WA **Hanford** Richland DOE 1942-. Projects & Facilities. DOE, Richland Operations Office : The Hanford Declassification Project with 131,427 total available records.
The Fluor Hanford Deactivation and Decommissioning (D&D) Project[545] is responsible for the large land area of central Hanford known as the Central Plateau. The area is approximately 70 square miles and includes the 200 East and West chemical-reprocessing areas and the 200 North storage area for contaminated materials, but excludes the Plutonium Finishing Plant compound. The D&D Project is also responsible for demolishing the K East Basin in Hanford's 100 K rivershore area.[546]

545 **The Fluor Hanford Deactivation and Decommissioning Project**, 2007. - 1 p.
- http://www.fluorfederalservices.com/pdfs/media_kit/mk_dd.pdf
546 **Audit faults Hanford plan to treat sludge**, Seattle Times, February 22, 2011.
- http://seattletimes.nwsource.com/html/localnews/2014303430_apwahanfordsludgeaudit.html
A new federal audit says a project planned to treat the Hanford nuclear reservation's K Basin radioactive sludge cost $43 million without producing any results. The audit by the Department of Energy's Office of Inspector General says the money was spent on engineering and purchasing of equipment from 2004 to 2007. The Tri-City Herald says the audit released Tuesday found that an initial feasibility study was not done, and laboratory and demonstration scale testing were not done in a timely fashion.
DOE Draining of Hanford's K East Basin. February 7, 2008. - 2 pp.
- http://www.hanford.gov/pmm/news.cfm/DOE/Press_080207_DOE.PDF
'The large water-filled, concrete basin once held more than 1,100 tons of uranium metal fuel rods, known as spent nuclear fuel, as well as approximately 42 cubic yards (37 cubic meters) of radioactive sludge. Water provided shielding from the highly radioactive materials while they were in the basin. Workers finished removing the spent fuel from the basin in 2004 and radioactive sludge in May 2007.'

A sample from the K West Basin at the Hanford site in southeastern Washington State is loaded for transport. Retrieving samples from the basin is a delicate task; the sampling tube with a one-half inch outside diameter threads down through guides that run 21 feet from fl oor grating to the bottom of the basin. The only view of the target is provided by remote video cameras.

Source: EM Update, Volume 3, Issue No. 3 • February 10, 2011

The Central Plateau contains the most highly radioactive wastes and contaminated facilities at the Hanford Site. D&D Project responsibilities include four of Hanford's five plutonium separations, or reprocessing, facilities – known by Hanford workers as "canyons." The canyons are contaminated with radioactive and chemical materials, and pose some of the toughest cleanup challenges at Hanford. The D&D Project is also responsible for four other nucleargrade facilities – that is, facilities containing enough nuclear materials and hazards to require high levels of surveillance and maintenance: 231-Z Plutonium Isolation Building, 224-T Transuranic Storage Facility, 224-B Plutonium Concentration Building, and 209-E Critical Mass Laboratory. There are also approximately 900 structures in Hanford's Central Plateau, as well as all of Hanford's high-level waste tanks.

Demolition of Plutonium Vaults. Demolition is complete on building 2736-ZC, a 1,539 sheet-metal structure built in 1983 that served as a Cargo Restraint Transportation Dock.

Demolition of Plutonium Vaults

DOE and contractor CH2M HILL Plateau Remediation Company began demolishing a vault complex in Hanford's Plutonium Finishing Plant the week of November 14, 2011. The vault once held stores of plutonium metal that was produced at Hanford for the U.S. nuclear weapons program. The vault complex is part of Hanford's Plutonium Finishing Plant, which once consisted of more than 60 facilities and produced nearly two-thirds of the nation's supply of plutonium during the Cold War.

Hanford's Critical Mass Laboratory Demolished

RICHLAND, WASH., December 14, 2011 – One of the Most Hazardous Facilities at Hanford Comes Down Following Two Years of Safety Preparations. Built in 1960 during the height of the cold war, the 209-East Critical Mass Laboratory was one of three buildings of its type in the DOE Complex. From 1960 to 1987, Battelle Pacific Northwest Laboratories (PNL) operated the Hanford Critical Mass Laboratory (CML) to identify controls for criticalities, the term used for the dangerous condition when fissile material can sustain a reaction by itself. The facility housed experiments to test the criticality limits of uranium and plutonium solutions.

•WA **Pacific Northwest National Laboratory** [547] Richland DOE - 1965-. - Pacific Northwest National Laboratory's began in 1965 when Battelle won the contract to perform research and development for the Hanford Site. The Laboratory's first projects were based on the needs of the Hanford Site and included protecting the environment, fabricating reactor fuel, and designing reactors. These projects, staff expertise in diverse fields, and national needs led to research and development in several key areas: environment, health, energy, computer science, and security.

547 National Institute for Occupational Safety and Health: : **Pacific Northwest National Laboratory – Site Description**. / William E. Joyce, 2007. - 30 pp. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/pnnl2-r1.pdf

Source: Milwaukee County Historical Society

•WI **Allis-Chalmers Co.**[548] West Allis, Milwaukee County AWE - 1943-1944 - Allis-Chalmers made vacuum pumps for the Y-12 plant effort. The company also wound magnetic coils for the "calutrons" used in the Y-12 plant to produce highly enriched uranium. In late 1943 General Leslie Groves ordered some partially-used coils be sent back to Allis-Chalmers for cleaning. Allis-Chalmers was also involved in the construction of the K-25 Plant.

•WI **Besley-Wells**[549] South Beloit AWE - 1953 - Besley was a cutting tool manufac-

548 Archive: Milwaukee County Historical Society: **Allis-Chalmers Corporation, 1847-1988**. Call Number: Mss-0774. - http://www.milwaukeehistory.net/manuscript/allis-chalmers-corporation-1847-1988/

Memorandum/Checklist; **A. Wallo to the File; Subject: Elimination of Allis-Chalmers, Milwaukee**; November 24, 1987. - 5 pp.

549 DOE Memorandum; Williams to File; **Elimination of the Sites from the Formerly Utilized Sites Remedial Action Program**; August 29, 1994. - 3 pp.

- http://www.lm.doe.gov/Considered_Sites/Gleason_Works_-_NY_55/

OWCP News Release: [10/13/2011]

'US Department of Labor notifies former Wisconsin nuclear weapons employees of energy workers' compensation program

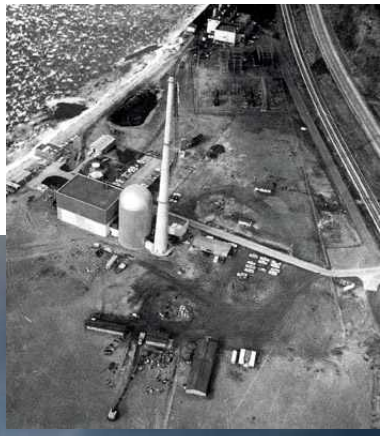
WASHINGTON —The U.S. Department of Labor is notifying former workers of six facilities located in Wisconsin about benefits that may be available to them under the Energy Employees Occupational Illness Compensation Program Act administered by the department's Division of Energy Employees Occupational Illness Compensation. Survivors of qualified workers also may be entitled to benefits.

Former employees of the following sites may be eligible for EEOICPA compensation and medical benefits if they worked at the facility during a period of covered employment: Ladish Co. in Cudahy, LaCrosse Boil-

turer. A National Lead Company of Ohio (Fernald) proposal indicates Besley was to machine a trial lot of 500 uranium slugs at its Beloit, WI, plant to evaluate whether the use of the Besley facing and radiusing machine could increase production.

•WI **General Electric X-Ray Division**[550] Milwaukee AWE - 1956-1966 - General Electric's X-Ray Division performed research and development work which supported its activities as contractor for the Pinellas Site in Florida. This work included the operation of a small pilot plant in Milwaukee. Sandia National Laboratory managed the GE X-ray division contract as part of the nuclear weapons program. The work in Milwaukee continued until 1966 when these activities were transferred to Pinellas and the staff relocated accordingly.

•WI **La Crosse Boiling Water Reactor**[551] La Crosse DOE- 1967-1969 - The La Crosse Boiling Water Reactor, now owned and operated by Dairyland Power Cooperative, was one of a series of demonstration plants funded by the Atomic Energy Commission.



•WI **Ladish Co.**[552] Milwaukee BE - 1959-1965 - Ladish supplied beryllium metal and

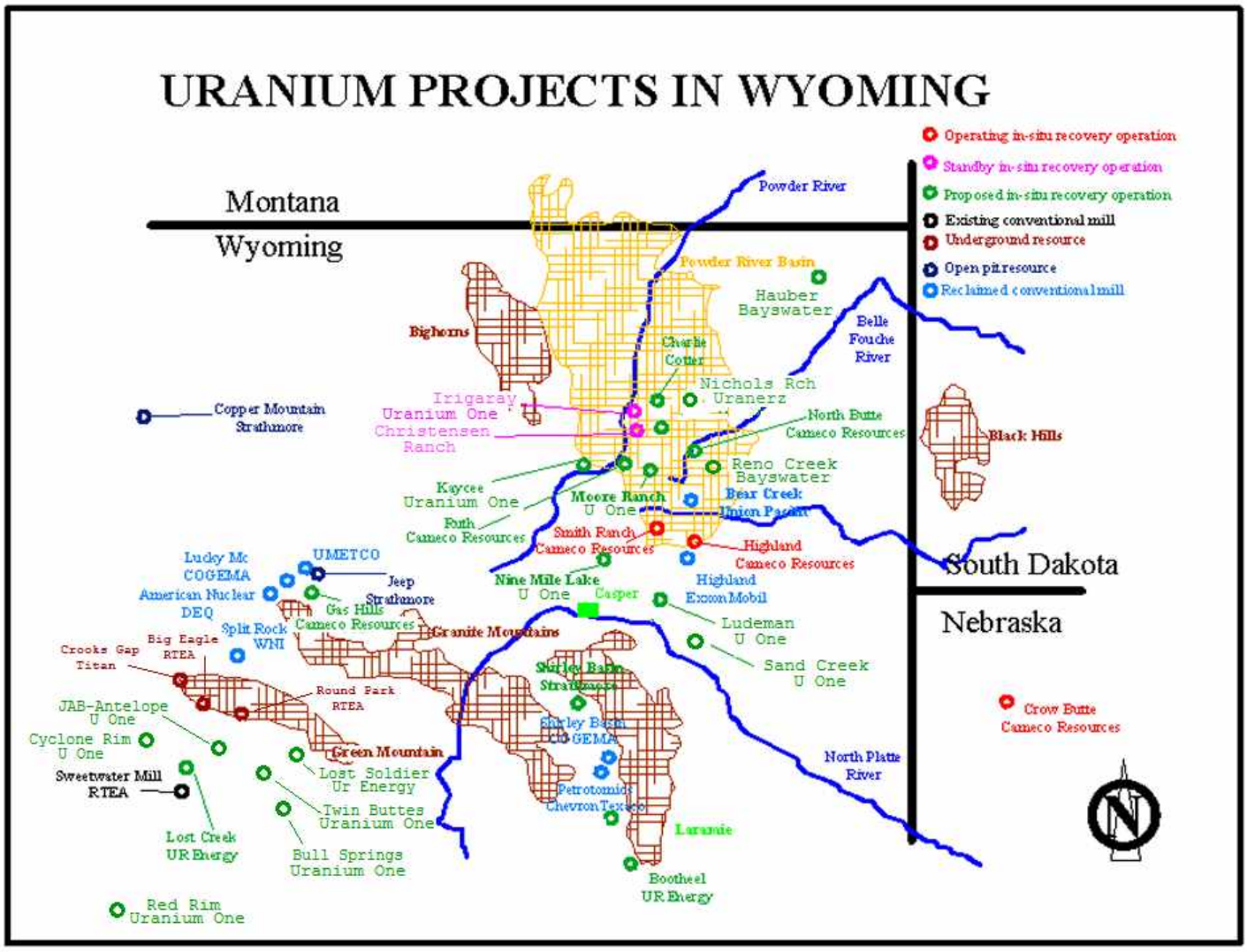
ing Water Reactor in LaCrosse, Allis-Chalmers Co. (also known as Hawley Plant) in West Allis, Besley-Wells in South Beloit, and A.O. Smith Corp. and General Electric X-Ray Division in Milwaukee'...

550 National Archives: **Records of the Atomic Energy Commission** [AEC] (Record Group 326) 1923-75.

551 **Operation of La Crosse Boiling Water Reactor, Dairyland Power Cooperative**. Docket No. 50-409. - Final environmental statement. Nuclear Regulatory Commission, Washington, DC. Office of Nuclear Reactor Regulation.1980.

552 **Beryllium makes a comeback** — in a Minuteman missile The announcement of a contract worth ... worked out by Brush Beryllium and the Ladish Company of Cudahy, Ohio. ... New Scientist, 5. march 1964.

parts to the Y-12 plant.



'In 1955, the Atomic Energy Commission constructed an ore buying station in Riverton Wyoming, in part to handle Gas Hills' ores; the ores were stored onsite and eventually milled (Susquehana). In the Gas Hills area, with approval of the AEC for purchase allotments in 1956, Utah Construction began the Lucky Mc Mill in the Gas Hills and Lost Creek Oil and Uranium (later Western Nuclear) began the Split Rock Mill 15 miles south at Jeffrey City. By 1959, the AEC Authorized three additional mills in the county: Fremont Minerals' (Susquehana Mining) mill in Riverton, Federal-Radorock-Gas Hills Partners' (later Federal-American Partners) central Gas Hills mill, and Globe Uranium Company's (later Union Carbide) east Gas Hills Mill.'[553]

National Inventory of Sources and Emissions: Beryllium – 1968. U.S. Environmental Protection Agency. Office of Air and Water Programs Office of Air Quality Planning and Standards Research. Triangle Park, North Carolina. W. E. Davis & Associates. Leawood, Kansas. 1971. - 56 pp.

553 **Technical Report on the Gas Hills Uranium Project, Fremont and Natrona Counties, Wyoming**: Mineral Resource Report Prepared For: Strathmore Minerals Corp. / Charles D. Snow. 2011. - 137 pp.

•WV **Francis E. Warren Air Force Base**[554] near Cheyenne Wyoming AWE -

554 **Installation restoration program, Phase I: records search, Francis E. Warren Air Force Base, Wyoming. Final report** / Schroeder, E.J.; Palumbo, D.A.; Stephens, R.D.; McAuliffe, J.P. Engineering-Science, Inc., Atlanta, GA (USA), 1985. - 215 pp.

'This report identified and evaluated several potentially hazardous waste-disposal sites at F E Warren AFB. Records of past waste handling and disposal practices were reviewed. Interviews with past and present installation employees were conducted to develop a history of waste disposal practices. The environmental setting was evaluated including soils, geology, groundwater, and surface water. Five landfills, six spill sites, two fire-protection training areas and an acid dry well were found to have sufficient potential to create environmental contamination.'US Air Force: F.E. Warren Air Force Base (AFB), Peacekeeper in Minuteman silos (WY,NE) : environmental impact statement, 1984.

Superfund record of decision (EPA Region 8): F. E. Warren Air Force Base, operable unit 1, Spill Sites 1 - 7, Cheyenne, WY, August 9, 1995. Environmental Protection Agency, Washington, DC (United States). Office of Emergency and Remedial Response, 1996. - 8 pp.

Superfund record of decision (EPA Region 8): F.E. Warren Air Force Base, operable unit 3, Nob Hill, Cheyenne, WY, March 13, 1996. Environmental Protection Agency, Washington, DC (United States). Office of Emergency and Remedial Response, 1996. - 31 pp.

Minuteman Missile and Peacekeeper missiles Site.

•WY **Ore Buying Station at Crooks Gap**, **Ore Buying Station at Split Rock**[555] or **Ore Buying Station at** Jeffrey City **Crooks Gap** DOE - 1956-1957 - The ore buying station at Crooks Gap, Fremont County, purchased uranium ore for the AEC. Lucius Pitkin managed and operated the Crooks Gap station from December 1956 to July 1957.

The AEC leased the land and equipment from a private company. Contractors: Lucius Pitkin, Inc.

555 **Technical Evaluation Report for Western Nuclear, Inc., Split Rock mill site, Jeffrey City, WY**, Feb. 24, 2010. - 14 pp.

•WY **Ore Buying Station at Riverton**[556] Riverton DOE - 1955-1957 - The ore buying station at Riverton purchased uranium ore for the AEC.

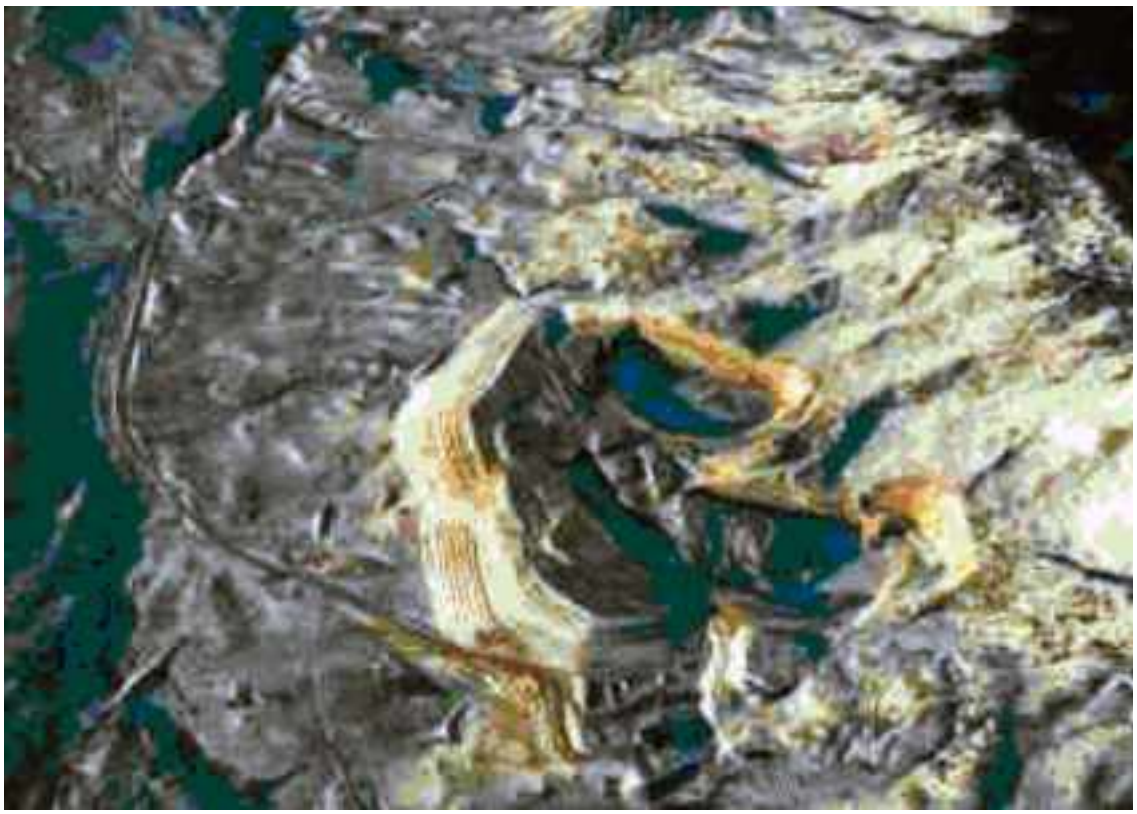
556 **An Overview of Uranium Production in Wyoming**. White Paper. School of Energy Resources, University of Wyoming. July, 2010. - 14 pp.

Ammundson, Michael A.: Home on the Range No More: Boom and Bust of a Wyoming Uranium Mining Town 1957 -1958. Western Historical Quarterly 26 (Winter 1995): 483-505.

Summary of Off-Normal Events in US Fuel Cycle Facilities for AFCI Applications / Lee C. Cadwallader, Steven J. Piet, Stephen O. Sheetz, David H. McGuire, W. Brent Boore. Idaho National Engineering and Environmental Laboratory Bechtel BWXT Idaho, LLC, 2005. - 138 pp.

DOE: **Groundwater and Surface Water Sampling at the Riverton, Wyoming, Processing Site September 2011**. - 114 pp. - http://www.lm.doe.gov/Riverton/S00611_RVT.pdf

DOE: **Verification Monitoring Report for the Riverton, Wyoming, Processing Site**. Update for 2010. February 2011, - 86 pp. - http://www.lm.doe.gov/Riverton/S07202_RVT.pdf



The American Smelting and Refining Company (ASRC)[557] managed and operated the Riverton station from March 1955 to January 1956. Lucius Pitkin replaced ASRC as the M&O contractor in February 1956. The AEC leased the land on which the ore buying station was located from a railroad. Contractors: American Smelting and Refining Company (1955-1956); and Lucius Pitkin, Inc. (1956-1957).

• WY **Spook Disposal Site** Converse County DOE - The Spook disposal site is a former uranium-ore upgrading facility. Wyoming Mining and Milling Company operated the facility from 1962 until 1965 to upgrade uranium ore to a concentrated slurry precipitate before shipment to the Western Nuclear mill at Jeffrey City, Wyoming.

557 Now ASARCO - http://en.wikipedia.org/wiki/ASARCO

•WV **Huntington Pilot Plant**[558] Huntington AWE/DOE - 1951-1963; 1978-1979 - The AEC built the Huntington Pilot Plant in 1951 to supply nickel powder for use in the Paducah and Portsmouth gaseous diffusion plants. One source of the nickel was scrap nickel which was contaminated with uranium. The plant was shutdown in 1963 and maintained in standby condition. It was demolished in 1978-1979.

Conclusion

The responsible military officials, politicians and scientists who planned and developed nuclear weapons during World War II saw only glimpses of the enormous impact these weapons would have on all life on this planet. And in the meantime there are threats of this weapon system can also be sensed in the general population, those who were defended by these weapons. We are only able to comprehend the tip of the iceberg of the many unsolved problems there are and will come in the future in connection with nuclear weapons. Is is a fact that for political and military reasons we

558 National Institute for Occupational Safety and Health, Office of Compensation Analysis and Support: **Technical Basis Document for the Huntington Pilot Plant, Huntington, West Virginia /** Tom Tomes, Sam Glover, Christine Corwin, 2008. - 30 pp. - http://www.cdc.gov/niosh/ocas/pdfs/tbd/oc-huntpp-r0.pdf

Rutherford Tony: **Huntington's Houdaille Plant Contained Radioactive Materials** : Hundreds Allegedly Died of Lung Cancer. Huntingtonnews.net, Oct. 28, 2010.

Rutherford Tony: **Huntington Pilot Plant/ Reduction Pilot Plant Buried, Slurry Wall Leaking**: Nickel Carbonyl Process Elements Have Exceptionally Long Half Lives; Worker Radiation Exposures Falsified; Sewage Sent to Scioto River. Huntingtonnews.net, Feb. 2, 2010

Rutherford, Tony: **Over Five Million Dollars Paid to Former Huntington Pilot Plant Workers**: More Than $413 Million to Portsmouth Workers. Huntingtonnews.net, April 2, 2010.

'Huntington, WV (HNN) – Based on statistics supplied by the US. Department of Labor (Office of Worker's Compensation Programs EEOICP) statistics 540 individuals have received a total of over five million dollars for occupational (atomic related) illness at the now buried plant'.

were never told the full truth about these weapons. Only now we can see, study and understand the magnitude of the issues in one of the nuclear powers: the United States.

The military-industrial development in this country has literally astronomical significance in the health, the environment and the economy both now and in the future and the main problem all those years has been the lack of access to relevant information. During the WWII, all decisions on nuclear weapons were taken in secrecy. The public was first informed about the project after the first bombs was thrown. The events during the World War institutionalized and created a tradition of secrecy for military information with the result that power was centralized with the military–industrial complex and the president. Do we want to continue it?

Manuscript edition closed November, 15th. 2001.

ISBN - 978-87-91085-05-5

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