Form No. 10-300 (Rev. 10-74)

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES INVENTORY -- NOMINATION FORM

FOR NPS USE ONLY
RECEIVED
DATE ENTERED

SEE INSTRUCTIONS IN *HOW TO COMPLETE NATIONAL REGISTER FORMS*
TYPE ALL ENTRIES -- COMPLETE APPLICABLE SECTIONS

1 NAME

HISTORIC
Experimental Breeder Reactor #1

AND/OR COMMON
Experimental Breeder Reactor #1

2 LOCATION

STREET & NUMBER SE1/4, of NE 1/4, of SW 1/4, Section 9 T2N., R9E Boise Meridian — NOT FOR PUBLICATION

CITY, TOWN
Arco — XX VICINITY OF

CONGRESSIONAL DISTRICT
2nd

STATE	CODE	COUNTY	CODE
Idaho	16	Butte	023

3 CLASSIFICATION

CATEGORY	OWNERSHIP	STATUS	PRESENT USE	
__DISTRICT	X PUBLIC	__OCCUPIED	__AGRICULTURE	X MUSEUM
__BUILDING(S)	__PRIVATE	__UNOCCUPIED	__COMMERCIAL	__PARK
__STRUCTURE	__BOTH	__WORK IN PROGRESS	__EDUCATIONAL	__PRIVATE RESIDENCE
__SITE	PUBLIC ACQUISITION	ACCESSIBLE	__ENTERTAINMENT	__RELIGIOUS
XX OBJECT	__IN PROCESS	X YES: RESTRICTED	X GOVERNMENT	__SCIENTIFIC
	__BEING CONSIDERED	__YES: UNRESTRICTED	__INDUSTRIAL	__TRANSPORTATION
		__NO	__MILITARY	__OTHER:

4 OWNER OF PROPERTY

Contact: Public Information Officer, Idaho Operations Office - 208/522-6640, Ext. 1317

NAME
Department of Energy (Federal Government)
(Interpretation of the site is by National Park Service staff. from Craters of the Moon National Park)

STREET & NUMBER
550 Second Street

CITY, TOWN
Idaho Falls — __ VICINITY OF

STATE
Idaho 83401

5 LOCATION OF LEGAL DESCRIPTION

COURTHOUSE, REGISTRY OF DEEDS, ETC.
Butte County Courthouse

STREET & NUMBER

CITY, TOWN

STATE

6 REPRESENTATION IN EXISTING SURVEYS

TITLE
Experimental Breeder Reactor #1, National Historic Landmark Plat

DATE

__FEDERAL __STATE X COUNTY __LOCAL

DEPOSITORY FOR SURVEY RECORDS
Butte County Courthouse

CITY, TOWN
Arco

STATE
Idaho

7 DESCRIPTION

CONDITION		CHECK ONE	CHECK ONE
XX EXCELLENT	__DETERIORATED	XX UNALTERED	X ORIGINAL SITE
__GOOD	__RUINS	__ALTERED	__MOVED DATE_____
__FAIR	__UNEXPOSED		

(decommissioned--inactive)

DESCRIBE THE PRESENT AND ORIGINAL (IF KNOWN) PHYSICAL APPEARANCE

The Idaho National Engineering Laboratory, which was formerly the National Reactor Testing Station established in 1949 by the Atomic Energy Commission (now administered by the Energy Research and Development Administration), is a complex of nuclear facilities distributed over 894 square miles of desert land in southeastern Idaho. This desolate site was initially chosen because of its isolation, its large supply of underground water and its earthquake-free history. Here the largest concentration of experimental breeder-reactors in the world have been built, including reactors for safety research, materials testing, electric power, and naval propulsion.

The EBR-I area, situated in the southwest part of the Idaho National Engineering Lab, comprised at its largest, the Experimental Breeder Reactor No. 1, the Argonne Fast Source Reactor, BORAX-V, and the Zero Power Reactor No. 3. Construction work by the AEC at the Station began in this area in May 1949 with the drilling of the EBR-I well. The EBR-I, the first major facility built at the testing station, was completed in Arpil 1951, at a total cost of approximately $2,700,000.

All of the buildings presently located at the EBR-1 site were in existence in 1964 when EBR-1 was decommissioned. However, only the EBR-I building was directly associated with the operation of the EBR-I reactor. The building, a buff-colored rectangular brick structure with a one-story north section and a two-story south section is located on the west side of the small complex and is the largest building there.

The building was essentially constructed around the reactor and the interior is split into three levels with special working rooms and equipment designed and built into the structure especially for the handling of this reactor and its products. Most of the equipment presently located within the building is historic--it was used during the operation of the EBR-I. Since the building is open to the public, various safety precautions have been taken, and some materials probably have been removed.

During its operational lifetime EBR-I was fueled with three cores of uranium 235, each of a somewhat different physical construction, and finally with a core of plutonium--the first power reactor ever to be so fueled. EBR-I operation at full power is about 1 megawatt (one million watts). The critical mass on December 21, 1951, when the reactor was brought to full power was 52 kilograms of U-235 (114 lbs.) and the core of fissionable material was about the size of a football.

The reactor consists of three principal parts: the core, an inner blanket of uranium surrounding the core, and a denser outer blanket. The outer air-cooled breeding blanket is made up of keystone-shaped natural uranium bricks which, when assembled, form a cup that may be moved up to surround the core-inner blanket assembly or dropped down to shut off the reaction.

8 SIGNIFICANCE

PERIOD	AREAS OF SIGNIFICANCE -- CHECK AND JUSTIFY BELOW			
__PREHISTORIC	__ARCHEOLOGY-PREHISTORIC	__COMMUNITY PLANNING	__LANDSCAPE ARCHITECTURE	__RELIGION
__1400-1499	__ARCHEOLOGY-HISTORIC	__CONSERVATION	__LAW	X SCIENCE
__1500-1599	__AGRICULTURE	__ECONOMICS	__LITERATURE	__SCULPTURE
__1600-1699	__ARCHITECTURE	__EDUCATION	__MILITARY	__SOCIAL/HUMANITARIAN
__1700-1799	__ART	__ENGINEERING	__MUSIC	__THEATER
__1800-1899	__COMMERCE	__EXPLORATION/SETTLEMENT	__PHILOSOPHY	__TRANSPORTATION
X 1900-	__COMMUNICATIONS	__INDUSTRY	__POLITICS/GOVERNMENT	__OTHER (SPECIFY)
		__INVENTION		

SPECIFIC DATES 1950-1964 (in operation) BUILDER/ARCHITECT

STATEMENT OF SIGNIFICANCE

The Experimental Breeder Reactor No. 1 of the Idaho National Engineering Lab demonstrated that a nuclear reactor, designed to operate in the high-energy neutron range, is capable of breeding (creating more fuel than its operation consumes) and also of achieving ecomonically competitive nuclear power.

This reactor, was the first reactor built in the Atomic Energy Commission's program to derive electric power for civilian use from atomic energy. On December 20, 1951, the EBR-I produced the first usable amounts of electricity created by nuclear means. The reactor is also noted for having been the first to achieve a self-sustaining chain reaction using plutonium instead of uranium as the major component in the fuel, in July 1963. The EBR-I was the first reactor used to demonstrate the feasibility of using liquid metal (sodium potassium) at high temperatures as a reactor coolant.

EBR-I sustained initial criticality in 1951 and was decommissioned early in 1964 for lack of further assignments.

The concept of a breeder reactor was known to the scientists working on the United States' wartime atomic energy program in the early 1940s. Experiments indicated that breeding nuclear fuel would be possible in a properly designed reactor. However at that time there was neither time nor resources to undertake such a project.

After the war, the newly established Atomic Energy Commission directed some of their agency's efforts to developing peaceful uses of the atom. The large amounts of uranium located in the 1950s were then unknown and uranium was in very short supply. Consequently the first prototype power reactor built was an attempt to prove the theory of fuel breeding.

EBR-I construction began late in 1949 at the new National Reactor Testing Station in Idaho. Early in 1951, a few months before the EBR-I building was completed, nine staff members from the AEC's Argonne National Laboratory in Illinois, arrived to install the reactor which they had designed at a laboratory near Chicago.

9 MAJOR BIBLIOGRAPHICAL REFERENCES

Report of the U.S. Atomic Energy Commission historian proposing national historic landmark sites associated with atomic energy. Historic Sites Survey files 1965.

Information book and pamphlets prepared by National Reactor Testing Station, U.S. Atomic Energy Commission, Idaho Falls, Idaho. (copies in file)

10 GEOGRAPHICAL DATA

ACREAGE OF NOMINATED PROPERTY 0.9508 acres

UTM REFERENCES

	ZONE	EASTING	NORTHING
A	12	337880	4819350
B			
C			
D			

VERBAL BOUNDARY DESCRIPTION

That portion of the SE 1/4, NE 1/4, SW 1/4, Section 9, T2N, R29E, of the Boise Meridian, better described as follows:

Beginning at a lava stone marking the South 1/4 Corner of Section 9, Township 2 North, Range 29 East of the Boise Meridian, County of Butte, State of Idaho, and running West 129.13 feet along the South side of said Section 9; thence North 1,316.71 feet to a brass cap marking the South East Corner of the Property, the TRUE POINT of BEGINNING; thence North 72°10'11" West 156.00 feet to a brass cap; thence North 17°49'49" East 265.50 feet to a brass cap; thence South 72°10'11" East 156.00 feet to a brass cap; thence South 17°49'49" West 265.50 feet to a brass cap, the TRUE POINT OF BEGINNING.

11 FORM PREPARED BY

NAME / TITLE

Blanche Higgins Schroer, Landmark Review Project

ORGANIZATION — DATE

Historic Sites Survey - National Park Service — 6/12/76

STREET & NUMBER — TELEPHONE

1100 L Street NW.

CITY OR TOWN — STATE

Washington — D.C.

12 STATE HISTORIC PRESERVATION OFFICER CERTIFICATION

THE EVALUATED SIGNIFICANCE OF THIS PROPERTY WITHIN THE STATE IS:

NATIONAL ___ STATE ___ LOCAL ___

As the designated State Historic Preservation Officer for the National Historic Preservation Act of 1966 (Public Law 89-665), I hereby nominate this property for inclusion in the National Register and certify that it has been evaluated according to the criteria and procedures set forth by the National Park Service.

(NATIONAL HISTORIC LANDMARKS)

FEDERAL REPRESENTATIVE SIGNATURE

TITLE — DATE

(NATIONAL HISTORIC LANDMARKS)

FOR NPS USE ONLY

I HEREBY CERTIFY THAT THIS PROPERTY IS INCLUDED IN THE NATIONAL REGISTER

DATE 4/16/84

DIRECTOR, OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION

ATTEST: DATE

KEEPER OF THE NATIONAL REGISTER

UNITED STATES DEPARTMENT OF THE INTERIOR
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Both the core and inner blanket consist of subassemblies, hexagonal in cross-section, filled with cylindrical rods of small diameter. The metallic fuel material is 7.5 inches of uranium enriched in the isotope U-235, with a section of natural uranium blanket above and below it.

Heat generated in the reactor core is transferred to the sodium-potassium coolant in the primary system, which becomes intensely radioactive in the high neutron flux. Heat is then transferred to a second sodium-potassium system, which does not become radio-active, and the secondary heat is used to manufacture steam in a bank of steam generators. Thus, the possibility of contact of radioactive coolant with water, which could be reactive in nature, is avoided. The steam produces operates through a conventional turbine-generator system to reproduce electricity.

The buildings located to the east of EBR-I, although built there prior to 1964 when EBR-I was decommissioned, were not associated with its operation. They were built for use by other reactors between 1955 and 1959. The EBR-I building, and the guard shack to the northeast, although still maintained by DOE, were open to the public as a museum and interpreted by the National Park Service during the summer of 1975.

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Experimental Breeder Reactor #1

In May of 1951 the first attempt to operate the new reactor was unsuccessful, since it was determined there was not sufficient fuel in the core. The next three months were spent acquiring additional uranium and refabricating larger fuel rods. Then, on August 24, Dr. Walter Zinn and his Argonne staff brought EBR-I to criticality (a controlled, self-sustained reaction) with a core about the size of a football.* For the next several months the reactor was placed on low power operation while the scientists observed their new invention.

December 20, 1951, the first historic EBR-I experiment began. The reactor was started and the power gradually increased over a period of several hours. At 1:50 p.m. the first electricity ever generated from a nuclear reaction began flowing from the EBR-I turbine generator and four light bulbs were lit by its power. The next day the experiment was repeated and the reactor generated enough electricity to power the EBR-I building.

EBR-I's chief purpose was to determine whether theoretical calculations on fuel breeding could be realized: that more nuclear fuel could be created in a reactor than it consumed while operating. Less than a year after EBR-I generated its first electricity, Argonne scientists calculated that the reactor could indeed breed fuel. In 1953 a laboratory analysis indicated that EBR-I was producing one new atom of a nuclear fuel for each atom consumed.

With fuel breeding a proven fact, Argonne scientists began to design cores that would increase the breeding ratio so that one reactor could not only sustain its own operation but also produce surplus fuel for additional reactors. Three such improved cores were developed over the next ten years. The last of them--called Mark IV-- produces 1.27 new atoms of fuel for each atom consumed.

Since these earliest EBR-I experiments, scientists and engineers at what is now called the Idaho National Engineering Laboratory and elsewhere have worked to scale up and improve technology pioneered in the relatively small EBR-I power plant. A larger version, EBR-II began operating at the Idaho testing station in 1964. EBR-II has operated safely for more than ten years and has generated enough electricity to supply a city of 35,000 for two years. EBR-II is still basically an experimental model reactor, providing information for development of fuels and composition for even larger breeder reactors.

*Although the core is equivalent in approximate size to a football, its shape and size more nearly match a two-pound coffee can.

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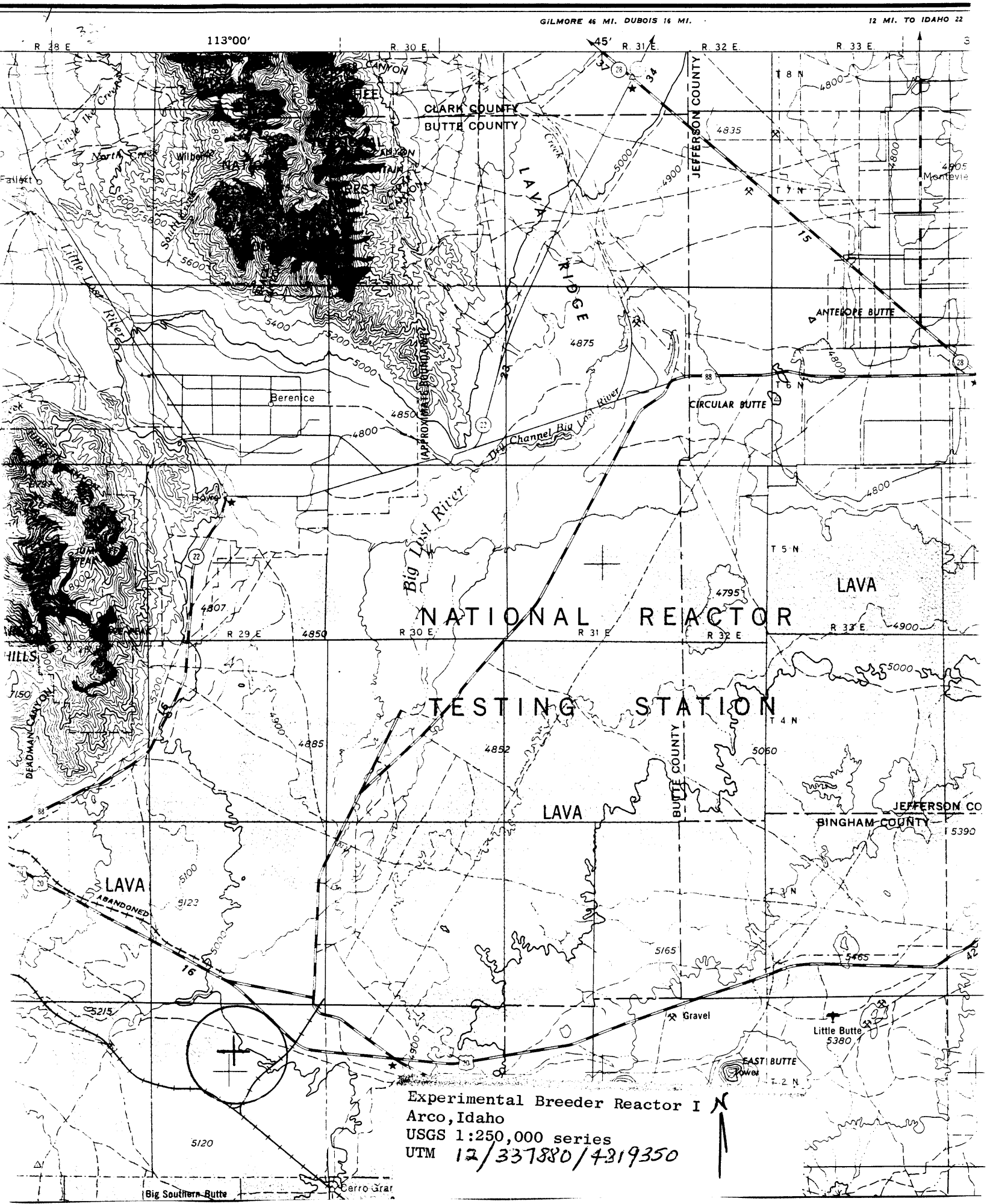
Experimental Breeder Reactor #1

EBR-I was indeed a critical accomplishment in atomic energy research which now has established a power reactor concept utilizing a source of energy more than 2,000 times greater than the world's supply of fossil fuels.

IDAHO FALLS


GILMORE 46 MI. DUBOIS 16 MI.
12 MI. TO IDAHO 22
113°00'
45'
R 28 E
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R 30 E
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R 32 E
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T 7 N
T 6 N
T 5 N
T 4 N
T 3 N
T 2 N
CLARK COUNTY
BUTTE COUNTY
JEFFERSON COUNTY
BINGHAM COUNTY
LAVA RIDGE
Little Lost River
Big Lost River
Dry Channel Big Lost River
APPROXIMATE BOUNDARY
Berenice
Howe
ANTELOPE BUTTE
CIRCULAR BUTTE
EAST BUTTE
Little Butte
5380
Gravel
LAVA
ABANDONED
NATIONAL REACTOR
TESTING STATION
DEADMAN CANYON
Big Southern Butte
Cerro Grar
Experimental Breeder Reactor I
Arco, Idaho
USGS 1:250,000 series
UTM 12/337880/4319350