United States Department of the Interior

NATIONAL PARK SERVICE
1849 C Street, N.W.
Washington, D.C. 20240

IN REPLY REFER TO:

SUPPLEMENTARY LISTING RECORD

NRIS Reference Number: SG100001250 Date Listed: 10/18/1974

Property Name: Experimental and Safety Research Coal Mines

Multiple Name:

County: Allegheny State: PA

This property is listed in the National Register of Historic Places in accordance with the attached nomination documentation subject to the following exceptions, exclusions, or amendments, notwithstanding the National Park Service certification included in the nomination documentation.

Patrick Andrus
Signature of the Keeper

6/26/2017
Date of Action

Amended Items in Nomination:

This property was listed in the National Register of Historic Places on 10/18/1974. The nominating authority has submitted additional documentation and a boundary clarification which were accepted on 6/26/2017. This SLR is issued to make a clarification about the site map depicting the boundary. Note that the dashed line on the boundary map depicts the extent of the underground mines and is not drawn to include the surface area. The only surface features that are included within the boundary are the two buildings (the Fan House and the Mine Control Building) and the Experimental Mine Portals and the Safety Research Mine Portals. The acreage of the 1974 listing has not changed.

SG-1250

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in National Register Bulletin, *How to Complete the National Register of Historic Places Registration Form.* If any item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions.

1. Name of Property

Historic name: Experimental and Safety Research Coal Mines

Other names/site number: Experimental Mine, U.S. Bureau of Mines (Additional Documentation)

Name of related multiple property listing:

N/A

(Enter "N/A" if property is not part of a multiple property listing

2. Location

Street & number: West side of Cochran Mill Road, approximately 2 miles south of Bruceton

City or town: South Park Township State: PA County: Allegheny

Not For Publication: N/A Vicinity: N/A

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended,

I hereby certify that this X nomination ___ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60.

In my opinion, the property X meets ___ does not meet the National Register Criteria. I recommend that this property be considered significant at the following level(s) of significance:

X national **___statewide** **___local**

Applicable National Register Criteria:

X A **___B** **___C** **___D**

Sam Tam / DIRECTOR OF PROJECTS & CONSTRUCTION SERVICES OFFICE 5/12/2017

Signature of certifying official/Title: **Date**

DHHS / CENTERS FOR DISEASE CONTROL & PREVENTION

State or Federal agency/bureau or Tribal Government

In my opinion, the property X meets ___ does not meet the National Register criteria.

[signature] May 2, 2017

Signature of commenting official: **Date**

Deputy SHPO Pennsylvania Historical and Museum Commission

Title : **State or Federal agency/bureau or Tribal Government**

4. National Park Service Certification

I hereby certify that this property is:

___ entered in the National Register

___ determined eligible for the National Register

___ determined not eligible for the National Register

___ removed from the National Register

✓ other (explain:) Accept Additional Documentation and boundary clarification.

Patrick Andrus 6/26/2017

Signature of the Keeper Date of Action

5. Classification

Ownership of Property

(Check as many boxes as apply.)

Private: ☐

Public – Local ☐

Public – State ☐

Public – Federal ☐

Category of Property

(Check only **one** box.)

Building(s) ☐

District ☐

Site ☐

Structure	X
Object	

Number of Resources within Property
(Do not include previously listed resources in the count)

Contributing	Noncontributing	
1		buildings
		sites
1		structures
		objects
2	0	Total

Number of contributing resources previously listed in the National Register 2

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6. Function or Use
Historic Functions
(Enter categories from instructions.)
EDUCATION/Research Facility
INDUSTRY/PROCESSING/EXTRACTION/Extractive Facility
TRANSPORTATION/Road-related (vehicular)

Current Functions
(Enter categories from instructions.)
EDUCATION/Research Facility
INDUSTRY/PROCESSING/EXTRACTION/Extractive Facility
TRANSPORTATION/Road-related (vehicular)

7. Description

Architectural Classification
(Enter categories from instructions.)
_No Style___________

Materials: (enter categories from instructions.)
Principal exterior materials of the property: _CONRETE, METAL GLASS, BRICK____

Narrative Description
(Describe the historic and current physical appearance and condition of the property. Describe contributing and noncontributing resources if applicable. Begin with **a summary paragraph** that briefly describes the general characteristics of the property, such as its location, type, style, method of construction, setting, size, and significant features. Indicate whether the property has historic integrity.)

Summary Paragraph
The Experimental Coal Mine, US Bureau of Mines was listed in the National Register of Historic Places in 1974. The property's original nomination, however, refers to the Experimental Coal Mine alone as configured prior to World War II and provides no documentation for the Safety Research Coal Mine. It identifies the nominated area as 38 acres but does not provide a boundary description or boundary map. Moreover, the nomination does not contain a full statement of significance or a NRHP boundary for the historic property. This current NRHP nomination updates the Experimental and Safety Research Coal Mines' historic context and reevaluates their significance, period of significance, and defines the NRHP boundary. The original nomination counted one contributing structure, the Experimental Mine, and one contributing building, which is unidentified. The nomination adds 1 contributing structure, the Safety Research Mine, and one contributing building; it also identifies the two contributing buildings.

The resources contributing to this nomination include the interior workings and exterior portals of the Experimental and Safety Research Coal Mines, as well as the Mine Control Building (Building 7) and the Fan House (Building 12) at the Pittsburgh research campus of the National Institute for Occupational Safety and Health (NIOSH). The NIOSH campus is located in

Allegheny County, about 13 miles south of Pittsburgh on a 238-acre federally owned property. The Experimental Coal Mine was built in 1910 by the United States Bureau of Mines (USBM) as a "room-and-pillar" type coal mine used for large-scale explosives testing in a real mining environment. The mine features two exterior reinforced concrete portal openings and an extensive underground network of mine workings used for research. Adjacent and connected to the Experimental Coal Mine is the c.1954 Safety Research Coal Mine (SRCM), built by the USBM to test safety equipment and conduct other mine safety experiments. The SRCM also features two reinforced concrete portals and a network of underground rooms that simulates a coal mine of the mid-20th century. Together, the two mines contain four and a half miles of underground workings. The Mine Control Building was completed in 1963 to house control rooms and mine monitoring equipment for experiments in the Experimental Coal Mine. The building was expanded with an addition in 1972. The Fan House was built in 1943 to house the fans and other equipment that control ventilation in the mine.

Narrative Description

Location and Setting

The NIOSH Pittsburgh Campus was originally known as the USBM's Bruceton Research Center after the nearby small town. The property is bordered by McElheny Road to the north, Cochrans Mill Road to the east, and Wallace Road to the south. The campus is shared with the Department of Energy (DOE) and the Department of Labor – Mine Safety and Health Administration (DOL-MSHA). The entire campus includes 114 buildings and the two experimental coal mines. The campus was originally set in an isolated, rural area that is now mostly suburban in character. Residential development surrounds the campus and led to a cessation of explosive experiments in the 1980s. The campus is located in a small east-west oriented valley on the west side of Cochrans Mill Road. It features a varied topography with steep ridges along the western edge transitioning to rolling hills followed by meadow and a stream valley along which Cochrans Mill Road follows. The elevations range from 900' to 1250', with slopes as steep as 80 percent (Jacobs 2002:3.5).

The Main Entry Drive through the campus runs through the bottom of the valley and the center's buildings are mostly arrayed along a network of terraced hillside roads to the south. The NIOSH buildings are for the most part located on the south side of the valley, though there are a few on the north side, and others are scattered in separate locations throughout the campus. The Pleasant Hills Authority Sewage Treatment Plant is situated on the east side of the campus between it and Cochrans Mill Road.

The Experimental Coal Mine and Mine Control Building are located in the historic heart of the campus, where the earliest USBM research was centered. This area is an irregularly shaped hillside parcel bounded on the north by Main Entry Drive and Experimental Drive and on the south by Gate Road. The area includes the two mine portals and originally featured several small experimental laboratories associated with research in the mine. These original laboratories were either altered or demolished years ago and no longer retain physical integrity. The Safety Research Coal Mine is located to the east of this area on the south side of Portal Drive.

Contributing Resources

The Experimental Coal Mine

The Experimental Coal Mine is an example of what is known as a room-and-pillar coal mine. In this type of mine, openings called "entries" are driven horizontally into a coal bed. From the original entries (Photo 17), perpendicular "rooms" are cut into the coal bed, leaving behind "pillars" of coal that support the mine roof. The mine was built to mimic the room-and-pillar mines common in the Pittsburgh district of the early 20th century with a 5-foot high roof, 9 to 10-foot wide entries, and 20-foot-wide rooms. These dimensions reflect the time when coal was mined by hand, before the advent of large mining machinery. Overall, the Experimental Coal Mine retains its underground workings as they appeared at the close of World War II.

The mine's original 1910 section consists of two parallel entries driven southward into the coal seam on the campus's south side (Photos 1 and 2). The entries were originally 700 feet deep with crosscut rooms opened between them every 200 feet. By 1913 these entries were lengthened to 1,300 feet. The western entry is called the Main Entry and was the chief explosion passage of the mine, while the east entry is the Air Course (Photo 7) that provided oxygen during explosions. An additional diagonal entry at a 45-degree angle off of the Air Course portal was connected to a fan used for ventilation of the mine. Additional rooms and crosscut openings were added to the original plan over time but the historic plan remains intact.

The mine was further expanded by 1914 with the excavation of eight new rooms and later an experimental vehicular tunnel to the north of No. 1 and No.2 Left Butt. Room Nos. 4-8 remain in place but were widened in the 1970s to simulate different types of mine entries used in the second half of the 20th century. The oval experimental vehicular tunnel, built in the early 1920s, occupies the original location of Room Nos. 1-3 and was used to conduct automobile tunnel ventilation studies preparatory to the construction of the Holland Tunnel in New York. The vehicular tunnel is intact with an approximately 30-foot high arched roof, which contrasts sharply with the low height of the passage that leads to it. The racetrack (Photos 8 and 9) is an underground resource associated with transportation technology, a historic site within a historic site with its own historic context and significance. Bulwarks secured the racetrack area after the research program ended to protect it and they have preserved the tunnel in situ. The tunnel now has some partition walls as well as temporary framing that were put in place for later tests in that area that could be readily removed to reopen it totally or partially.

Two more entries known as A Butt and B Butt were driven to the east off the Air Course by 1933. They were later connected to the experimental vehicle tunnel.

The roof of the mine is faced throughout with steel open mesh that is bolted into the roof to prevent collapse. The floor is concrete and the walls, or "ribs," are covered in gunite (sprayed concrete) to prevent spalling and control dust. Bulkheads are used to separate and control airflow in the rooms between entries with "submarine" doors.

In addition to its intact configuration, the Experimental Mine has numerous mechanical features related to explosion testing that are well preserved. Metal shelving used to hold coal dust for explosives research (Photo 3) remains in place along its walls. Instrument chambers embedded in the mine's walls are still visible (Photo 4). No chamber was opened during survey but the potential for some intact explosives testing instrumentation exists behind the doors that seal them. The most impressive historic features are located in the ignition zone (Photo 6) at the face of the mine. This zone is slightly more compact than the mine tunnel leading to it. An embedded cannon with a 42" diameter sits at the floor level, an electric match head (18" in diameter) sits above it, and equipment associated with the gas delivery system is also preserved in place (Photo 5). The air course is linked to the main mine course at the face. A circular steel "cap" suspended by a metal yoke from a steel bar still can be manually slid into place to cover the entry to the air course when needed. These electronic and mechanical components range in date from circa 1910 to the cessation of explosive work in 1982.

The Experimental Mine portals are located on the south side of the valley along Portal Drive. The portals are reinforced concrete structures that retain their original design details. The portal on the left that leads to the Air Course entry bears the title "US Bureau of Mines Experimental Mine 1910" and is slightly different in construction having a framing element built at its top which is used for the signage. The portals, framed by shrubbery, are set into a grassy slope. A marker in recognition of the Experimental Mine's listing in the National Register has been placed adjacent to the eastern portal.

The Experimental Mine was originally oriented in this way so that shockwaves from its powerful explosions would deflect off the valley wall to the north and avoid damaging nearby houses and other buildings. Early in its history, the Experimental Mine's support buildings were arranged on either side of its portals in a linear fashion. As the need grew for more facilities, multiple narrow terraces were cut into the slope of the ridge above to provide more building sites. Historic photographs show that the campus's early architecture, functional and diminutive, fit well into the landscape. Today, the small buildings hug the terraces in layers situated above the coal bed through which the mine's main entries were driven. These surface buildings were not counted because they are not substantial in and scale.

<u>Safety Research Coal Mine</u>

The Safety Research Coal Mine (SRCM) is physically and historically linked to the Experimental Coal Mine. The SRCM was constructed between circa 1954-1958 by the Health and Safety Branch of the USBM and reflects how room-and-pillar mine geometries changed in the mid-20th century to accommodate the larger scale of mechanized mining. Where the Experimental Coal Mine had a 5-foot high roof and 9 to 10-foot wide entries, the SRCM has a 6.5-foot high roof and 14-foot wide entries (Photo 12) to make room for new equipment such as continuous mining machines. The SRCM is situated to the east of the Experimental Coal Mine to take advantage of the remaining coal bed. While considered a separate mine when built, the entries and headings on the east side of the older mine were incorporated as part of the newer mine. The two mines were linked together circa 1970 when the Health and Safety Branch transferred the SRCM to the staff of the Experimental Coal Mine.

The SRCM's plan is oblong and the regularity of its rooms (Photo 11) gives it a grid like appearance. It is also a room-and-pillar mine, with a gunited interior and concrete floors. Like the Experimental Coal Mine, the SRCM has two main entries, an Air Course and Main Entry with portals. These main SRCM entries are connected to the Experimental Coal Mine via two extensions of the A and B Butt entries created in the 1920s for tests on the compressibility of coal. The length of the extended A and B Butt entries are about 1,200 feet. There are 18 rooms turned from the entries. The average height of the entries is 6.5 feet in height, and 14 feet wide. The entries are lighted and haulage rail track is laid in the Main Entry, the A and B Butt entries, and to some rooms. Butt End No. 3, a short passage, contains an artifact display with coal-mining related artifacts, a graphic showing how mines are excavated, and an end wall of solid coal (Photo 13). NIOSH mining staff use this area for educational outreach for school groups.

Like the Experimental Coal Mine, the SRCM has concrete exterior portals similar in design but with wider wingwalls (Photo 10). The name of the mine is inscribed above the portal. The two mines are linked by steel bulkheads installed circa 1970 when the Experimental Coal Mine crew became the administrators of both mines.

The Experimental Coal Mine continued to be used for explosion research until 1982 while the Safety Mine was used for ventilation controls and equipment, dust research, miscellaneous training, small mine fire control, miner safety training, general rescue training, and public outreach. Together the linked mines comprise four and a half miles of underground workings.

Mine Control House

A contributing building for the Experimental and Safety Research Coal Mines is the Mine Control House (also known as Building 7), which sits on the hillside above both the Experimental Mine portals and the fan house used to ventilate the mine. The Mine Control House (Photos 14 and 15) was used to monitor the instrumentation installed in the mine. It is a metal building with a rectangular footprint, a poured concrete foundation, a side gable metal roof, and two large picture windows on the north facade used for monitoring explosions. The building's two entrances are also located on the north façade. The control house was built in two sections, with the western half built in 1963 and the eastern half in 1972. The building's two rooms feature open plans. The 1963 section contains monitoring equipment aligned along the walls and the viewing windows. These windows offer a clear view of the Experimental Mine's portals and the area in which an explosion plume (Photo 16) would appear during a test. Most of the control equipment installed in the 1960s appears to be intact. The east room was used as an office and storage space.

Fan House

A contributing building for the Experimental and Safety Research Coal Mines is the Fan House (also known as Building 12), which sits just below the Mine Control House on the hillside above the Experimental Mine. The Fan House (Photo 18 and 19) houses the large fans and other mechanical equipment used to control ventilation in the Experimental Mine. It is a squat, one-story building built into the side of the hill where it is located with a T-shaped floor plan. It has a flat concrete roof with two metal fan exhaust vents on top; the roof has chain link fencing around three sides. The exterior walls are brick and the foundation is poured concrete. The symmetrical façade has five evenly spaced metal door entrances and there is a concrete staircase leading up the hill on the immediate west side of the building.

Integrity

The historic property has all seven aspects of integrity: location, design, materials, workmanship, setting, feeling and association and is able to convey the significance of the USBM's 20th century mission to provide a safe and healthy work environment for miners. While the USBM expanded the mines over time the agency did so in a manner that was consonant with the mines' mission. The setting and feeling of the campus remains industrial but some erosion of this quality has resulted from new construction and with the encroachment of suburban neighborhoods around the campus edges. However, the physical setting of the mines within the campus remains intact.

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing.)

- [x] A. Property is associated with events that have made a significant contribution to the broad patterns of our history.
- [ ] B. Property is associated with the lives of persons significant in our past.
- [ ] C. Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.
- [ ] D. Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations
(Mark "x" in all the boxes that apply.)

- [ ] A. Owned by a religious institution or used for religious purposes
- [ ] B. Removed from its original location
- [ ] C. A birthplace or grave
- [ ] D. A cemetery
- [ ] E. A reconstructed building, object, or structure
- [ ] F. A commemorative property
- [x] G. Less than 50 years old or achieving significance within the past 50 years

Areas of Significance
(Enter categories from instructions.)
SCIENCE
EDUCATION
ENGINEERING

Period of Significance
_1910-1982_________

Significant Dates
_C. 1954-1958_______

Significant Person
(Complete only if Criterion B is marked above.)
_N/A_______________

Cultural Affiliation
_N/A_______________

Architect/Builder
_U.S. Bureau of Mines

Statement of Significance Summary Paragraph (Provide a summary paragraph that includes level of significance, applicable criteria, justification for the period of significance, and any applicable criteria considerations.)

The Experimental and Safety Research Coal Mine is eligible for the NRHP under Criterion A for its association with 20th century government research that directly enhanced the safety of the mining industry. The 1974 nomination identified Engineering and Education as the areas of significance at the national level with a period of significance of 1910-1924. The mines also possess significance at the national level in the area of Science. The period of significance is expanded from 1910-1982. Research in the mines led to breakthroughs in understanding the physical and chemical characteristics of coal dust and methane gas and how they interact with explosives and electronic equipment in a mine environment. Staff applied mine research to produce new explosives that replaced the dangerous use of black powder with a list of permitted explosives that prevented mine explosions. Also developed through mine research were a multitude of new electronic equipment, headlamps, lighting systems, and other safety equipment that reduced the possibility of explosions and increased the likelihood of miners surviving a disaster. The sum of this work led to the prevention of mining disasters and the creation of a safer and healthier work environment for coal miners in the twentieth century. Because the work of the Experimental and Safety Research Mines continued through most of the 20th century the resource meets Criteria Consideration G for properties achieving significance within the last 50 years. The period of significance begins in 1910 with the construction of the Experimental Mine and ends in 1982 when significant experimentation related to the coal industry ceased at this location. The mines are proposed for listing on the NRHP as part of CDC/NIOSH's responsibilities under Section 106 of the National Historic Preservation Act of 1966.

Narrative Statement of Significance (Provide at least **one** paragraph for each area of significance.)

The Coal Bin

Known as "the nation's coal bin," Pennsylvania possesses extensive coal deposits that produced more than half of the nation's coal until the start of the Civil War. Bituminous or "soft" coal is the state's most abundant coal supply, underlying approximately one third of the state's area, mostly in the western part of the state. At its peak of production 29 counties in western Pennsylvania had active bituminous mines, with the most productive being the southwestern counties of Allegheny, Cambria, Fayette, Greene, Washington, and Westmoreland (DiCiccio 1996:1-2).

The significance of readily available soft coal in the Pittsburgh area dates to the original exploration and settlement of western Pennsylvania and Allegheny County in the eighteenth century. European trappers, hunters, and other early explorers noted the existence of rich coal deposits in the riverbeds of the Pittsburgh area as early as the 1740s. By 1758, the British had secured from the French the strategically important triangle of land at the confluence of the Allegheny and Monongahela rivers, which join to create the Ohio River, to establish Fort Pitt, the site that would eventually become the great City of Pittsburgh. Almost immediately, the settlers in and around Fort Pitt began mining soft coal from Coal Hill on the south side of Pittsburgh, an area now known as Mount Washington (DiCiccio 1996:15).

The Commonwealth of Pennsylvania emerged after 1880 as the principal coal and coke producing state in the nation. Connected to the state's production of coal was the local growth of a robust steel industry led by competing magnates Andrew Carnegie and J.P. Morgan, whose ties to both the railroad and steel industries facilitated the creation of their industrial empires (Swetnam 1955:175). Carnegie's Edgar Thomas Steel Works, 12 miles down the Monongahela River from Pittsburgh, was by 1890 producing almost 500,000 tons of steel annually using locally mined coal and coke in its blast furnaces (DiCiccio 1996:67).

The expansion of Pennsylvania's steel industry produced a dramatic increase in the demand for cheap and unskilled labor to mine coal. Unable to provide the labor demanded by the coal industry, the existing work force in the state was augmented by waves of immigrants from southern and eastern Europe. Between 1860 and 1920 only New York attracted more immigrants than Pennsylvania. During that period, Pennsylvania's foreign-born immigrant population grew from 430,000 to 1,400,000 people (DiCiccio 1996:85-87). Thousands of these unskilled immigrants poured into Pittsburgh and the coal fields of western Pennsylvania, where coal mine operators put them to work often untrained and undersupervised in what was one of the nation's most dangerous industries. In addition to routine occupational hazards associated with coal mining such as "miner's asthma," or "black lung," which resulted from the inhalation of coal dust, the combination of untrained miners and generally unsafe mining practices led to scores of coal mine explosions in the late nineteenth and early twentieth centuries. Between 1870 and 1914, in fact, almost 50,000 miners died in mining accidents, many of them in devastating mine explosions caused by the combustion of mine gases and coal dust (DiCiccio 1996:121). These materials were ignited by a number of sources, including open flame miner headlamps and mine lighting systems, sparks from electric mining equipment, and the use of black powder as the chief explosive used to mine coal.

U.S. Bureau of Mines and the Pittsburgh Experiment Station

It was in this context of the expansion of the steel industry and the growing dangers of coal mining that the USBOM and the Pittsburgh Research Center, then the Experiment Station, were created to address issues of health and safety in the nation's coalmines. A series of deadly mine explosions in 1907 and 1908 rocked Pennsylvania and nearby West Virginia and garnered headlines around the nation. Shortly thereafter, the USBOM was created in 1910 by Congress as part of the Department of the Interior (Act of May 6, 1910; 36 Stat. L., 369) and the Pittsburgh Research Center was established. The center was composed of two locations for approximately sixty years; the Central Experiment Station in the City of Pittsburgh, which housed the agency's administration and several research laboratories, and the Experimental Coal Mine used for large scale mine explosions and other research at Bruceton. The Central Experiment Station was first located at a former arsenal on Butler Street (Manning 1919:17) and in 1917 moved to a new building on Forbes Avenue designed by Pittsburgh architect Henry Hornbostel. This building is now part of the campus of Carnegie-Mellon University. By the early 1970s, the operations of the downtown station were moved to Bruceton where ample space allowed for program and laboratory expansion (Tuchman and Brinkley nd: 15).

Even before the tragic coal mine explosions of 1907 and 1908 there was interest in Federal involvement in the mining industry, especially coal mining, as a means to study mine safety and the scientific, technological, and economic forces that shaped the production and use of American industry's primary fuel. In 1891 Congress passed the nation's first, albeit limited, mine safety law that established minimum mine ventilation requirements and prohibited children under the age of 12 from working in mines. It was not until 1941, however, that legislation was passed to authorize federal inspections of mines to enforce safety standards. As early as 1904, the United States Geological Survey (USGS) was authorized by Congress to test and analyze the fuel properties of the nation's coal deposits for the Louisiana Purchase Exposition in St. Louis, Missouri (Mine Safety and Health Administration n.d.).

This work was conducted under the direction of Dr. Joseph A. Holmes, former North Carolina State Geologist and a university professor. By 1908, Holmes was guiding research in mining and the mineral industry in a newly created separate branch of the USGS (Manning 1919:17). In 1910 Holmes was made the first director of the USBOM where he focused his expertise on the problem of the high mortality rate in the U.S. mining industry. He noted in his first annual report that while the western states with mining interests had pushed for federal recognition for the mining industry for years, the real impetus for government action in 1910 was the coal mine disasters that led to “a growing realization of the waste of both life and resources in the varied mining and metallurgical industries” (Holmes 1911:1).

Under Holmes’ leadership the agency focused on providing the mining industry with information on explosive materials and techniques that could be used safely in the presence of coal dust and methane gas, the main causes of coal mine explosions. This research was part of Holmes’ broader mission to reduce the high mortality rate in the mining industry through explosives research, improved mine safety and rescue operations, and techniques to reduce hazards to which mine workers were exposed (Kirk 1994:1; Tuchman and Brinkley nd: 3).

The USBOM was charged with a mission to research health and safety in the mining industry on an entirely unprecedented scale. This made it necessary to update older research techniques and create wholly new technology and methods for studying the agency’s myriad interests, including mine safety, the characteristics of coal dust and methane gas, the use of explosives, the physical and chemical properties of explosions, metallurgy, and mine environments. To these ends, the agency briefly operated a 100-foot long test “gallery,” or aboveground simulated mine entry, at its location in the City of Pittsburgh. Additional material and equipment was gathered at this location and formed the first official USBOM headquarters under the supervision of engineer H. M. Wilson.

Experimental Coal Mine

Finding the urban facility too limited in its abilities for explosives testing, the Bureau leased a 38-acre coal bed from the Pittsburgh Coal Company in Bruceton, a tract that forms the original nucleus of the present research center. The USBOM bought the property outright from the coal company in 1924 along with several adjacent parcels. On this site in 1910 the agency constructed the Experimental Coal Mine to test explosives on a much larger scale and, significantly, in a real coal mine environment. Scientists in several European countries such as Austria and England had been experimenting for years with coal dust explosions in test galleries and underground tunnels, but nothing of the magnitude envisioned by the USBOM had ever existed before (Rice et al. 1913:17).

Several factors influenced the decision to locate the Experimental Mine at Bruceton. At first, the USBOM sought an existing coal mine, which would be suitable for its work, but the agency could not locate one that possessed all the necessary requirements, including the following:

> 1-The agency wanted the mine to be located in a coal bed that produced sufficient dust to produce explosions;
>
> 2-The mine needed to be relatively free of natural methane gas so that coal dust tests could be conducted without the added complication of flammable gas, but a nearby natural gas pipeline was necessary to supply gas for controlled experiments;
>
> 3-The mine needed to be naturally dry so that the coal dust remained free of moisture, but a nearby water source was necessary for boiler use, fire protection, and experiments;

4-The agency wanted a mine with horizontal "drift" openings, rather than a vertical shaft, because drift openings are easier to reopen after an explosion;

5-Finally, a nearby railroad line was necessary to ship coal and other materials in and out of the mine location (Rice et al. 1913:18).

The Bruceton location met all of the USBOM requirements, offering a section of the renowned Pittsburgh coal seam in which many large coal-dust explosions had occurred. The Pittsburgh seam underlies four states, including much of western Pennsylvania, covers 5,729 square miles and is the most valuable bituminous coal deposit in the state of Pennsylvania (DiCiccio 1996:12). The Bruceton site had the added benefit that it was isolated and situated in such a way that powerful explosions from the mine were deflected upward by the adjacent valley wall, reducing potential damage to dwellings in the vicinity.

The strata encountered by the mining engineers in 1910 at the Experimental Mine site were described in the 1913 USBOM Bulletin. The coal bed at the Bruceton site averages about five and a half feet in thickness and is overlain by a layer of soft shale or draw slate ranging in depth from a few inches to two feet. The slate, removed by picks or light shot was covered by a shaly layer of "top coal" or a coal roof about one to two feet thick, and then sandstone. The floor below the coal bed at the mouth of the Experimental Mine is clay, about two to three feet thick, underlain by limestone. Future coal from the Experimental Mine, mined under non-commercial circumstances offered by the Bureau, would become the source of standard samples for the Pittsburgh coal seam whenever such a sample was needed. It continues to be the source for standard samples.

Excavation of the Experimental Mine entries began in December of 1910 with the first few support and laboratory buildings erected shortly thereafter (Wilson et al. 1912:29). The mine is similar to typical early twentieth-century "room-and-pillar" type coalmines of the Pittsburgh district. A room and- pillar mine refers to the architecture of an underground mine in which rectangular areas have been mined, leaving "pillars," once part of the coal bed, to support the mine roof. Left at regular intervals, the pillars define the "rooms," rectangular areas where coal has been removed.

The Experimental Mine has a five-foot high roof, entries that are nine to nine and a half feet wide, and rooms that are 20 feet wide. The low roof and narrow entries reflect the time when coal was mined by human hands, before mines were mechanized with large machinery. Rice et al. (1913:25) note that the "regular method of mining in the Pittsburgh district consist [sic] of undercutting the coal either by hand or with machines, generally the latter, and then blasting down with two shots in entry work, or two or three shots in the rooms. In general, through the gas and steam coal districts about one-third of the coal produced is nut coal or finer, and two-thirds is 'lump.'" It is likely that the Experimental Mine coal, considered "gas-coal," was originally extracted using small-scale machines.

In 1911 when the first explosion test occurred, the layout of the Experimental Coal Mine consisted of two parallel entries, ranging between nine and nine and a half feet in width, driven southward into the hillside of a narrow valley and running southward approximately 700 feet. By September 1912, the entries were driven further into the hillside, extending back 1,260 feet. The west entry, called the main entry, was to be the main explosive passage while the east entry was the airway. The dual entries, main entry and air course, allowed regular air flow and "stub" entries were to be added later to recreate stagnant air conditions. Three crosscuts, or "cutthrough," were opened between the two entries every 200 feet creating "rooms" (Wilson et al. 1912:30). A third diagonal heading was constructed measuring almost 200 feet in length and approximately 6 feet wide and high. It connected with the mouth of the air course at a 55-degree angle for additional ventilation that was supplied by a reversible centrifugal fan driven by a steam engine. The third heading contained a 122-foot long steel external explosion gallery, a pipe like chamber used to safely conduct explosion tests. The centrifugal fan was attached to the gallery, a duplicate of the gas and dust gallery located at the Pittsburgh station. The gallery was incorporated into the third heading to accommodate special experiments and its hillside opening was protected with an earthen barricade.

Some support cross-timbers were used but the natural roof was strong enough to support itself. The sides of the entries were fitted with side posts from which shelving was hung. The shelving would contain the coal dust needed for coal dust explosion research. The posts were later recessed into the rib to protect them during blasts. Instrument stations built into the coal rib and lined with reinforced concrete were constructed to house the recording manometers and circuit breakers that collected scientific data. Manometers were used to measure the pressure curve of the explosion and the circuit breakers allowed velocity records and the use of automatic gas sampling equipment. Two instrument stations were built in the main entry at 40 and 140 feet from the portal and others were located in the gallery for the first test (Wilson et al. 1912:34). Finally, a 42-inch gage track was laid in each entry for the 24 coal cars acquired and to facilitate materials handling such as the truck with a mounted cannon used for coal dust ignition experiments as well as other equipment (Rice et al. 1913:13).

The reinforced concrete mine portals were positioned to face north to the adjacent valley wall. Both are similar in appearance featuring retaining walls, wing walls, and buttresses but the west portal, constructed first, was more substantially built with heavily reinforced concrete. The walls and buttresses lie on the limestone subsurface three and a half feet below the coal. Steel rods of three diameters were positioned vertically, diagonally, and horizontally for reinforcement in the portal where explosions were to occur. The wing walls also served as retaining walls for the roof shale and dirt that covered the tunnel arch. A counterweighted door was under consideration in 1913 but does not appear to have been added. The air course portal was added when funding became available, probably in 1912.

Rice et al. (1913:21-24) discuss at length the lining or "guniting" of parts of the entries. Gunite is a sprayed-on concrete that adheres to the naturally irregular walls and was used to eliminate dust from the testing zone, as a cleaning aid, and as a structural aid to protect the roof and ribs during explosion testing (Rice et al 1913:2). The lining of the outer part of the entries was needed due to the "poor roof" which had to be supported by heavy timbers while the entry was being driven. The timber solution was temporary as it could not meet the needs of explosion testing so a reinforced concrete lining was chosen based on a type of lining used in the Bethune coal mines, Pas de Calais district, in northern France designed by J. Lombois, engineer (Rice et al. 1913:21). The sidewalls were six to nine inches thick or thicker and the arch was about seven inches thick. The arch, which was finished smooth, is eight feet high at the portal but loses six inches in height in the interior. Rice notes that the lining was extended during the first series of experiments - 169 feet into the main entry, the entire diagonal heading was lined, and the air course was lined 65 feet - and that steel pipes were placed behind the lining wall containing electrical cables, compressed air-line, and a two–inch water main with hydrant boxes. Where the entries were unlined, the entries were nine feet in width and possessed a height of six to seven feet. Lining these mines entries with gunite continued so that by 1933, the roof and the ribs of the explosion zone were lined and the floors concreted. Eventually, the entire "standard test zone" for explosions would be gunited.

The USBOM purchased the Experimental Mine and surrounding acres in 1924 and conducted explosions in the Experimental Mine until increased suburban development, which began encroaching on the area in the 1960s, forced the center to cease large-scale explosive tests in the 1980s.

Early research tests in the Experimental Mine focused primarily on the interaction of explosives with airborne coal dust. These experiments revealed that, contrary to popular belief among miners, coal dust alone was capable of igniting devastating explosions even in the absence of methane gas. Given these observations, the USBOM worked to identify and classify "permissible" explosives, those with temperatures low enough and flames short enough to be considered safe in a flammable coalmine environment. This work led to the gradual replacement of black powder, the very dangerous but universally used explosive in the U.S. mining industry, with safer but equally productive explosives. Also significant were experiments in the proper ventilation of methane gas, laboratory tests on the flammability of coal dust, and the use of pulverized rock dust, water, and other quenching agents to arrest explosions before they destroy an entire mine (Tuchman and Brinkley nd: 4-6).

Initial work was carried out under the guidance of George S. Rice, chief mining engineer, and his team: L. M. Jones, engineer; H. L. Smith, assistant mining engineer; H. C. Howath, mine foreman; J. K. Clement, physicist; and W. L. Egy, assistant physicist (Wilson et al. 1912:41). Rice, Jones, Howath, and Egy would still be associated full time with research at the Experimental Mine in the early 1920s as engineers and physicists. In addition, a full-time superintendent, a carpenter, mine driver, and about 18 laborers worked on site. The laborers were employed on an as-needed basis (Powell 1922:61).

Other early experiments investigated the use and permissibility of electrical and motorized mining equipment, which sometimes caused sparks or electric arcs that resulted in mine explosions. This research led to the USBOM development of new safety equipment, including "portable electric mine lamps, explosion-proof motors, storage-battery locomotives, mine-lamp cords, flash lamps, flame safety lamps, gas detectors, danger signals, and coal-cutting apparatus" (Powell 1922:10). Several examples of this equipment are currently on display in exhibit cases at the Bruceton research center. To better understand the specific physical and chemical characteristics of mine explosions, the USBOM also used instruments such as the Bichel Gauge to measure the speed of explosions, the pressure produced, and samples of resulting gases (Powell 1922:9).

The USBOM mission to improve mine safety began with a grand public demonstration of equipment and techniques on October 30 and 31 of 1911 at both its headquarters in Pittsburgh and at the Bruceton Experimental Mine. Thousands of mine operators and miners, as well as President William H. Taft, attended the demonstrations of mine safety and first-aid techniques at the central station in Pittsburgh, and of these, 1,200 people attended a coal-dust explosion at the Experimental Mine that demonstrated the violence and danger of such an event. Writing about the impact of the demonstrations, the USBOM claimed “since this demonstration, the organization of first-aid corps and of rescue corps has been undertaken at mines where there had previously been no such organizations. The Bureau has received letters of commendation attesting the value of the demonstration in drawing attention to the dangers and to possible means of greater safety in mining” (Wilson et al. 1912:7). The demonstrations coincided with a program initiated by Holmes to equip railroad cars as mobile mine safety and rescue stations. These cars, which could be dispatched to the site of mine emergencies, also traveled to coal fields in the region to train miners and mine operators in first aid, rescue work, and mine safety (Tuchman and Brinkley nd.: 5).

By the time of the explosion demonstration, the USBOM had constructed its first complex of laboratory buildings and equipment at Bruceton. The USBOM’s Bulletin 56 from 1913 listed a building and equipment inventory including an “external explosion gallery, ventilating fans, a power plant, a coal-dust and rock-dust crushing and grinding plant, an observatory and control station in which recording instruments are placed, an incline, a coal tipple and chute for loading railroad cars, a reservoir, pump house, blacksmith shop, barn, tool house, and a water-tank and hydrant system for fire protection” (Rice et al. 1913:26). Most of these early utilitarian buildings were small and of frame construction with simple wood siding and metal gable roofs. The buildings resembled those built at mining camps and towns throughout the region. An exception was the observatory, which was built of heavy reinforced concrete with small windows through which the test explosions were watched. Few of these original buildings remain at Bruceton.

Shortly after the Bruceton location acquired its first few support buildings, the USBOM secured an appropriation to build a state of the art new administrative and research building in the Oakland neighborhood of Pittsburgh. Replacing the inadequate former arsenal facility that the agency had inhabited since 1910, the Central Experiment Station, also known as the Pittsburgh Experiment Station, was built in 1917 at 4800 Forbes Avenue. The building was designed by renowned Pittsburgh architect Henry Hornbostel (1867-1962), in a restrained neo-Classical style. Hornbostel also designed much of the Carnegie-Mellon University Campus, of which the Central Experiment Station is now a part. It was in this new building that the USBOM conducted much of its innovative laboratory research while all explosives testing was done at the Bruceton campus. The Central Experiment Station was listed in the National Register of Historic Places in 1973 for its significance in architecture and engineering (Kimmel 1973).

A Broader Mission for the USBOM

Early in its history the USBOM realized that much of the research done at the Pittsburgh Research Center had broader applications for industry, municipalities, and the military. The USBOM developed a close relationship with the military beginning in World War I. Coal dust testing was suspended in 1918 during the war to allow USBOM researchers to dedicate their efforts to wartime research and defense. These years witnessed testing and research in military mining techniques, sound ranging, gas mask and rescue apparatus development, explosives testing, and high pressure helium storage and brought about new research partnerships that engendered special research projects that made use of the Experimental Mine's research potential.

On the municipal front, the USBOM's cutting-edge mine ventilation research led to agency cooperation in the 1920s with engineers building the Holland Tunnel connecting New York City and New Jersey. Research on this topic was conducted in an underground oval track, or "race track," built specially for the study in the mine's interior, 1,050 feet from the mouth of the mine and approximately 130 feet underground with an axial length of 400 feet (Fieldner and Paul 1921). It is referred to as the "experimental vehicular tunnel" in the USBOM records.

Construction of the vehicular tunnel began in 1919 when two left entries, No. 1 Left Butt and No. 2 Left Butt, were driven 525 feet from the main air course entry and eight rooms were extended from the entries to obtain coal for fuel for the site's steam boilers (Rice et al. 1927:2, 10-12). Rooms 1-3, closest to the entries but sufficiently distant from the mouth of the mine, were selected for the racetrack site. To truly create a model of the proposed Holland tunnel "about one-third in scale in cross section and elliptical in plan," required that an additional ten feet of the roof be excavated within the tunnel area. On completion of the tests, heavy bulkheads were put in place at the tunnel entrances to protect it during future explosion testing. Notably the outline of the rooms still appears on plans showing the mine's early configuration before the oval was built. Fuel for the site's energy was supplied during the ventilation testing from a room driven off No. 1 Right Butt.

The oval track simulated conditions in the Holland Tunnel and allowed test cars to drive around the track while USBOM instruments recorded carbon monoxide levels as well as "the effects of temperature, humidity, airflow rate, smoke, and exhaust gases on the drivers" (Tuchman and Brinkley nd.:6-7). Construction on the Holland Tunnel was begun in 1920 and, with help from the USBOM, completed in 1927. The ventilation system design founded on "elaborate theories of physiological and mechanical tests conducted by the U.S. Bureau of Mines" forced fresh air at the ceiling over the entire length of the twin tunnels (8,500 feet). The design is considered to be the landmark for all vehicular tunnels that followed it (American Society for Mechanical Engineering 2006). Carbon monoxide detectors developed at the Experimental Mine were also installed in the Liberty Tunnels in Pittsburgh.

The suspension of coal dust explosion research from 1918 through 1923 to accommodate wartime research and then projects such as the vehicular tunnel and ventilation tests occurred when disasters from coal dust explosions appeared to be on the decline. This changed abruptly as mining disasters claimed the lives of 26 men in 1921, 286 men in 1923, and 445 men in 1924.

All were due to coal dust explosions (Rice et al. 1927: viii). Some of these explosions could have been prevented or lessened by rock dusting, using rock dust in manufactured barriers or by broadcasting methods. Previous research at the Experimental Mine had shown the advisability of rock dusting but the American mining community had not followed the scientific guidance developed by the Bureau researchers. Conversely, European mines had already moved forward on this safety method; government agencies in both England and France had approved and made mandatory rock dusting.

In 1923, a vigorous and successful campaign was initiated to educate "mining men" about the need for rock dusting. The USBOM entered into a cooperative agreement with the British Mines Department for joint research purposes. This agreement led to an exchange of ideas and personnel and ultimately helped the cause for rock dusting in the United States as leading figures in British mining were able to discuss the merits of compulsory rock dusting in England with the American mining community. Rock dusting methods became the focus of the Bureau's research and information requests from state officials, mining companies, and insurance companies led to the publication of Serial 2606, which contained the specifications for rock dusting. The specifications were approved by the American Engineering Standards Committee and as rock dusting was adopted industrywide further research was needed for special rock dust treatments and the development of "recommended barriers" to fit the many diverse conditions encountered in American mines (Rice et al. 1927: viii-ix).

George Rice, the chief mining engineer, set the program for this work at the Experimental Mine and was assisted by J. W. Paul, chief of coal mine investigations. Two men worked directly on site on the coal dust explosibility tests: H. P. Greenwald, a physicist in charge of the instrumentation and test data interpretation and H. C. Howarth, mine superintendent. H. C. Howarth, who dealt with the miners and laborers and the physical details of preparing for the tests, received high marks from Rice: "the admirable manner in which he [Howarth] has kept the mine in condition for all tests and experimental work has permitted reliable records to be obtained whose consistence is remarkable in view of the complicated nature of the explosion tests." Chemical analysis was conducted by A. C. Fieldner at the downtown Pittsburgh experiment station assisted by V. C. Allison, chemist (Rice et al. 1927: xi).

Between 1925 and 1932, the mine was extended by the completion of Rooms 7 and 8 off the No. 1 left butt entry and a new set of entries were begun off the air course near the pit mouth. After survey of an old wagon mine located to the south, the plan for future extension of the interior left entries was affected as the old workings were more extensive than previously thought (Rice et al. 1927:12). Instead, the new entries closer to the pit mouth would allow the engineers to develop the full extent of the coal bed they had acquired. A small passage off the B Butt was used for tests of compressibility and the bearing strength of the Pittsburgh coal bed. Other changes included the extension of the standard test zone in 1931. The extension called for the concreting of the floors, guniting of the roof and ribs, and the installation of wall shelves for testing (Rice et al. 1933: 6). The switch to electrical power from steam at the site lessened the need for coal for fuel and this change led to no other major extensions at the mine prior to World War II. A 1940 discussion of explosion tests notes the presence of "explosion proof stoppings" between the main entry and air course that when closed were gas tight (Hartmann et al. 1940:16). To better control the expanded mine's ventilation and air flow, key variables in many of the site's experiments, the Fan House (Building 12) was built in 1943.

During these years, knowledge of the science of explosions was continually being defined and the USBOM researchers also used tests as an opportunity for educational demonstrations as well as to gather data. Demonstrations for the Mine Inspectors Institute of America, the American Institute of Mining and Metallurgical Engineers, the Coal Mining Institute of America, the International First Aid and Mine Rescue Contest, and the Second International Conference on Bituminous Coal brought between 50 and 300 spectators to the Experimental Mine property (Rice et al. 1933: 44).

Mine and Explosives Testing Station, World War II and Beyond
During World War II, a national weapons complex developed to produce an atomic bomb that wedded facilities and personnel across the nation from the government, universities, and business contexts in an unprecedented manner into a national defense effort under the Manhattan Project. The Bruceton Research Center was a part of that complex. Its role was in explosives and gun propellant research as part of the US Navy's Explosives Laboratory under the National Defense Research Committee (NDRC) at Bruceton. In 1943, two avenues of research were on the table for triggering a nuclear explosion: implosion or detonation by guns. Implosion meant that the fissionable material might be assembled by detonating a high explosive around a hollow sphere and crushing it into a critical mass. How to actually accomplish this was uncharted territory unlike gun manufacture, albeit with uranium and plutonium bullets and targets, at which the nation's armory was already proficient.

Implosion had been proposed early but advocates such as Richard Tolman, a professor of physics at Cal Tech and vice-chairman of the NDRC and Seth H. Neddermeyer, also a Cal Tech physicist championed it. Neddermeyer, working with Oppenheimer at Los Alamos as head of Ordnance Engineering Group (E-5), requested support for implosion research. For him, implosion appeared more promising particularly as the materials needed could be more quickly assembled than the guns and time was critical. Neddermeyer began his research at Bruceton where he studied high explosives. George B. Kistiakowsky, a Harvard chemist, headed up the effort at Bruceton, supervising the fabrication of "implosive charges" for experiments: "Neddermeyer and Edwin M. McMillen, a University of California physicist who traveled there [Bruceton] with him, were impressed that when a shell of explosives surrounding an iron pipe was set off, it closed the pipe. They returned to Los Alamos to repeat the experiment…" (LANL 2006).

One of the central issues was the need for symmetry in the implosion so that an efficient nuclear reaction would occur. Explosive lenses, a principle that had been studied at the U.S. Navy's Explosives Research Laboratory at Bruceton and in England offered promise but Kistiakowsky and his staff, galvanized at what they had learned, had to learn from experiments on what type of precise geometric design would work and how to manufacture what was needed (Hewlett and Anderson 1990:313). This early research at Bruceton was pivotal for researchers at the Los Alamos National Laboratory who eventually developed an effective implosion technique. The Trinity Test conducted on July 16, 1945, in New Mexico and based on the implosion design is considered to be the dawn of the atomic age (Gosling 1994:48).

During WWII and continuing through the Cold War, the USBOM shifted its attention to the military's interest in "'strategic and critical' minerals and materials required to support the defense and industrial needs of a growing economy." The Bureau's interest in strategic and critical minerals had international scope and led to the publishing of the annual USBOM *Minerals Yearbook* chronicling mineral industry activities in over 160 countries (Kirk 1994:3).

In the 1950s the Health and Safety Branch of the USBOM, headquartered at the Bureau's Forbes Avenue building, began opening a new mine at Bruceton called the Safety Research Coal Mine. According to Mr. George Bercik, former USBOM Mine Superintendent at Bruceton, the Bureau began construction of the Safety Research Coal Mine circa 1954 and finished it circa 1958 (Bercik 2006). The new mine was opened in the coal seam adjacent to the east side of the Experimental Coal Mine, and it featured twin reinforced concrete portal entries and a room-and-pillar design much like the Experimental Mine. The most obvious difference between the old and new mines were the entries, which were broader and taller in the Safety Research Coal Mine to reflect the new age of large-scale mechanized coal mining.

The construction of this new mine reflected the broader scope of research that the USBOM embraced in the second half of the twentieth century, as mechanized mining practices and the exploitation of deeper, less accessible minerals introduced new safety hazards to the industry. To the Pittsburgh Research Center's traditional research with explosions and explosives were added new work with modern mining health hazards such as respirable dust, methane ventilation, noise control, industrial hygiene, and the environmental and conservation issues associated with mining. Some of these hazards had always been plagues in the mining industry, but the larger scale of modern mining made them even more dangerous and demanded increased attention. The Safety Research Coal Mine facilitated new experiments in ventilation, mine fire control, instrument testing, and post-disaster survival and rescue training. The mine was administered under the auspices of the Health and Safety Branch until circa 1970, when it was transferred to the staff of the Experimental Coal Mine, under whom it remains operated (Bercik 2006; Tuchman and Brinkley 10).

The construction of the Safety Research Coal Mine in the 1950s anticipated the passage of the 1969 Federal Coal Mine Health and Safety Act, the most comprehensive and stringent law in the history of federal mining legislation. This law established stronger mine health and safety standards, a framework of multiple annual inspections for mines, increased federal enforcement powers, and created heavy financial and criminal penalties for violators of mine health and safety standards (Mine Safety and Health Administration 2006). The 1969 law also substantially increased federal funding of mining health and safety research, a development that had a striking effect on the built landscape of the Pittsburgh Research Center.

With increased funding the USBOM in the early 1970s transferred most of the research activities from the Bureau's Forbes Avenue building to Bruceton, where there was room to expand older buildings and construct new ones to accommodate new laboratories and equipment. It was during this period that Bruceton's historic buildings and landscape, which began to take shape in 1910, were dramatically changed to meet the needs of modern mine health and safety research. Several early buildings arrayed along Portal Drive were demolished and replaced, including the

Experimental Mine Observatory, the Boiler House, and the Grinding House. Other older buildings were expanded with substantial additions such as Building 1 (Administrative Offices) and Building 30 (Photo Lab) or remodeled with new materials and designs such as Building 2 (Laboratories and Offices) and Building 41 (Video Editing).

With the energy crisis of the 1970s looming over the nation, the USBOM enhanced its programs to increase the efficiency and production of coal through new equipment and techniques. To this end the Bureau constructed the Mining Equipment Test Facility (METF), a one-of-a-kind resource, on nine acres at the Bruceton campus. The centerpiece of the METF is the mine roof simulator, which is capable of producing three million pounds of downward force to conduct load tests for mine roof supports and other experiments with mine roof dynamics (Tuchman and Brinkley nd:15).

As previously mentioned, by the 1980s Pittsburgh's suburban growth had reached Bruceton, forcing the USBOM to halt explosions in the Experimental Mine. Not only were the explosions loud and disturbing to the center's new residential neighbors, they were also potentially damaging as concussive waves of air emitted from the mine could shatter windows in the vicinity. To continue its research the USBOM established in 1982 the Lake Lynn Laboratory, a 400-acre tract near Fairchance, Fayette County, Pennsylvania, that contained a former limestone mine. The Bureau assembled a handful of new laboratory buildings and equipment stations and resumed large-scale explosions and mine fire research. Like the earlier Experimental Coal Mine and Safety Research Coal Mine, the Lake Lynn mine accurately simulates contemporary coalmines with wide entries supported by modern roof support techniques.

The research of the Pittsburgh Research Center in Bruceton had done much to reduce the numbers and severity of coal mine explosions, but explosions still occurred during the decades leading up to the construction of Lake Lynn Laboratory in the early 1980s. An explosion at the Farmington Mine in 1968 and the Sunshine Mine fire disaster in 1972 revealed that an updated research facility was necessary to replicate modern mine sizes and configurations, including those of the heavily mechanized new method of longwall mining, which the Experimental Coal Mine and Safety Research Coal Mine in Bruceton were not capable of providing. The wishes of the USBOM were answered at Lake Lynn, which not only offered an isolated setting for explosion research, but also provided the "old workings" of the former limestone mine as a starting point for a series of new mine entries representative of modern coal mines (Mattes et al. 1983: 2-3).

The Experimental and Safety Coal Mines at the Pittsburgh Research Center represent nearly a century of USBOM innovation in mine safety and health research. Faced with a frighteningly high mortality rate in the mining industry through the nineteenth and early twentieth centuries, the USBOM used the Experimental and Safety Coal Mines as scientific tools to identify and eliminate the causes of coalmine explosions and other hazards. The Bureau worked with industry leaders to disseminate this research through publications, conferences, and live demonstrations of explosions at the Experimental Mine. The USBOM mission eventually broadened in the twentieth century as the Bureau realized its research had applications for the military, industry, and municipalities. The Experimental Mine was a pivotal tool used to design the Holland

Tunnel, and research at Bruceton also contributed to the Manhattan Project's development of nuclear implosion. Though mining disasters continued to occur through the twentieth century, and even to the present, the Bureau's work drastically improved the working conditions within the mineral industry and helped reduce the number of coal mine explosions.

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Previous documentation on file (NPS):

____ preliminary determination of individual listing (36 CFR 67) has been requested
_X__ previously listed in the National Register
____previously determined eligible by the National Register
____designated a National Historic Landmark
____ recorded by Historic American Buildings Survey #____________
____recorded by Historic American Engineering Record # __________
____ recorded by Historic American Landscape Survey # ___________

Primary location of additional data:
_X_ State Historic Preservation Office
____ Other State agency
_X_ Federal agency
____ Local government
____ University
____ Other
Name of repository: _NIOSH Technical Library, Pittsburgh Research Center, Bruceton, PA

Historic Resources Survey Number (if assigned): __N/A______________

10. Geographical Data

Acreage of Property _38 acres_______

Use either the UTM system or latitude/longitude coordinates

Latitude/Longitude Coordinates (decimal degrees)
Datum if other than WGS84:__________
(enter coordinates to 6 decimal places)

1. Latitude: 40.305881 Longitude: -79.984339
2. Latitude: 40.305709 Longitude: -79.977294
3. Latitude: 40.301333 Longitude: -79.976998
4. Latitude: 40.301182 Longitude: -79.984165

Or

UTM References

Datum (indicated on USGS map):

☐ NAD 1927 or ☐ NAD 1983

1. Zone: Easting: Northing:
2. Zone: Easting: Northing:
3. Zone: Easting: Northing:
4. Zone: Easting : Northing:

Verbal Boundary Description (Describe the boundaries of the property.)
The boundary is shown on the "Experimental and Safety Research Coal Mines, Allegheny County, PA, Site Plan" at a scale of 1" = 160'.

Boundary Justification (Explain why the boundaries were selected.)
The proposed boundary includes all features that have historically been associated with the Experimental and Safety Research Coal Mines, including their entire underground workings, the coal bed in which they are located, their portals, and the Mine Control Building.

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11. Form Prepared By

name/title: David Price/Historian/Architectural Historian
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e-mail dprice@newsouthassoc.com
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date: August 20, 2009

Additional Documentation

Submit the following items with the completed form:

- **Maps:** A **USGS map** or equivalent (7.5 or 15 minute series) indicating the property's location.

- **Sketch map** for historic districts and properties having large acreage or numerous resources. Key all photographs to this map.

- **Additional items:** (Check with the SHPO, TPO, or FPO for any additional items.)

Photographs

Submit clear and descriptive photographs. The size of each image must be 1600x1200 pixels (minimum), 3000x2000 preferred, at 300 ppi (pixels per inch) or larger. Key all photographs to the sketch map. Each photograph must be numbered and that number must correspond to the photograph number on the photo log. For simplicity, the name of the photographer, photo date, etc. may be listed once on the photograph log and doesn't need to be labeled on every photograph.

Photo Log

Name of Property: Experimental and Safety Research Coal Mines

City or Vicinity: South Park Township

County: Allegheny State: PA

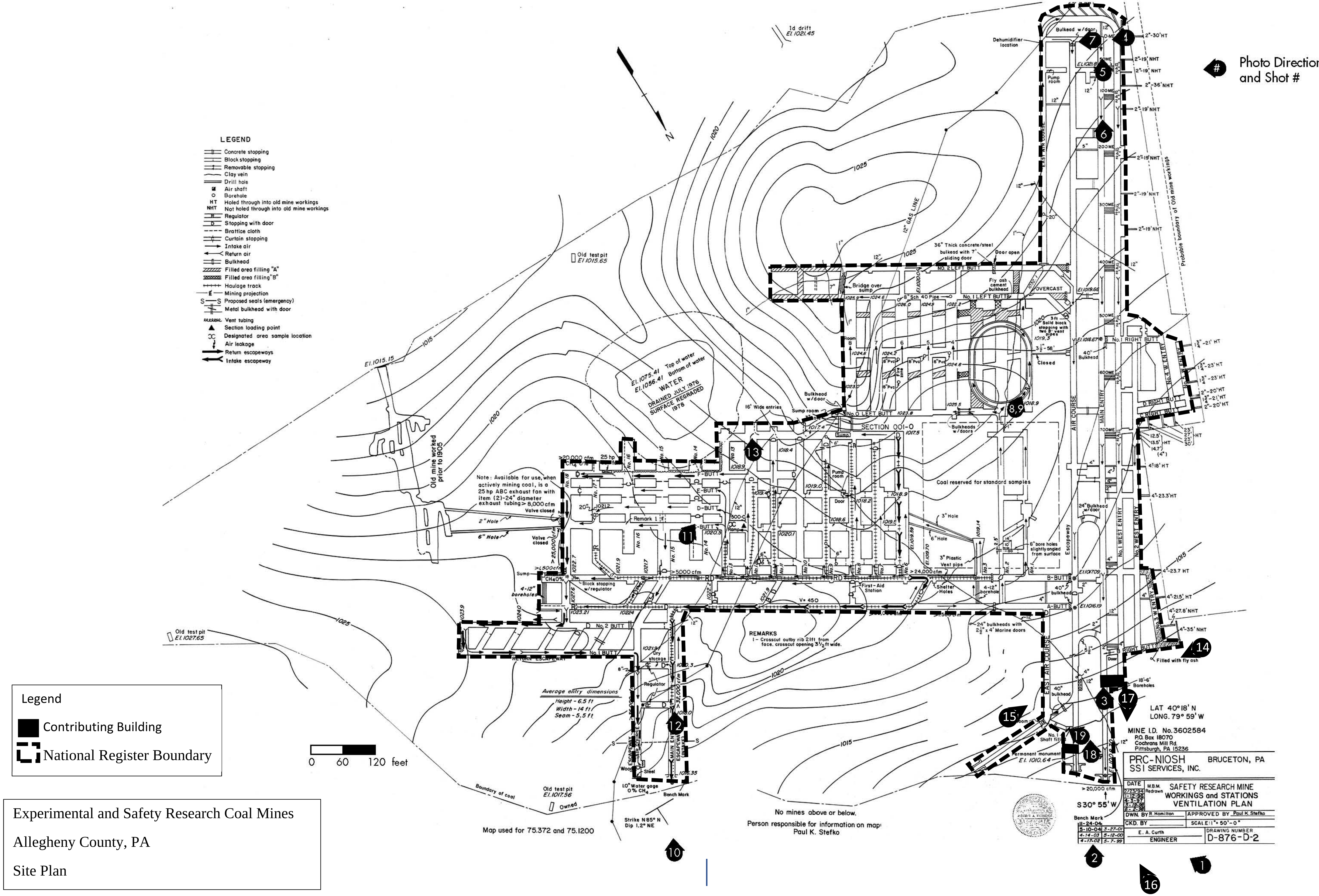
Photographer: David Price and Mary Beth Reed (Photos 1-8; 10-15; and 17-19); USBOM (Photos 9 and 16).

Date Photographed: February 2006 (Photos 1-8; 10-15; and 17-19); Photos 9 and 16 are historic photos.

Description of Photograph(s) and number, include description of view indicating direction of camera:

Photo Number	Description	Direction
1	Setting of Experimental Mine Portals	SE
2	Detail of Experimental Mine Portals	S
3	Experimental Mine Supervisor Paul Stefko Showing Original Coal Dust Shelves On Mine Roof and Walls	SW
4	An Original Preserved Instrument Chamber Near Ignition Zone of Mine Face	E
5	Experimental Mine Supervisor Paul Stefko Showing Face of Mine and Preserved Cannon, Lighter, and Gas Delivery System, Circular Entry to Air Course on Left	SW
6	Experimental Mine Supervisor Paul Stefko Approaching Mine Ignition Zone	SW

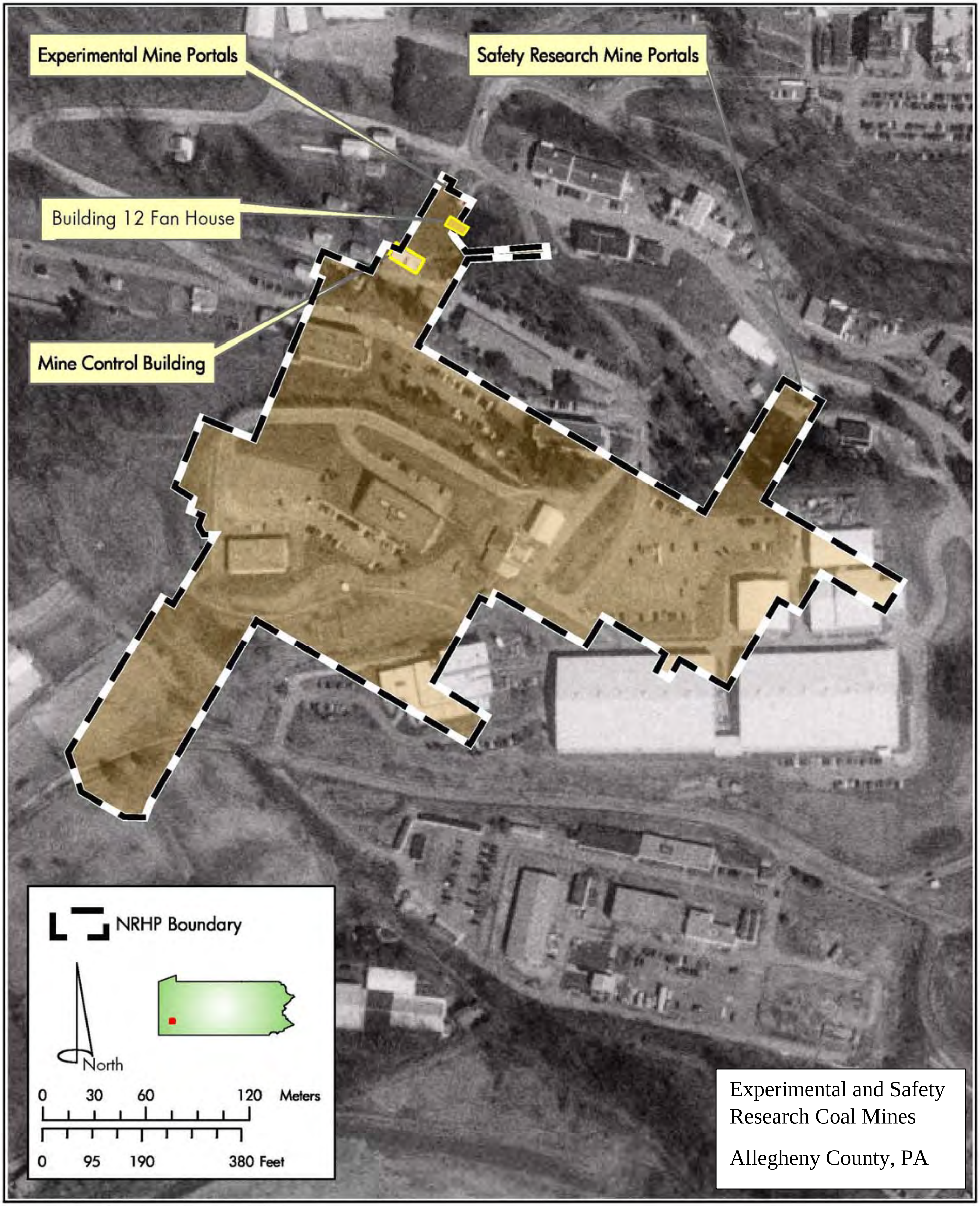
Photo Number	Description	Direction
7	Experimental Mine Supervisor Paul Stefko Showing Mine's Air Course Cover and Tunnel at Mine Face	E
8	Interior View of Underground Racetrack	W
9	Historic Photograph of Automobile and Testing Crew in Mine Racetrack	W
10	Safety Research Coal Mine Portal	S
11	Experimental Mine Supervisor Paul Stefko Explaining Mine Safety Shelter, Safety Mine	SW
12	Interior View of Safety Mine Entry	S
13	Artifact Display and Interpretation Area in Safety Mine: Face of Coal Bed with Features Labeled, Full View of End Butt Used for Interpretation	SW
14	Exterior View of Mine Control Building, Building 7	NW
15	Exterior View of Mine Control Building, Building 7	SE
16	Historic View of Mine Explosion	SE
17	View From Mine Control Building, Looking Toward Experimental Mine Portals	NW
18	Exterior View of Fan House	SW
19	Exterior View of Fan House	S



Experimental and Safety Research Coal Mines

Allegheny County, PA

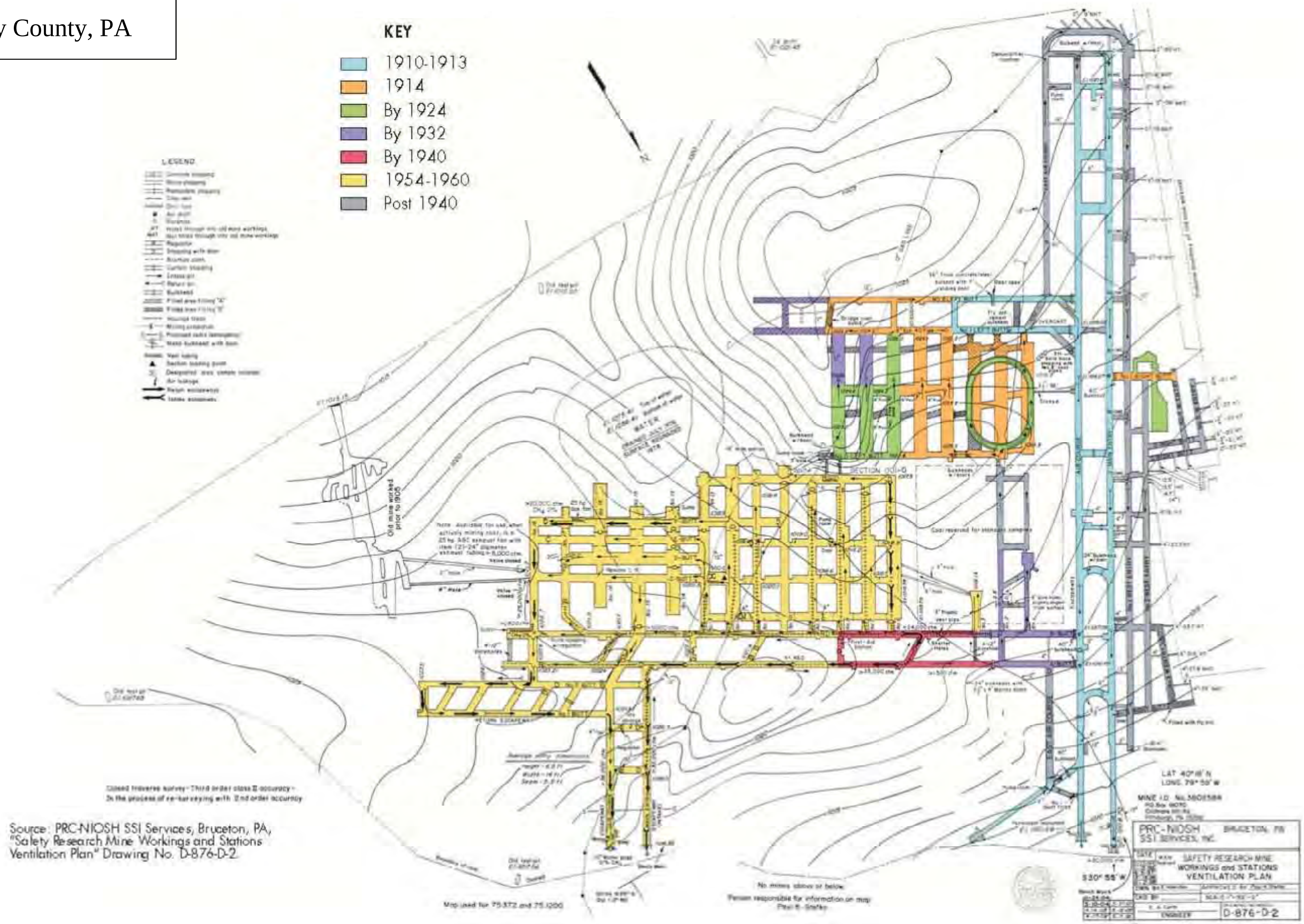
Site Plan



Source: Microsoft Terraserver Imagery (1995)

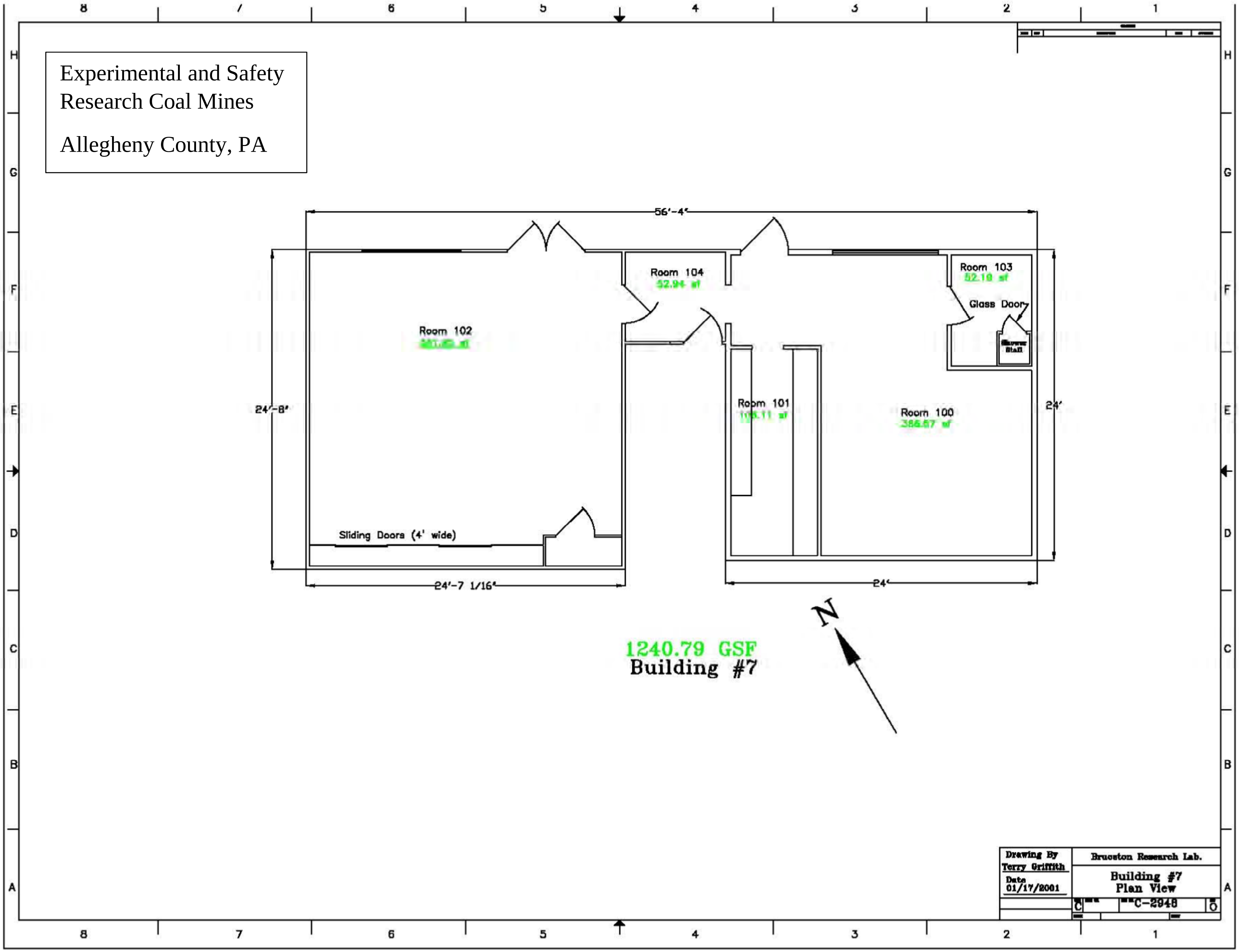
Experimental and Safety Research Coal Mines

Allegheny County, PA

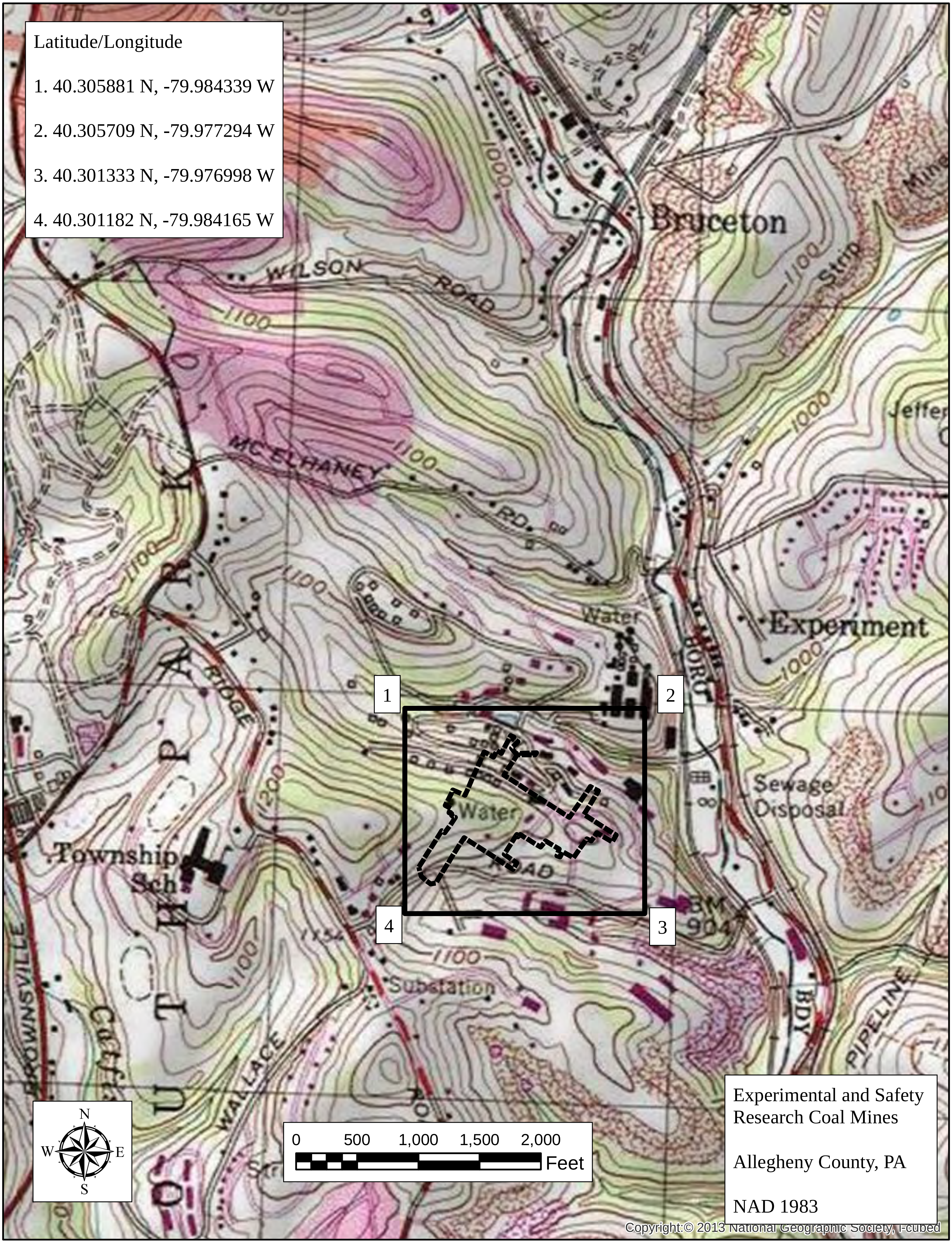


Source: PRC-NIOSH SSI Services, Bruceton, PA, "Safety Research Mine Workings and Stations Ventilation Plan" Drawing No. D-876-D-2

Development of Mine Property, 1910-1990s



Building 7, Floor Plan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2. 40.305709 N, -79.977294 W
3. 40.301333 N, -79.976998 W
4. 40.301182 N, -79.984165 W
1
2
3
4
Bruceton
Experiment
WILSON ROAD
MC ELHANEY RD
RIDGE
Water
Sewage Disposal
Township Sch
Substation
WALLACE
BROWNSVILLE
BM 904
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PIPELINE
Strip
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0 500 1,000 1,500 2,000 Feet
Experimental and Safety Research Coal Mines
Allegheny County, PA
NAD 1983
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COMM
PRTNRSHP
MEETING


SAFETY RESEARCH COAL MINE


RESIN CARTRIDGE


CUTTING MACHINE
FACE DRILL
LOADING MACHINE
ROOF BOLTER


DANGER
HIGH VOLTAGE
12


DANGER
HIGH VOLTAGE

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES
EVALUATION/RETURN SHEET

Requested Action: Nomination

Property Name: Experimental and Safety Research Coal Mines

Multiple Name:

State & County: PENNSYLVANIA, Allegheny

Date Received:	Date of Pending List:	Date of 16th Day:	Date of 45th Day:	Date of Weekly List:
5/12/2017			6/26/2017	

Reference number: SG100001250

Nominator: State

Reason For Review:

__X__ Accept ____ Return ____ Reject __6/26/2017__ Date

Abstract/Summary Comments:

Recommendation/ Criteria: This property was listed in the National Register of Historic Places in 1974. The nominating authority has submitted a boundary clarification and additional documentation. Accept. See SLR for comment on site map.

Reviewer Patrick Andrus Patrick Andrus Discipline Historian

Telephone (202)354-2218 Date 6/26/2017

DOCUMENTATION: see attached comments : No see attached SLR : ~~No~~ yes

If a nomination is returned to the nomination authority, the nomination is no longer under consideration by the National Park Service.

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control
and Prevention

May 5, 2017

J. Paul Loether, Deputy Keeper and Chief
National Register and National Historic Landmarks Program
National Register of Historic Places
Mail Stop 7228
1849 C Street, NW
Washington, D.C. 20240

Re: NR Nomination Discs

Dear Mr. Loether:

The following nomination forms are being submitted electronically per the "Guidance on How to Submit a Nomination to the National Register of Historic Places on Disk Summary (5/06/2013)":

Experimental and Safety Research Coal Mines, Allegheny County, PA
Mine Roof Simulator, Allegheny County, PA

The enclosed discs contain the true and correct copies of the nominations for the Experimental and Safety Research Coal Mines and the Mine Roof Simulator. The proposed action is listing in the National Register.

If you have any questions regarding the nominations please contact Sam Tarr at 770-488-2408.

Sincerely,

Sam Tarr

Sam Tarr
Centers for Disease Control and Prevention