REPORT >

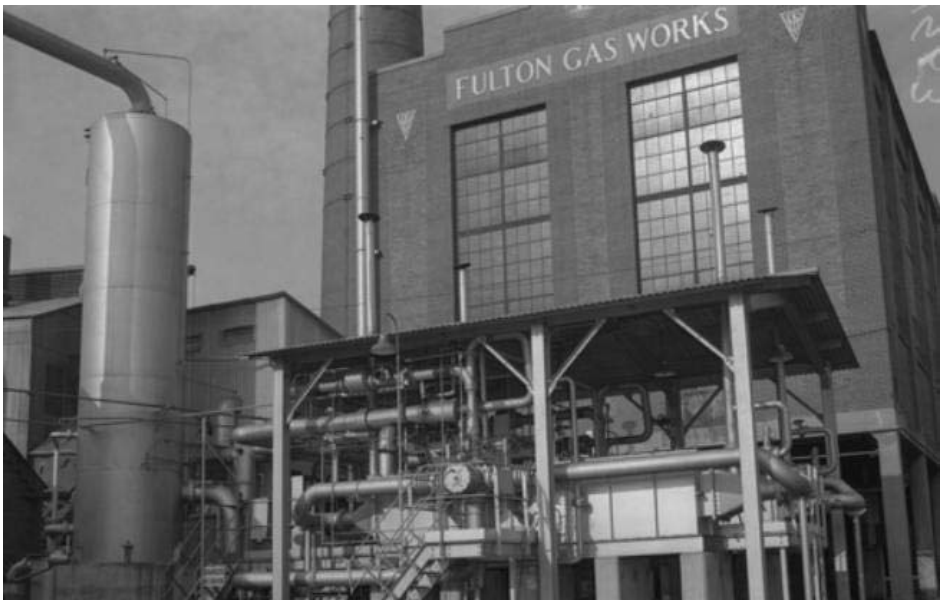
Historic American Engineering Record (HAER) Level II Documentation Package Fulton Gas Works

LOCATION > Richmond, Virginia

DATE> SEPTEMBER, 2019

PREPARED FOR >

City of Richmond
Department of
Public Utilities



PREPARED BY >

Dutton + Associates, LLC

HAER # >

VA-147

Dutton + Associates

CULTURAL RESOURCE SURVEY, PLANNING, AND MANAGEMENT

FULTON GAS WORKS
(Richmond Lower Gas Works)
City of Richmond
Virginia

HAER No. VA-147

PHOTOGRAPHS
WRITTEN HISTORICAL AND DESCRIPTIVE DATA
REDUCED COPIES OF MEASURED DRAWINGS

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1201 Eye Street, N.W. (2270)
Seventh Floor
Washington, D.C. 20005

HISTORIC AMERICAN ENGINEERING RECORD

FULTON GAS WORKS
(Richmond Lower Gas Works)

HAER No. VA-147

Location: The Fulton Gas Works is located at 3301 Williamsburg Avenue within the portion of the City of Richmond commonly referred to as Fulton. It is set on a 7.9-acre property generally bound by Williamsburg Avenue, Gillies Creek, and the Chesapeake & Ohio Railroad corridor.

The complex is located at latitude: 37.523518, longitude: -77.415508. This coordinate represents the approximate center of the property. This coordinate was obtained on June 19, 2018, using Google Earth. The datum used for this point is WGS84.

Date of Construction: 1854-1950

Present Owner: City of Richmond Department of Public Utilities

Present Use: Vacant

Significance: Although some of the earliest experiments with gas illumination took place in Richmond, Virginia in the early-nineteenth century, including the "new light" demonstration by Benjamin Henfry at Hay Market Garden near the Canal Turn Basin, as well as the subsequent construction of a temporary 40-foot tall gas lantern at the corner of 11th and Main Streets, it was not until the 1840s that the city embarked on utility-scale public gas production. In 1849, the first City Gas Works opened on Cary Street but quickly became obsolete as the popularity of gas lighting exploded within the first two years. In 1854, construction began on a new and larger municipal gas production site at Rocketts Landing which would become the Fulton Gas Works.

From its opening in 1856 until it ceased production in 1972, the Fulton Gas Works provided the City of Richmond and its citizens with gas for lighting, heating, and cooking. During it's nearly 120 years of operation, the Fulton Gas Works remained a modern and evolving production facility, transitioning from coal gas to water gas, and finally propane.

As a result of these changes, the buildings, structures, and other facilities at the site were rebuilt, modified, and adapted on multiple occasions. Since production ceased, many of the buildings have fallen into disrepair and/or been demolished, however, the extant buildings at the site continue to

represent an important aspect of the industrial and developmental heritage of Richmond. As such, the site has been determined eligible for listing in the NRHP at the local level.

Historian(s): Dara Friedberg and Robert J. Taylor, Jr., Dutton + Associates, LLC, Midlothian, Virginia. Report completed July 2018.

Project Information: This Historic American Engineering Record (HAER) Package was prepared by Dutton + Associates, LLC for the City of Richmond Department of Public Utilities. Architectural descriptions and historical context were compiled by D+A Architectural Historian, Dara Friedberg. Photography and documentation was prepared by Robert J. Taylor, Jr.

PART I. HISTORICAL INFORMATION

A. Physical History:

1. Date of erection: Original construction took place in 1854-55. Additions and expansion occurred in 1907, followed by substantial reconstruction between 1919 and 1924. Additional improvements were made circa 1937 and again circa 1950.

2. Architect/Engineer: City of Richmond Committee on Light / Department of Public Utilities

3. Builder, contractor, suppliers: The original Cary Street Gas Works site was developed by W. Bucknell Jr. & Co. The initial developers or engineers of the 1856 Fulton Gas Works site is not documented. Known contractors of later alterations and additions include Fred Bredel Company, Consulting Engineers of Milwaukee; Carneal, Johnston, and Wright, Architects, of Richmond; and Forstall and Robison, Consulting Engineers of New York.

4. Original plans and construction: Beginning in 1855, construction for the new City Gas Works at Rocketts was underway on the southeast corner of Maple Street and Williamsburg Avenue. Early maps depict the Gas Works buildings clustered near the corner, with an L-shaped coal shed abutting both streets. The rest of the buildings and structures were set further in to the property, including a retort house, condenser, exhauster, engine house, purifying house, tar wells, 200,000-cubic foot gasometer, and office.[1]

5. Alterations and additions: Alterations and additions were limited in the nineteenth century due to financial struggles associated with the Civil War that erupted just five years after the site went into operation and Reconstruction for the next decade. However, several substantial floods of the James River in the 1870s necessitated a variety of repairs and new construction. An additional gas holder was completed in 1872, a photometer to measure the relative candle power produced by the gas was installed in 1873, and various smaller repairs and equipment improvements took place over the remainder of the decade.[2] Additional rail connections were also provided in the 1880s.

The twentieth century saw more substantial expansion and development of the site as the manufacture of gas changed and the city grew. In 1907 the site was nearly doubled in size with additional property acquired on the west side of Maple Street on which a new coal gas retort house was built. As coal gas was phased out and replaced by carbureted water gas in the 1920s, a substantial reconfiguration of

[1] Beers, F.W. *Illustrated atlas of the city of Richmond, Va.* Richmond, VA: F.W. Beers. 1877
[2] Peters, Margaret. *Richmond Department of Public Utilities: 175 Years of Service*. City of Richmond, VA: Department of Public Utilities. 2008

the gas works occurred between 1919 and 1924. During that period, many of the older facilities were removed and replaced with new buildings and structures, and others were adapted to new uses with replacement mechanicals and equipment. It was following this renovation phase that the Fulton Gas Works complex began to take on a site layout and configuration more reflective of its existing conditions. New structures built as part of this renovation includes a railroad trestle, additional gasometer, oil and tar tanks, purifying boxes, condensers, office and store room, engine room, gas machines, and oil pump room.

In the 1930s various improvements were made following additional flooding of the James River, the most substantial of which was a new boiler house built on a raised concrete pier foundation. This building includes the name "Fulton Gas Works" in the cornice and remains highly visible from Williamsburg Avenue.

The final period of substantial renovations occurred in 1950 to adapt the facility to the production of propane gas. In additional to internal improvements to machinery and equipment, it also included a large new liquid gas condenser system composed of metal tubs set on a raised concrete platform with an associated pump house.

A devastating flood in the 1970s resulted in significant damage to much of the Fulton Gas Works Site. Coupled with the already decreasing need for gas from the site, the Gas Works were shuttered in 1972. Since that date, many of the buildings have fallen into disrepair and/or been razed, leaving the site far less densely developed than during its peak of operation.

B. Historical Context:

1. Cary Street (Upper) Gas Works: Richmond was the site of several experiments and demonstrations in gas lighting in the early nineteenth century. The first recorded was a demonstration of the "New Light" by Benjamin Henfry at the Hay Market Garden near the Canal Turn Basin. Public interest in the event resulted in the construction of a 40-foot high tower built at the corner of 11th and Main Streets with several gas jets burning in a lantern on the top by the City.[3] While these were among the earliest examples of gas lighting implemented in the nation, Baltimore's adoption of an ordinance to manufacture and distribute gas throughout the city in 1817 was the first example of large-scale, utility-level gas-powered street lighting in the country. Other cities followed Baltimore's example in the adoption of gas lighting: Boston in 1822, New York in 1823, and Evansville, Indiana in 1833.[4]

[3] Peters, Margaret. *Richmond Department of Public Utilities: 175 Years of Service*. City of Richmond, VA: Department of Public Utilities. 2008. Pg. 21
[4] Ibid

Richmond was much slower in the adoption of gas as a utility. It was not for forty years after the first introduction of gas in the City of Richmond that a larger effort was made to produce and sell gas. By the mid-1840s, residents were increasingly vocal about the lack of city lighting, with only a night watch that provided little security, and money getting spent on other projects. The public wanted light: "Let us have light; now we are compelled to grope in darkness through our rugged and dangerous streets".[5] Around that time, a vote was made to create a committee on the Richmond Gas Work and establish a municipal gas plant. Unfortunately, while the issue had broad support there was an unwillingness in providing the necessary capital.[6]

It was not until November 1849 that Richmond finally adopted an ordinance to create a "Committee on Light" tasked to construct "suitable works for the manufacture and distribution of carbureted hydrogen gas from bituminous coal for the purpose of illumination through the streets, lanes, and alleys of the city".[7]

The first site of the gas works was on Cary Street between 15th and 16th Streets and the site was developed by W. Bucknell Jr. & Co.[8] A grand building was constructed with a façade of cast iron with hollow Corinthian Columns which were connected to the retorts, serving to cool the gas. "City Gas Works" was carved in the granite over the main entrance on the front.[9] Operations began in 1851 and the initial area served reached from Madison Street to the west, Broad Street to the north, 25th Street to the east, and the James River to the south, essentially lighting the principal business streets in the city. Richmond's gas works also led the way with the use of interior gas lighting with the introduction of gas into City Hall supplied to a chandelier "for the purpose of emitting a fully supply of light." A newspaper article reported, "We have rarely seen more general satisfaction and delight diffused throughout the city than this event gave birth to".[10]

After the debut of street lights, Council proceeded to set regulations and rates for the private purchase of gas service. In addition to a fee per consumption, subscribers had to pay the installation of line connections and a meter. The early use of a meter allowed the gas utility to not suffer the same problems of the flat fee water utility that encouraged excessive use and waste.

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[5] Christian, William Asbury. *Richmond: Her Past and Present*. Richmond, VA: L.H. Jenkins. 1912. Pg. 153
[6] Peters, Margaret. *Richmond Department of Public Utilities: 175 Years of Service*. City of Richmond, VA: Department of Public Utilities. 2008. Pg. 22
[7] "An Ordinance: For Lighting the City with Gas," *Enquirer*. 30 November 1849, Page 4.
[8] "Report of the Committee on Light." Presented to Richmond City Council February 18, 1850.
[9] Peters, Margaret. *Richmond Department of Public Utilities: 175 Years of Service*. City of Richmond, VA: Department of Public Utilities. 2008. Pg. 23
[10] Ibid

The use of gas quickly became popular, with the number of customers increasing from 45 to 627 in the first year of service necessitating expansion of the gas works almost immediately.[11] Council recommended the acquisition of a new and cheaper property away from the Cary Street site. Although availability and cost of property played a big role in the selection of a new site, it was later suggested that "it seems possible that the extremely offensive odors which were produced by the purifying process then in use had something to do with this recommendation".[12] In 1853, Council approved the purchase of a new property for a "Lower" Gas Works near Rocketts Landing. Curiously, a site near Rocketts had been proposed for the initial Gas Works site in 1849, but rejected on the basis it was too far distant from the center of consumption and the cost to build the necessary supply lines would be too high.[13]

2. **Fulton (Lower) Gas Works:** The site at Rocketts Landing acquired by the city in 1853 for the new gas works was located on the southeast corner of Maple Street and Williamsburg Avenue, extending southeast to Gillies Creek. In 1854, the city issued a request for proposals to develop the plant with specifics outlined in the newspaper ("Proposals" 1854). Notice was placed for specifics in the newspaper and construction of the new plant with a 200,000-cubic-foot holder were completed in 1856 at which time production there began.[14]

Operation of the new works was successful for the first few years, however, was soon met with challenging times as the Civil War erupted in 1861. As men left the city to join the fighting, some industries, such as the gas works, were forced to change their workforce. The Committee on Light put forth a proposal to buy slaves to replace those workers that left; City Council approved the resolution and $30,000 was provided for the purchase.[15] Gas continued to be produced throughout the war although prices escalated due to the difficulty of acquiring coal and other raw materials.[16] In 1861, the Gas Works produced about 190,000 feet per day.[17]

In April 1865, Gen. Robert E. Lee reported to President Jefferson Davis that he could no longer hold the line in Petersburg to the south and that the government should abandon Richmond. In the wake of the retreat, several stores of armament,

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[11] Peters, Margaret. *Richmond Department of Public Utilities: 175 Years of Service*. City of Richmond, VA: Department of Public Utilities. 2008. Pg. 23
[12] "Report of the Administrative Board to the Committee on Public Buildings, Properties, and Utilities." In Reference to the Lease of the City Gas Works. Richmond, Virginia June 7, 1915.
[13] "Report of the Committee on Light." Presented to Richmond City Council February 18, 1850.
[14] Eastman, Jeff. *Fulton Gas Works Site Development Plan for the National Slavery Museum in Richmond, Virginia*. Prepared for the City of Richmond Department of Community Development. 2008. Pg. 10
[15] Ibid
[16] Peters, Margaret. *Richmond Department of Public Utilities: 175 Years of Service*. City of Richmond, VA: Department of Public Utilities. 2008. Pg. 23
[17] "The Gas Works," *Richmond Dispatch*. 8 May 1862, Page 2.

cotton, tobacco, and other supplies, as well as the Navy Yard at Rocketts, were intentionally burned to prevent their capture by the Union Army, however the flames spread and by the time they were extinguished, a substantial portion of the city lay in ruins. The close proximity to the burning Navy Yard led to the complete shutdown of the lower gas works on April 3, 1865 which prevented explosions and even more widespread destruction.[18]

Reconstruction-Era

After being forced to shut down during the evacuation fire, Gas Inspector John H. Knowles was summoned by Federal Brig. Gen. George Shepley and asked to restart the gas works primarily for restoring "nighttime lighting for security and military construction".[19]

In late-September/early-October 1870, the James River flooded. Like much of lower Richmond, Rocketts and the Gas Works were submerged.[20] Equipment was destroyed but the "prompt and heroic conduct of the men" prevented violent explosions that might have otherwise occurred.[21] This situation would repeat itself in the flood of 1877 and many times in more recent history.[22]

In 1876, the nearby Midlothian coal mines where the majority of coal used at the gas works went out of operation, forcing coal to be shipped from other sources. This necessitated improved railroad connections to the site, although ultimately improved the quality of the gas as a result of better grade-coal.[23]

Beginning in 1886, many of the by-products created by the gas works were mitigated through an arrangement with the Armitage Manufacturing Company to manufacture roofing materials, tarred felts, oils black varnish, roofing papers, paints, crude carbolic acid, pitch, and ammonia utilizing the unwanted by-products of the gas production. Initially the company operated a facility on the gas works property; however, in 1900, they built a new factory building across the street at 3200 Williamsburg Avenue.

1907 Expansion

[18] Peters, Margaret. *Richmond Department of Public Utilities: 175 Years of Service*. City of Richmond, VA: Department of Public Utilities. 2008. Pg. 24
[19] Ibid
[20] Christian, William Asbury. *Richmond: Her Past and Present*. Richmond, VA: L.H. Jenkins. 1912. Pg. 321
[21] Peters, Margaret. *Richmond Department of Public Utilities: 175 Years of Service*. City of Richmond, VA: Department of Public Utilities. 2008. Pg. 28
[22] Christian, William Asbury. *Richmond: Her Past and Present*. Richmond, VA: L.H. Jenkins. 1912. Pg. 153
[23] Peters, Margaret. *Richmond Department of Public Utilities: 175 Years of Service*. City of Richmond, VA: Department of Public Utilities. 2008. Pg. 23

The twentieth century brought additional expansion and construction to the gas works. In 1907, a resolution was passed to enable the city to acquire additional property adjacent to the gas works site for an extension of operations.[24] This included the block between Maple and Elm Streets that roughly doubled the size of the plant.

On this property, a new coal gas retort house was built adjacent to a raised rail trestle. Meanwhile older facilities were updated to produce "water gas", a cheaper and faster fuel that could be mixed with the coal gas to meet increased demands. By 1920, over four times as much gas was produced at the site as in 1900.[25]

Carburreted Water Gas Era

In 1919, the Richmond Water Works, Electrical Plant, and Gas Works were consolidated into the Richmond Department of Utilities and a resolution was passed to increase the budget and expand all the utilities to meet the expanded needs for city services following additional county annexations. Between 1919 and 1924, nearly all buildings and equipment at the gas works site were replaced by new facilities at a cost of $800,000 after studies showed coal gas production was no longer profitable.[26] As part of the overhaul, all coal gas production equipment was removed and the facility was converted to produce only carbureted water gas. The last coal gas produced was in 1922. Rather than relying on coal, the carburreted water gas production process utilized cheaper and easier to obtain crude oil in its manufacture.[27] Besides more efficient production, the new facilities also insured that the gas would reach all households within the expanded city limits at an acceptable level of pressure.[28]

The economic difficulties of the Depression did little to slow the demand for gas or expansion of the gas works. The growth of Richmond's West End and in Ginter Park, led to a drastic increase in new gas lines during the 1930s and an increase in services by more than 100-percent.[29] A variety of improvements were made to update facilities as well as make repairs following several floods that decade. In 1930-31, a new waste-heat boiler and purifying equipment were added. A new steam-generating plant resulting in a far greater degree of efficiency was completed soon after and in 1937 a new boiler plant was built. The building was placed on concrete piers 16-feet above ground level to avoid future flooding

[24] "Resolutions," *Richmond Times Dispatch*. 7 May 1907, Page 2.
[25] University of Virginia. *Richmond's Post-Industrial East End*. 2011
[26] Chen, Kimberly and Hannah Collins. "Department of Public Utilities Howard (Overbrook) Road Facility," *National Register of Historic Places Registration Form.* 28 February 2007. Pg. 13
[27] Chryst, Abby Marie. *Fulton Gas Works: Historical, Cultural, and Ethnographic Meaning of Site [**re**]-activating the urban fabric*. Master's thesis for University of Virginia.
[28] Peters, Margaret. *Richmond Department of Public Utilities: 175 Years of Service*. City of Richmond, VA: Department of Public Utilities. 2008.
[29] Ibid. Pg. 36, 40

issues. It was also set near the perimeter of the property adjacent to Williamsburg Avenue, with the name "Fulton Gas Works" adorning the cornice, thus becoming one of the most visible elements of the site. That same year, publicity of the Richmond Gas Works was further promoted when it was the recipient of the Richmond Safety Council Award. A new "12-foot gas generating set designed by Barlett-Haywood Division of the Koppers Company" was put into service and in 1938 the city had 32,157 gas customers.[30] By 1939, additional renovations were made so that all gas manufacturing equipment was situated above flood levels.[31]

While the Depression had done little to slow the growth and success of the gas works, World War II brought hardship with government restrictions and limited raw supplies (Peters 2008:44). Steel, oil, and a variety of other materials were rationed and gas production was curbed accordingly. The challenge was worsened by an increasing transition by residential, commercial, and industrial users from gas to electricity. A variety of campaigns were initiated to promote the continued use of gas, particularly for appliances rather than lighting or heating.

Propane Gas Era

The post-World War II years brought renewed growth for Richmond and the surrounding areas which was reflected through an 11-percent increase in gas usage. During that time, most of the gas made was used for cooking and refrigeration as there was an insufficient supply for heating; most homes and businesses use oil or coal for heating.[32]

However, drastic changes for the gas works were looming once more during this period. With advances in metallurgy and transportation, in conjunction with the increasingly bad reputation of the nation's gas works, newer forms and uses of energy were developed, namely natural gas.[33] In 1950, the Federal Power Commission allocated the delivery of natural gas via pipeline to Richmond and by November 27, 1950, Richmond had entirely converted to natural gas, rendering the carbureted water gas production at Fulton Gas Works largely obsolete.[34] To remain viable, the gas works was converted to a Propane/Air Peak Shaving Plant to produce a gas comparable to natural gas which would act as a supplement in times of high demand. A Kopper-Hasche reforming plant and three storage tanks for production of peak shave gas from propane or butane were constructed at a cost of $325,000. This new form of production was cheaper and the gas formed

[30] Peters, Margaret. *Richmond Department of Public Utilities: 175 Years of Service*. City of Richmond, VA: Department of Public Utilities. 2008. Pg. 40-41
[31] Ibid. Pg. 38-40
[32] Ibid. Pg. 45, 47
[33] Chryst, Abby Marie. *Fulton Gas Works: Historical, Cultural, and Ethnographic Meaning of Site [**re**]-activating the urban fabric*. Master's thesis for University of Virginia.
[34] Ibid

burned more efficiently.[35] Despite the transition, the need for the Fulton Gas Works continued to decrease between 1950 and 1963, when there was a sevenfold increase in natural gas distribution.[36]

The death nail came in 1972, when Hurricane Agnes brought some of the worst flooding of the James River experienced at Rocketts. The 1972 flood would be the last for the Gas Works as damages reached $425,000 with 29,000 gallons of liquid propane lost. Later that year, the propane air-peak shaving plant was moved from Fulton to the South Gate location in Chesterfield County and the Fulton Gas Works site was officially abandoned.[37]

Since that time, many of the buildings at the site have been subject to extensive deterioration and many others razed. There have been a number of attempts to rehabilitate the extant buildings and site, as well as to repurpose the property altogether, however, most have been foiled by concerns over contaminates and other environmental issues. As of 2018, only a piecemeal collection of buildings and structures leftover from its operation remain standing. This includes a late-eighteenth century gas holding tank frame, a contemporary exhausters and purifying house, the foundation of the 1907 coal gas retort house with a 1950 pump house addition, and the 1937 boiler house. Additionally extant are a variety of foundations for other buildings and structures as well.

[35] Peters, Margaret. *Richmond Department of Public Utilities: 175 Years of Service*. City of Richmond, VA: Department of Public Utilities. 2008. Pg. 50
[36] Ibid. Pg. 60
[37] Ibid. Pg. 70

PART II. ARCHITECTURAL INFORMATION

A. General statement:

1. **Architectural character:** The Fulton Gas Works site and the remaining buildings and structures reflect an industrial, manufacturing site character, albeit in an abandoned, deteriorated, and sparsely developed condition. Although historically occupied by a dense complex of buildings, structures, and equipment interconnected by a network of railroads, pipes, and other features; the property now retains only a handful of above-ground features. The most prominent and visible of these is a circa-1870/1880s 200,000-cubic foot gasometer. The structure is an imposing 90-foot radius steel frame skeleton that is nearly as tall. The second most visible landmark, and the one that clearly identifies the former use of the site is the 1937 boiler house building. The building is set immediately adjacent to Williamsburg Avenue and visible for traffic traveling both directions. Embellishing the gable parapet on both ends of the building are metal tiles and letters spelling out "Fulton Gas Works." The only other complete standing building is a structure composed of blocks built in the 1870s, 1920s, and 1930s that became attached through successive addition and renovation. This building reflects its nineteenth century construction through decorative brickwork and arched window openings but is obscured by deterioration, graffiti, and overgrown vegetation. The remaining features on the property include a variety of foundations, underground structures, and piecemeal remains of more substantial components that now only partially convey their historic form, function, and character.

2. **Condition of fabric:** As of 2018, little of the site from its peak of operation remains extant, and those buildings and structures that do remain standing are in fair to poor condition. As stated above, only two primary buildings and the steel skeleton from a gas storage tank remain standing. Since becoming vacant in 1972, these buildings have been vandalized and many of the doors and windows broken or removed. Some sections of brick wall are crumbling or missing and the roof reveals damage in some areas. Inside the building is evidence of vandalism as well, although much of the large machinery remains in place and in remarkably good condition.

   Additionally are several small sheds built atop a larger concrete platform that originally was the foundation for a more substantial building, the concrete base for a condensor tank system, and the in-ground foundations for several other buildings and structures. There are likely additional underground tanks and piping, but the number and extent of these features is unclear. These features also remain in a deterioratred condition with spalling concrete, setting and cracking, and rusted metal.

B. Site:

At present the Fulton Gas Works site is abandoned and enlosed by a chain link fence. What remains of the complex is situated on a 7.9-acre property generally bound by Williamsburg Avenue, Gillies Creek, and the trestle Chesapeake & Ohio Railroad corridor. Since the site was shuttered in 1972, many of the buildings and structures have been demolished and removed leaving only a handful of extant resources and a relatively sparse layout. The buildings and structures rest on a mostly grassy landscape with pockets of brush and taller vegetation around the perimeters.

Primary access to the site is provided by a gate at the end of Peebles Street at the southwest corner of the property. The gate opens to a gravel driveway which leads through the core of the complex. The driveway first travels between two sets of concrete bases for a former condenser tank system. Set next to the concrete bases on the north side of the driveway is the concrete foundation and platform that comprises the location of a former coal gas retort house. Beyond this structure is a short length of a brick perimeter wall that was built around the western edge of the property when it was expanded in 1907. Beyond the concrete platform, the driveway extends around the one remaining gasometer steel frame, set on a slight raised berm just to the south side of the road. Across the driveway is an open grassy field that was formerly the site of a large retort house and other smaller buildings. Set at the far end of this field is the extant boiler house building immediately next to the property fence and Williamsburg Avenue beyond. Also set next to this field is the extant compressor house/engine room/purifying house. The driveway continues on extending between the concrete slab foundation for a former purifying house/office on the north side and the concrete pad of another former gasometer. At this point, the gravel driveway dissipates into an open grassy field that occupies the eastern edge of the property.

C. Extant Resources:

1. **Boiler House (1937):** The boiler house remains as the most prominent and visible building on the Fulton Gas Works site as it is located immediately adjacent to Williamsburg Avenue. Constructed in 1937, and originally appended to the end of an older retort house structure, the boiler house is oriented northwest-southeast to hug the border of the property and road. The masonry structure is set on a raised reinforced concrete pier foundation so as to place the functional part of the building above the flood line. In addition to the grid of piers beneath the building is a freight elevator shaft set on ground level. The tall one-story main block of the building above is composed of red brick laid in a 5:1 American Bond. The building bays are delineated by brick posts with slightly recessed brick curtain wall panels above and beneath the windows in between. The brick posts on the front end of the building are embellished by panels of rubbed brick set flush with the primary wall surface and are topped by inlays exhibiting the “DPU” symbol for Department of Public Utilities. It is topped by a metal-clad gable roof set

behind a stepped brick parapet. The parapets on both the front and rear end is topped by cast concrete coping and is adorned by the words "Fulton Gas Works" spelled out in metal letters set on flat tiles, as well as a tile with the round seal of the City of Richmond.

Set in each bay of the building are tall panels of multi-light industrial style metal windows. Each window panel rests on a concrete sill and has tilting hopper sashes near the top and bottom. The primary entrance is offset on the front end of the building and is approached by a run of covered metal stairs. On the rear end of the building is a large panel infilled by later brick and topped by steel lintels that was the original connection of this building to the adjacent retort house.

The interior of the building consists of a single open and unfinished space. The structural system of the building, including cast concrete floors, brick walls, and metal roofing trusses are exposed. The space is occupied by a large boiler system that extends nearly to the ceiling.

2. **Compressor House, Engine Room, Purifying House, Boiler Room (1870s, 1920, 1950):** Just south of the 1937 boiler house is a building that is composed of several interconnected buildings constructed at various time and that have functioned in a variety of roles. The oldest portions of the building date to as early as the 1870s at which point in time they served as an engine house and purifying house. By 1905 the purifying house also contained a meter room and the engine house was expanded to include exhausters. In 1920, the two buildings were connected and an addition was made to the rear of the engine house block for a boiler room. By 1950 the building held a boiler room, gas and air compressors, and pipe storage.

All of the blocks and portions of the building are of masonry construction and rest on a continuous foundation. The red brick is laid in a 5:1 American Bond, although each block of the building exhibits differing decorative brickwork and embellishment. It is topped by an interconnecting system of gable roofs covered with corrugated asbestos set behind stepped brick parapets. The older portions of the building features stepped brick cornices and one section is ornamented with rubbed brick headers in a sawtooth pattern just below the cornice. The stepped brick parapet has been extended and widened on one side where a side addition was appended in 1920. The bays on the gable ends of the building are delineated by recessed panels between the framing posts, while the side walls are flat surfaces.

Several entrances are located around the building to provide access into the various interior spaces, although there is not a formal "front" entry. On the south end of the building is a single pedestrian doorway set centrally on what was the original engine room. On the east side of the building are a single doorway and an

adjacent set of double doors, as well as another entry set within a concrete block-enclosed shed addition near the rear. On the west side of the building is a large roll-up garage bay set centrally on the engine room block as well as an adjacent set of double pedestrian doors. A single pedestrian doorway is located on the side of the rear boiler room block. There are additional pedestrian entrances on the rear of the building also. Fenestration on the building is diverse and has been modified over time. At present, only a handful of industrial style windows with operable hopper sashes remain. These windows are later inserts within altered openings. Other openings have also been altered and partially infilled for smaller window units that no longer remain in place, and other openings have been infilled altogether. Most openings appear to originally have been arched and set on concrete sills.

The interior of the building is divided into three discrete areas, each of which is unfinished with the structural system exposed. Floors are cast concrete slab, walls are exposed brick, and the ceilings are metal truss with corrugated asbestos above. The areas are further interrupted by cast concrete ledges and decking on which a variety of mechanical equipment remains in place.

3. **Coal Gas House, Pump House (1907, 1950):** Set to the west of the 1937 boiler house and 1870s-1920 engine house complex is a concrete platform that originally served as the foundation and lower level for a circa 1907 coal gas retort house and was later partially demolished and converted to pump house following the abandonment of coal gas production in 1922.

What remains of the building are three one-story tall concrete walls with a concrete platform on top. Set atop the platform is a later pump house building. The structure has a streel frame structural system clad with corrugated asbestos and is topped by a side-gabled roof also covered with corrugated asbestos. The building and roof is divided into two sections by a concrete party wall. The building is approached by a covered run of metal stairs from the “courtyard” area inside the concrete foundation walls. The stairs lead to a “balcony” running the length of the front of the building that is part of the concrete platform that tops the older structure. This balcony is sheltered by a shed roof extension from the roof of the pump house. This roof sheltered three separate doorways into the building, although no doors remain in place. Additional fenestration consists of window openings on the sides and rear wall, but no windows remain.

The interior of the building is divided into two rooms, both of which are unfinished. Each room retains a variety of mechanical equipment and systems; one of which is dated 1949, coinciding with the construction of the pump house. An extension of the pipe projects through the side wall of the building and terminates roughly 10-feet out.

The pump house is connected to the rest of the open concrete platform by a metal catwalk. Set near the rear corner of the platform are two smaller sheds similar in appearance and character to the pump house. One shed is located directly on the platform and the other is slightly off the west side and is accessed by steps. Both consist of steel frame clad with corrugated asbestos. They are topped by shed roofs and feature open doorways and window openings. The larger of the two sheds has an open-sided, shed roof topped storage area on one side. Both buildings are currently empty, although steel framing for pump equipment remains in place. At the opposite corner of the concrete platform are two round openings lined with steel and approached by inset steel tracks for a rail car. These openings were the location of retorts leftover from its original construction.

4. **Gasometer:** Centered near the southern edge of the complex is the remains of a 600,000 cubic foot gasometer built in the late-nineteenth century. The structure consists of a circular steel frame skeleton that is roughly 90 feet in diameter and nearly as tall. The skeleton is framed with I-beam vertical posts connected by a series of trusses and diagonal tie-rods. The frame is set on a poured concrete base set atop a raised earthen berm. A sheet metal floor pierced by several pipes remains in place. These pipes extend to a valve house and interconnect under the structure that is access by a bulkhead doorway within a concrete box at the north end. The valve piping remains in place within this structure.

5. **Liquid Gas Condenser Tank Foundation:** Immediately west of the 1907 coal gas retort house foundation are the remains of the liquid gas condenser tank facility. This structure was built circa 1950 and originally consists of a network of interconnected pipes and tubes set on a raised concrete base; however, all that remains are the concrete supports. A second set of concrete bases for a smaller condenser system are located just to the south.

6. **Other:** In addition to the buildings and structures listed above are a variety of features and remains of other equipment and infrastructure throughout the property. Just north of the 1950 condenser foundation and 1907 coal gas retort house platform is a brick wall with a concrete base that enclosed the 1907 extension of the property and separated it from the adjacent railroad line. There is a single doorway on the wall at the liquid gas condenser tanks.

   Just south of the 1870s engine house complex is a poured concrete foundation from a purifying house built circa 1905 and converted to office and storage space in the 1920s. The building was torn down in 2015. Just south of the 1905 purifying house foundation is a circular concrete pad that was the base on which a 1930s 200,000-cubic foot gasometer storage tank was located that was torn down prior to 2003. Also visible are foundations and structural remains from several underground tar wells, an above-ground crude oil tank, and 2,000,000-cubic foot gasometer.

PART III. OPERATION

The Fulton Gas Works produced utility-grade gas for the City of Richmond from its establishment in 1856 until it was shut down in 1972. During that period, the site grew and evolved to meet increasing demands as well as changes in technology. Initially producing coal gas, the site eventually supplemented this with carbureted water gas, and finally transitioned solely to propane gas. Each of these various forms of gas required specialized machinery, materials, and facilities. The finished gas products were then distributed to the municipal grid as well as individually subscribing customers through a network of pipes and meters. Below is a summary of the production and distribution process for municipal gas during this period, as well as the types and functions of buildings and equipment typically required.

Production Process

Coal Gas

Coal gas is produced when coal is heated in the absence of air in an enclosed chamber. When bituminous coal is heated to a temperature of about 400°C it softens and coalesces, giving off water vapour, rich gas and tar. As the temperature is raised to 1,000°C the remaining volatile matter, ultimately hydrogen, is almost entirely driven off leaving coke residue. The coal gas consists largely of hydrogen, carbon monoxide and methane. But in its raw state it also contains condensable products such as tar and ammonia which are removed in the purification process.[38]

To produce coal gas, the initial requirement is availability of large amounts of bituminous coal. For the first twenty years of operation at the Fulton Gas Works, the majority of coal was acquired from the nearby Midlothian mines in Chesterfield County. When the Midlothian mines ceased extraction in 1876, coal for the gas works was acquired from greater distances, including primarily the western region of Virginia, West Virginia, and Pennsylvania. After arriving at the site by railcar, the coal was crushed before being fed into the retorts for heating.

Within the retorts, the coal was subject to extreme temperatures which would release raw gas to be collected through a network of pipes. The gas was then piped to a system of condensers, exhausters, and purifiers. Meanwhile the spent coke was released and removed to a storage area on site. The coke was then sorted by size and quality so that it could then be reused to heat the retorts for coal gas, used in conjunction with steam to create water gas. Leftover coke was sold to the public as smokeless fuel for kitchen stoves or industrial usages such as steel foundries.

The job of the condensers was to cool the gas, which at this point is a yellow-brown smoke, to liquid form where by-product solids could be separated. Condensers use either an air or water cooling system in which the gas passes through a long and complex system of pipes to slowly lower its temperature. Through this process, the gas is liquefied and by-products such as tar, light oils, and water containing ammonia salts drop out of solution. These products drain into

[38] Dunedin Gas Works Museum. ‘History of Coal Gas Production.” No Date.

underground tar wells where they are further separated and the materials can be sold for other uses.

From the condensers, the liquid gas passes through an exhauster. The exhauster is a large rotary pump driven typically by a steam engine that serves to pressurize the gas before it begins the cleaning and purifying process. Cleaning the gas involves multiple steps and equipment that have changed over time and also vary by size and production level of the gas works, but typically involve washers, scrubbers, and purifiers. The intent of the cleaning is to remove the two primary unwanted contaminants; ammonia and Hydrogen Sulfide. Larger and later systems also incorporate a benzole removal process.

Ammonia removal took place in one of two ways. Either the gas could be bubbled up through a tank full of water, or be pumped up a vertically oriented chamber that is divided by perforated trays with layers of coke while water is sprayed down through it. In both cases, the water would absorb the unwanted ammonia from the gas and then drain off to the tar well. Any residue ammonia could then be removed from the gas by a rotary washer with a number of bass brooms that move slowly round inside a steel drum containing water. The brooms expose the gas continuously to large wetted surfaces, which removes the last of the ammonia.

The next step, termed purification, is to remove Hydrogen Sulfide from the gas. To accomplish this, the gas was re-heated to atmospheric pressure by steam pipes fed by a boiler house. The purification then occurred in one of two ways dependent on time period. In the nineteenth century, the gas was passed through a fired clay chamber full of lime. By the twentieth century, the process took place in an iron chamber full of moist ferric oxide. In both methods, the hydrogen sulfide was extracted.

In some larger gas works sites in the mid-twentieth century, the gas was subject to further purification through benzole removal. The benzole plant consisted of a series of vertical tanks containing petroleum oil through which the gas was bubbled. The benzole dissolved into the petroleum oil was run through a steam separating plant to be sold separately.

Finally, the purified coal gas was pumped through the station meter, to measure the amount of gas before entering a gasholder, or “gasometer” for storage and distribution. Gasholders were built in two forms; wet and dry, and served to not only store gas prior to distribution, but to also maintain even pressure in distribution pipes. The wet type consists of a bottomless drum floating in an open-topped drum or well containing water. The gas is collected above the surface of the water, and the top of the holder rises and falls with the fluctuations of the gas supply within. The dry type of gasholder consists of a huge steel tank in which an enormous piston is forced upwards by the pressure of gas beneath it. The piston is rendered airtight by a "seal," a stream of tar that is pumped continuously round its edge, to prevent the leakage of gas and the entry of air.

Water Gas

To augment the supply of gas to the consumer, many gas works site added a quantity of "carburreted" water gas to the coal gas. Water-gas could be produced far more quickly than coal gas and thus provided a ready means of increasing the supply to cope with peak loads. The Fulton Gas Works underwent extensive reconstruction and development from 1919 to 1924 to add water gas production facilities.

The production of water gas involved use of the coke that was a byproduct from burning coal for coal gas. Water gas was produced in a deep brick generator filled with coke at a high temperature. Blowing air through the hot coke for about two minutes raised the temperature and made the coke incandescent whereupon the air was shut off and steam was blown through. This reacted with the coke (carbon) to produce water gas, a mixture of hydrogen and carbon monoxide. After about one and a half minutes the steam was shut off and air blown through again to reheat the coke. This air-steam cycle was maintained automatically. The water gas was then passed through a second heated brick chamber known as the carburettor. Here light petroleum oil was sprayed onto the brickwork where it was `cracked' to produce gas which boosted the energy content of the water gas which could then be mixed with coal gas from the retorts.

PART IV. SOURCES OF INFORMATION

A. Architectural drawings: Original plans or drawings for the Fulton Gas Works either do not exist or could not be located. However, there are a variety of plans and drawings for renovations and additions to the complex in the collections of the Library of Virginia. These are supplemented by detailed layouts and labeled buildings on a variety of historic maps including local atlases and Sanborn Fire Insurance Maps on file at the Library of Virginia and Library of Congress.

The majority of drawings and plans in the archives of the Library of Virginia are from the records of the City of Richmond, including from the Department of Utilities, Bureau of Permits and Inspections, and Office of the City Engineer; and therefore represent new construction, additions, and renovations of buildings and infrastructure. These collections may be found in "Bureau of Permits and Inspections, Building permit architectural blueprints and specifications, 1907-1949" – Accession numbers 30150, 30745, 38536; and "Office of the City Engineer Records, 1809-1975" - Barcode numbers 1205723, 1156595-1159596. The earliest drawings located date from 1905 and depict the proposed layout of the gas works site following additional property acquisition and expansion to the west. A follow-up drawing from 1908 by the City Engineer depicts the revised street configuration following the opening of the expanded site. A set of plans from 1906 illustrates a new Coal Gas Retort House to be built on the expanded property as designed by Frederick Bredel Consulting Engineers of Milwaukee. A set of plans for alterations and additions to the Compressor House as designed by local architects Carneal & Johnston dates from 1920. There is also a set of drawings for a proposed railroad connection to the site that year as designed by Forstall and Robison, Engineers of New York. Finally is an extensive set of drawings and plans for the new Boiler House from 1937 as designed by Carneal, Johnston, & Wright.

Unfortunately, the collections do not include detailed drawings or schematics of the mechanical systems or actual gas production equipment which was designed, fabricated, and installed by private companies rather than the City.

The early drawings and plats on file from the City are supplemented by additional historic maps that provide additional detail and useful information on building function and location of support facilities and infrastructure. The 1877 Beers Atlas of Richmond provides an early layout and configuration of the site, depicting the size and shape of primary buildings with the function labeled. Sanborn Fire Insurance Maps from 1905, 1925, and 1950 provide additional detail on buildings and support structures, with such details as building dimensions, interior divisions, construction materials, and function with equipment labeled.

The most recent set of drawings and plans is from 2015 and was assembled for the City of Richmond by Timmons Group Engineers. These include a comprehensive set of drawings for extant buildings with plans, elevations, and sections derived from laser scan

and detailed measurements. Also included is a detailed site plan with overhead and underground utilities marked.

B. **Early Views:** There are a number of known early views and photographs depicting the Fulton Gas Works, mostly from the early- to mid-twentieth century. The earliest is a bird's eye view of the site taken from above the James River in the 1930s. The image clearly depicts the entire complex as well as its immediate setting. The clarity is good and details on individual buildings and structures can be discerned. The next view was taken in 1936 during a flood of the James River. This bird's eye view was taken from the southeast and is focused on the river with Shockoe Valley and downtown beyond; however, the gas works complex is visible at the edge of the frame where it can be seen that the water line was up to the gasometers and most buildings within the complex.

The next group of early views are from 1955 and 1956. The 1955 image is a bird's eye view taken from above the James River with the Fulton Gas Works in the foreground and Chimborazo Park and North Church Hill in the background. The image includes most of the complex with the exception of the extreme southeastern corner which is just out of frame. The image from 1956 is the only identified ground-level photograph detailing a building within the complex, and is a front end view of the 1937 Boiler House with mechanical systems in front.

Aerial photography from 1968 and 1979 on file at the United States Geological Service provides additional documentation of the density of the complex in the former and the demolition of many resources at the site following the 1972 closure in the latter.

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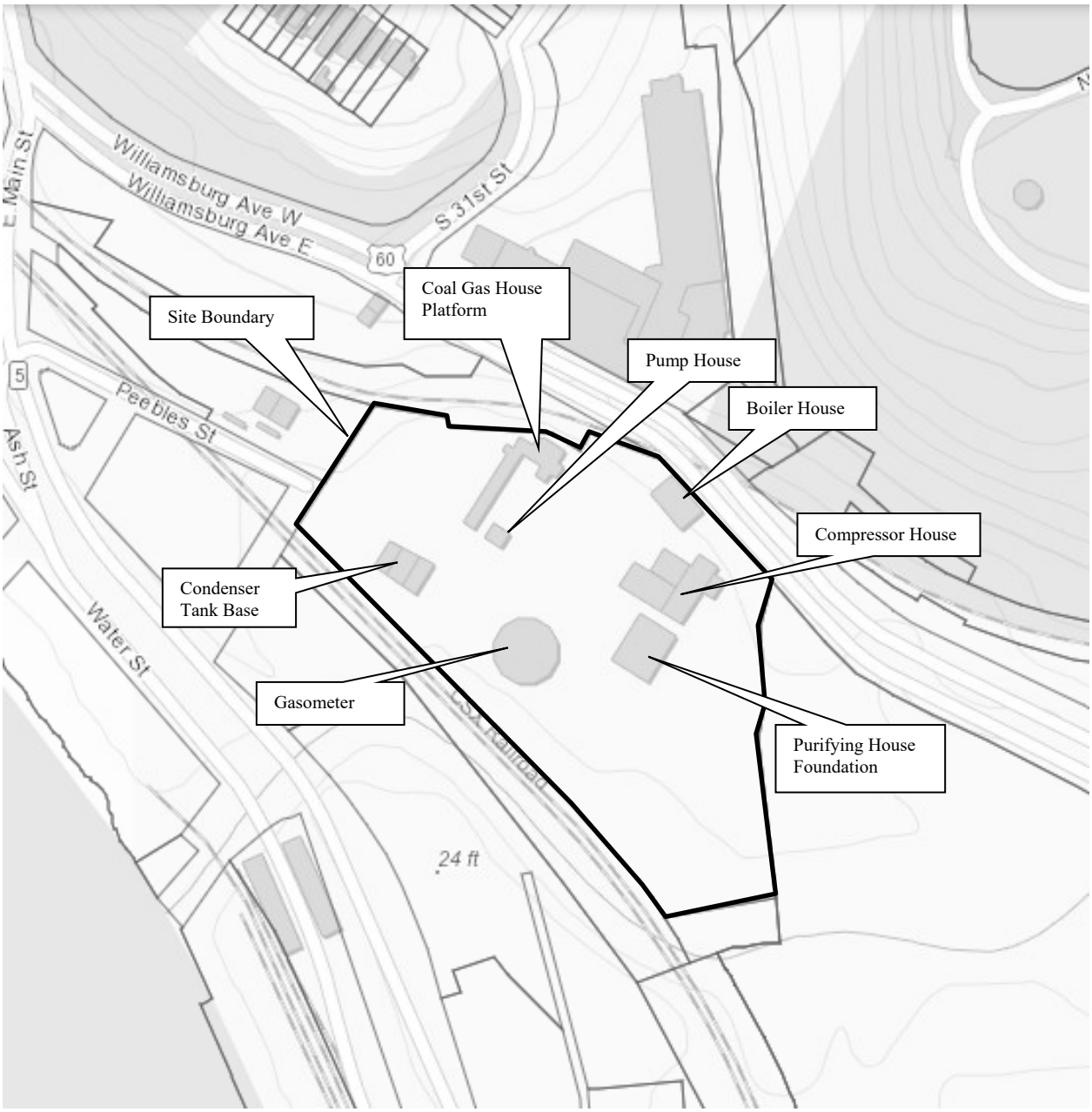

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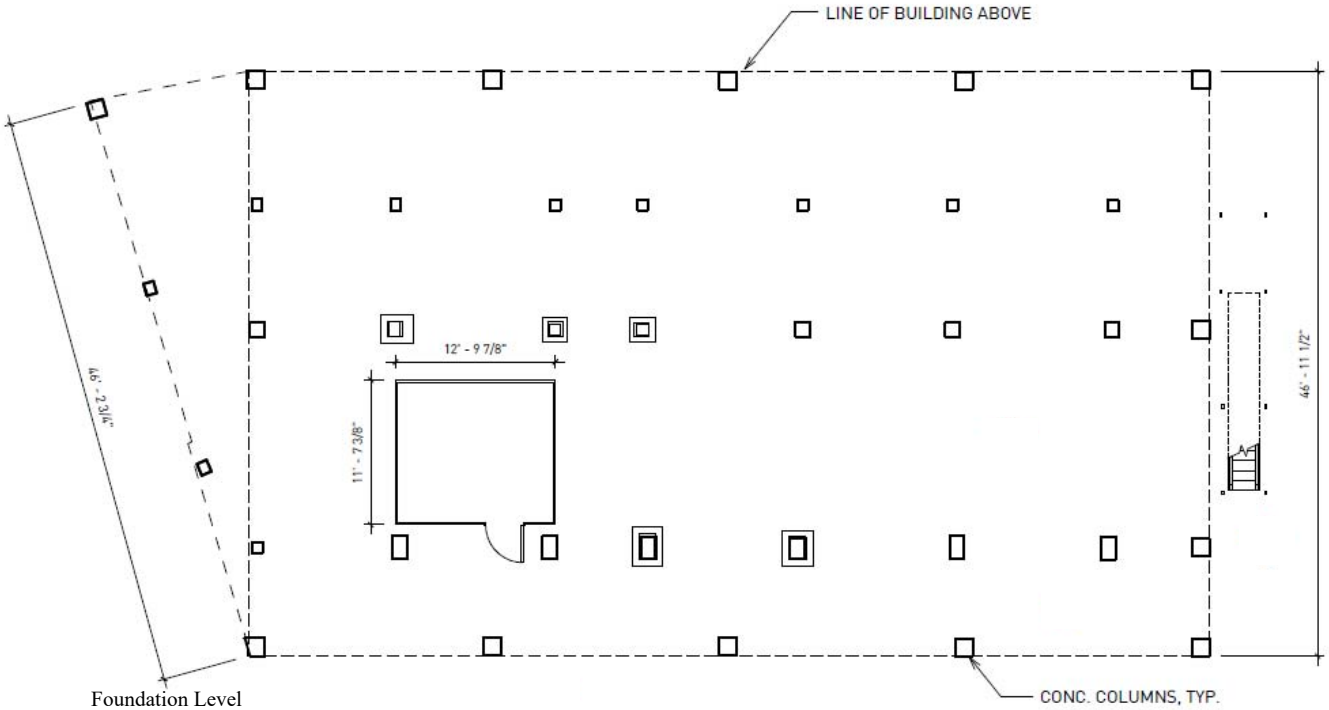

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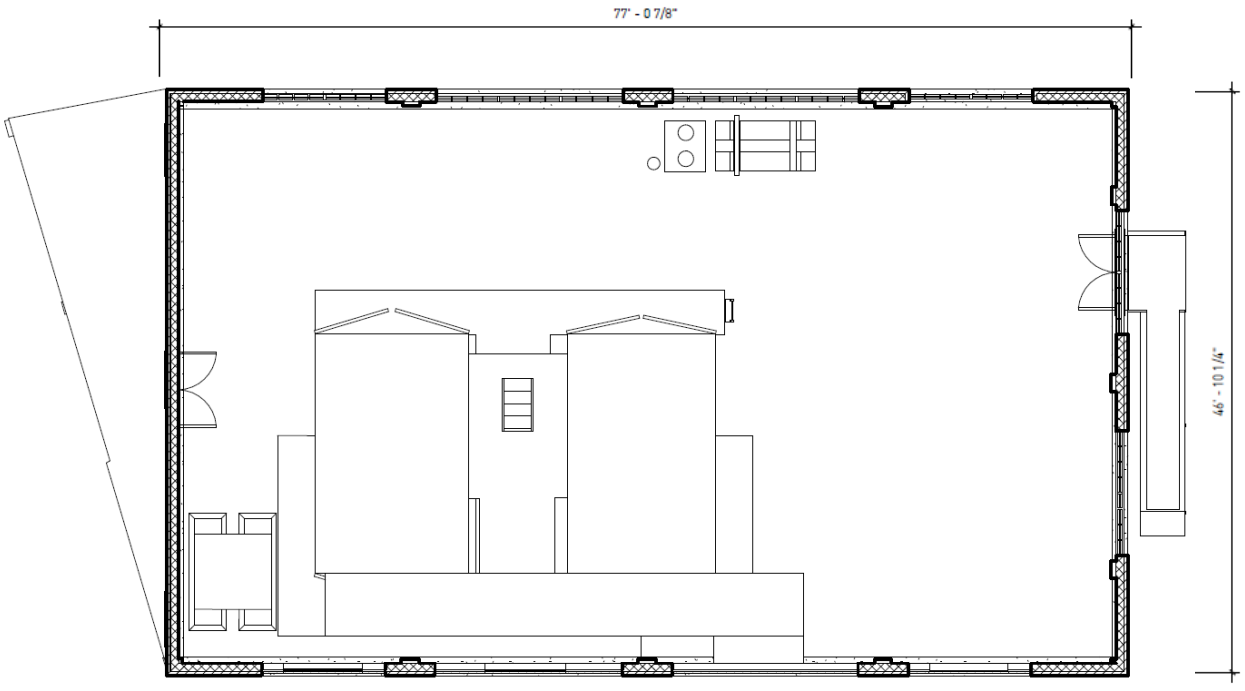

Mezzanine Level

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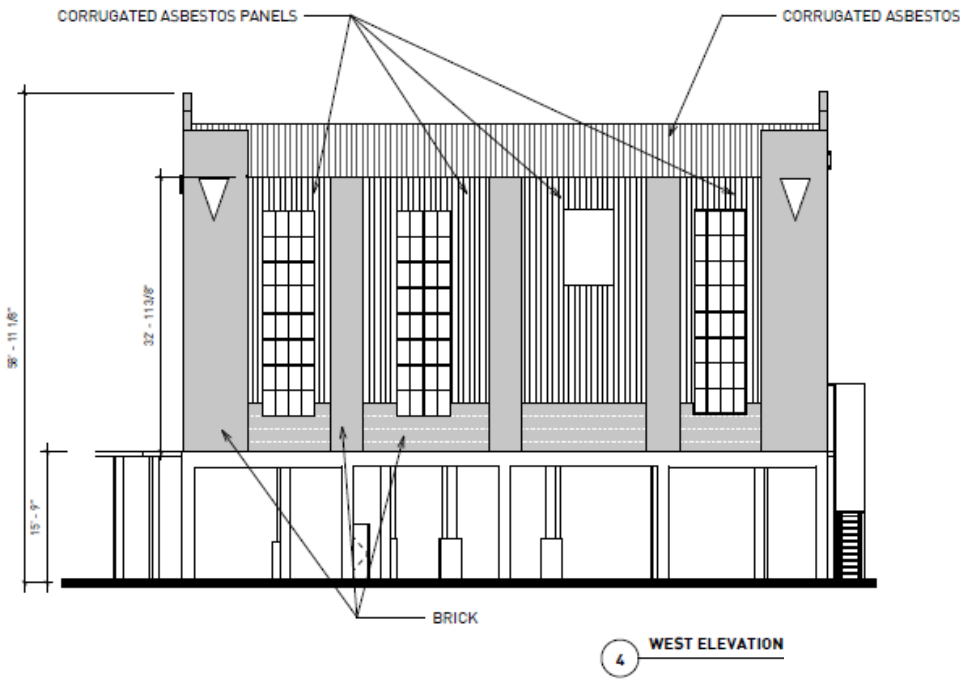

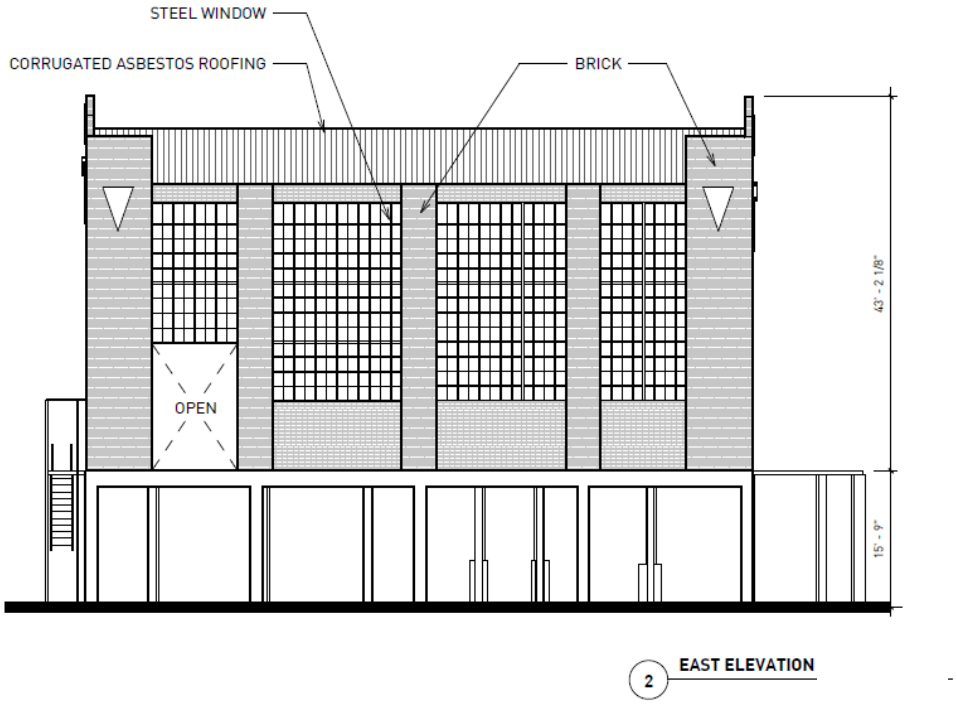

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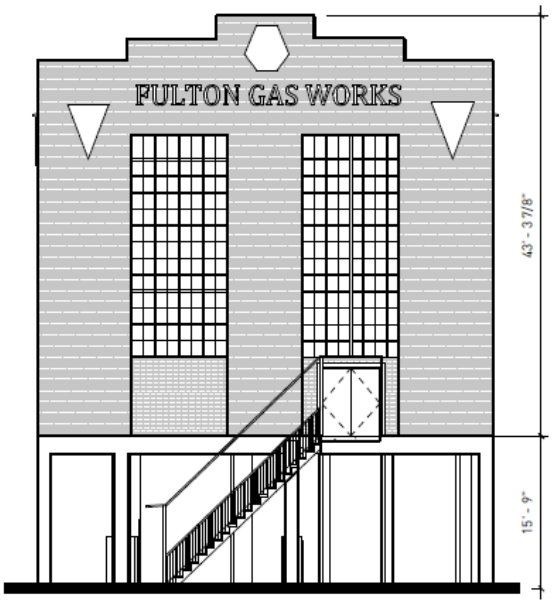

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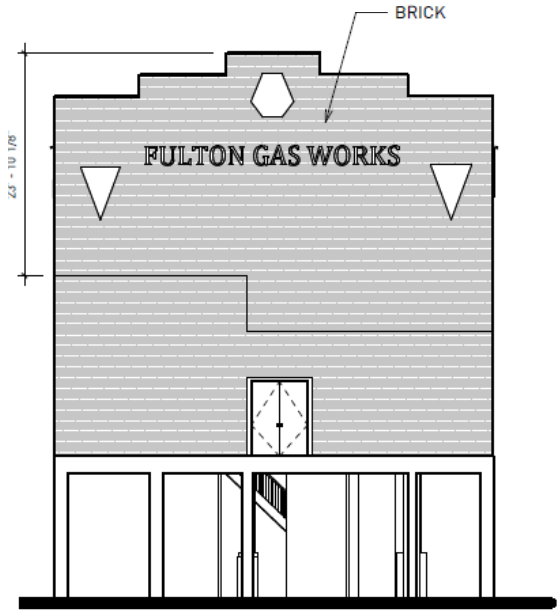

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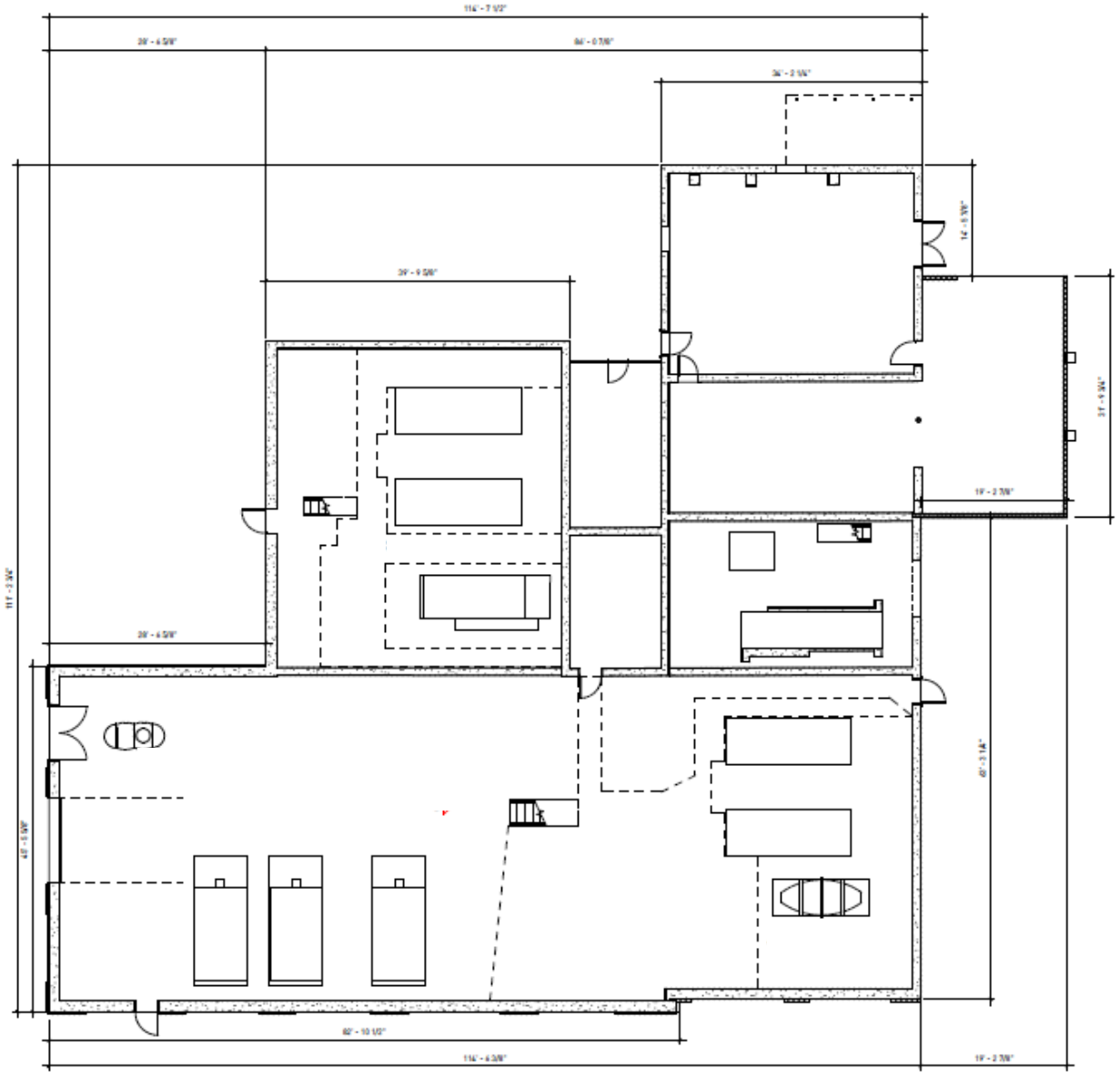

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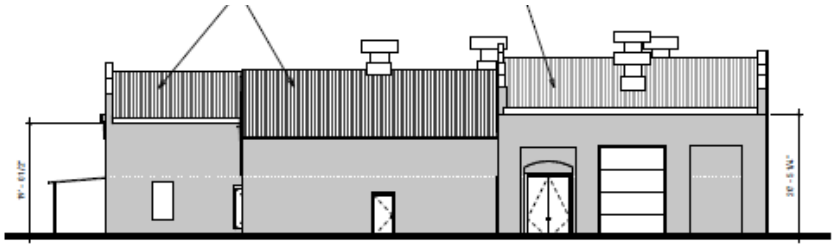

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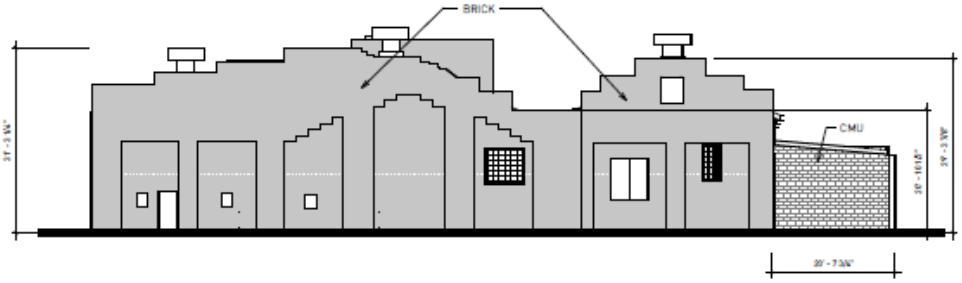

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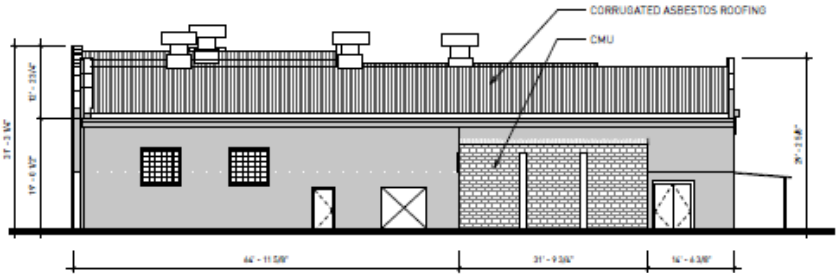

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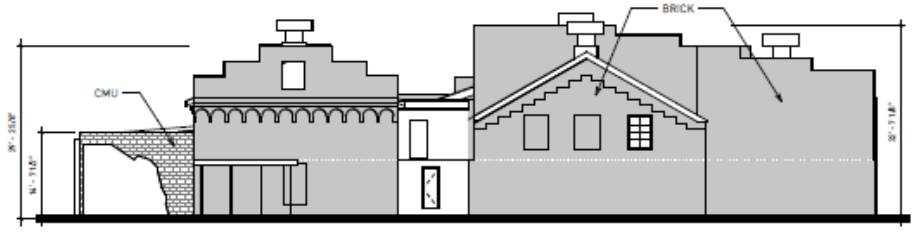

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(Richmond Lower Gas Works)
3301 Williamsburg Avenue
Richmond
Virginia

HAER No. VA-147

Robert J Taylor Jr, Photographer

June 2018

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HAER No. VA-147-11

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HAER No. VA-147-12

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HAER No. VA-147-13

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HAER No. VA-147-14

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HAER No. VA-147-17

HISTORIC AMERICAN ENGINEERING RECORD
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HAER No. VA-147-18

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HAER No. VA-147-19

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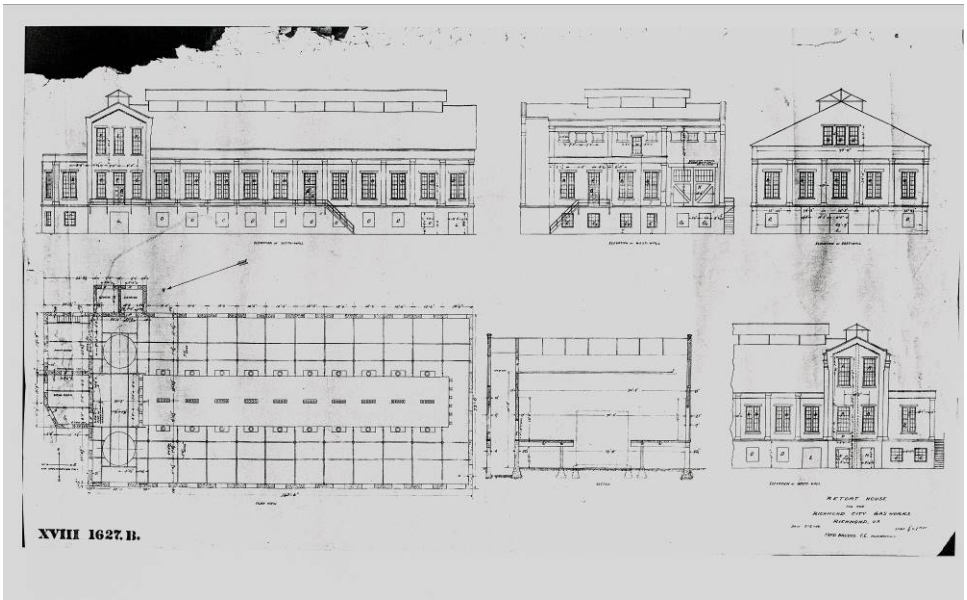
HAER No. VA-147-20


XVIII 1627. B.


FULTON GAS WORKS
SECTION A-A'
SECTION B-B'
EAST ELEVATION
SECTION C-C'

HISTORIC AMERICAN ENGINEERING RECORD
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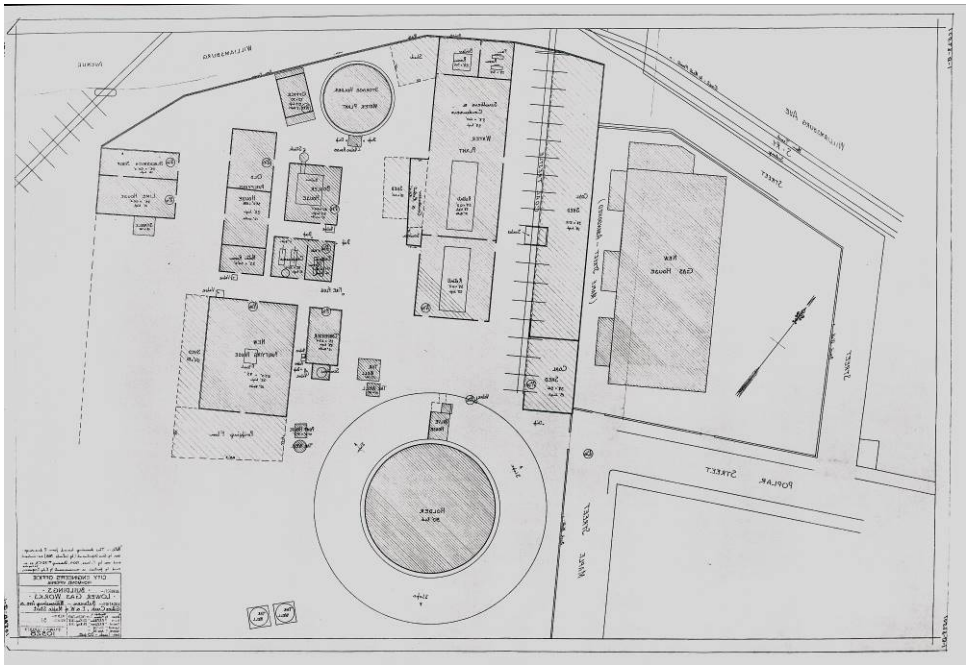
HAER No. VA-147-23




-ALTERATIONS & ADDITIONS TO COMPRESSOR HOUSE-
LOWER GAS WORKS- RICHMOND-VA.
CASKIE & JOHNSTON
ARCHITECTS & ENGINEERS
RICHMOND-VIRGINIA
-SOUTH ELEVATION-
④

United States Department of the Interior

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

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Photographs ☐ Illustrations ☑ Textual Materials ☐ Oral History/Interviews ☐

Audiotape ☐ Videotape ☐ Other (describe) ☐

Detail Description of Materials (attach additional pages if necessary)

Reduced copies of sketch plans and elevations of buildings located in the Fulton Gas Work Complex, prepared by 3North Architects for the City of Richmond, included on Data Pages 25-29 of HAER No. VA-147

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John A. Hugo, III	[signature]	09.19.19
Name	Signature	Date
201 West 7th Street; Richmond, VA 23224		804.232.8900
Address		Telephone Number

United States Department of the Interior

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

IN REPLY REFER TO:

3 October 2019

Robert J. Taylor, Jr.
Dutton + Associates
1115 Crowder Drive
Midlothian, VA 23113

Dear Mr. Taylor,

On behalf of the National Park Service's Heritage Documentation Programs (HABS/HAER/HALS), I acknowledge the receipt and acceptance of the Historic American Engineering Record documentation of the Fulton Gas Works (HAER VA-147).

The completed documentation will be transmitted to the Prints and Photographs Division of the Library of Congress. The records are in the public domain and will be accessible through the library.

Sincerely,

Mary McPartland

Mary McPartland
Collections Manager
Heritage Documentation Programs (HABS/HAER/HALS)