Report. HW314071.1.1.1987

Phase I investigation

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EA SCIENCE AND TECHNOLOGY

A Division of EA Engineering, Science, and Technology, Inc.

EA REPORT CHG61A

PHASE I INVESTIGATION

POUGHKEEPSIE (BAYEAUX STREET)
COAL GASIFICATION PLANT SITE
CITY OF POUGHKEEPSIE
DUTCHESS COUNTY, NEW YORK

Prepared for

Central Hudson Gas & Electric Corporation
284 South Avenue
Poughkeepsie, New York 12601

Prepared by

EA Science and Technology
R.D. 2, Goshen Turnpike
Middletown, New York 10940

A Division of EA Engineering, Science, and Technology, Inc.

January 1987

CONTENTS

1. Executive Summary

1. EXECUTIVE SUMMARY

The Poughkeepsie (Bayeaux Street) Coal Gasification Plant (Bayeaux Street Gas Plant or Bayeaux Street Gas Works) site is composed of approximately 1.2 acres of property located at the corner of North Perry (formerly Bayeaux Street) and Main Streets in the City of Poughkeepsie, Dutchess County, New York (Figures 1-1 and 1-2). The majority of the site is currently owned by Admiral Halsey Senior Village. Inc. The eastern-most portion of the site encompasses a portion of two separate parcels of property, one owned by M. Keefer Newburgh K.G. and the other owned by Mr. John Bahrenburg. The site is relatively flat, currently consisting of a 13-story apartment complex, parking lot, and an open-landscaped area (Photographs 1-1 through 1-4).

The Bayeaux Street Gas Works was constructed by the Poughkeepsie Gas Company (the first light company in the City) in 1850. Through a series of corporate mergers and changes of ownership, the facility was acquired by Central Hudson Gas and Electric Company in 1911. The Bayeaux Street Gas Works is believed to have operated until about 1911, when the Poughkeepsie (Water Street) Gas Plant started operation, which centralized gas production in the City of Poughkeepsie. The Bayeaux Street Gas Works property was sold to Mr. Charles Effron in 1919. The property has been privately owned since that time. Central Hudson Gas & Electric Company merged with several other gas manufacturing companies to form Central Hudson Gas & Electric Corporation (CHG&E) in 1926.

As part of the effort to determine the history of operations at the Bayeaux Street Gas Works, EA obtained information from CHG&E files, conducted a site inspection, interviewed personnel potentially familiar with the plant and its operation, and contacted federal, state, county, and local government agencies and officials. A detailed account of actual wastes or byproduct production and management practices for the Bayeaux Street Gas Works does not exist.

On 9 September 1986, EA performed an inspection of the former Bayeaux Street Gas Works site, and no evidence of coal gas manufacturing wastes or hazardous chemical compounds was observed, although no samples were taken from the site environs at that time. During the site inspection, a photoionization detector was used to measure for volatile organics in the air. No readings above background levels were obtained in the breathing zone. Therefore, because the EPA Hazardous Ranking System is designed to evaluate migration pathways of identified hazardous substances from a site; and because there is no documented hazardous waste or contamination in this case, it is not appropriate to provide a Hazard Ranking Score (or documentation) for this site.

In order to prepare a final HRS score for this site, analytical data regarding the quality of the ground water and soil will be necessary, thus requiring performance of a Phase II investigation. The proposed Phase II study would include the performance of a soil vapor survey, the installation of 4 observation wells, and the collection and analysis of ground-water and soil samples.

Site Coordinates:

Latitude: 41^{o} 42' 23"
Longitude: 73^{o} 55' 56"

POUGHKEEPSIE BAYEAUX STREET COAL GAS PLANT

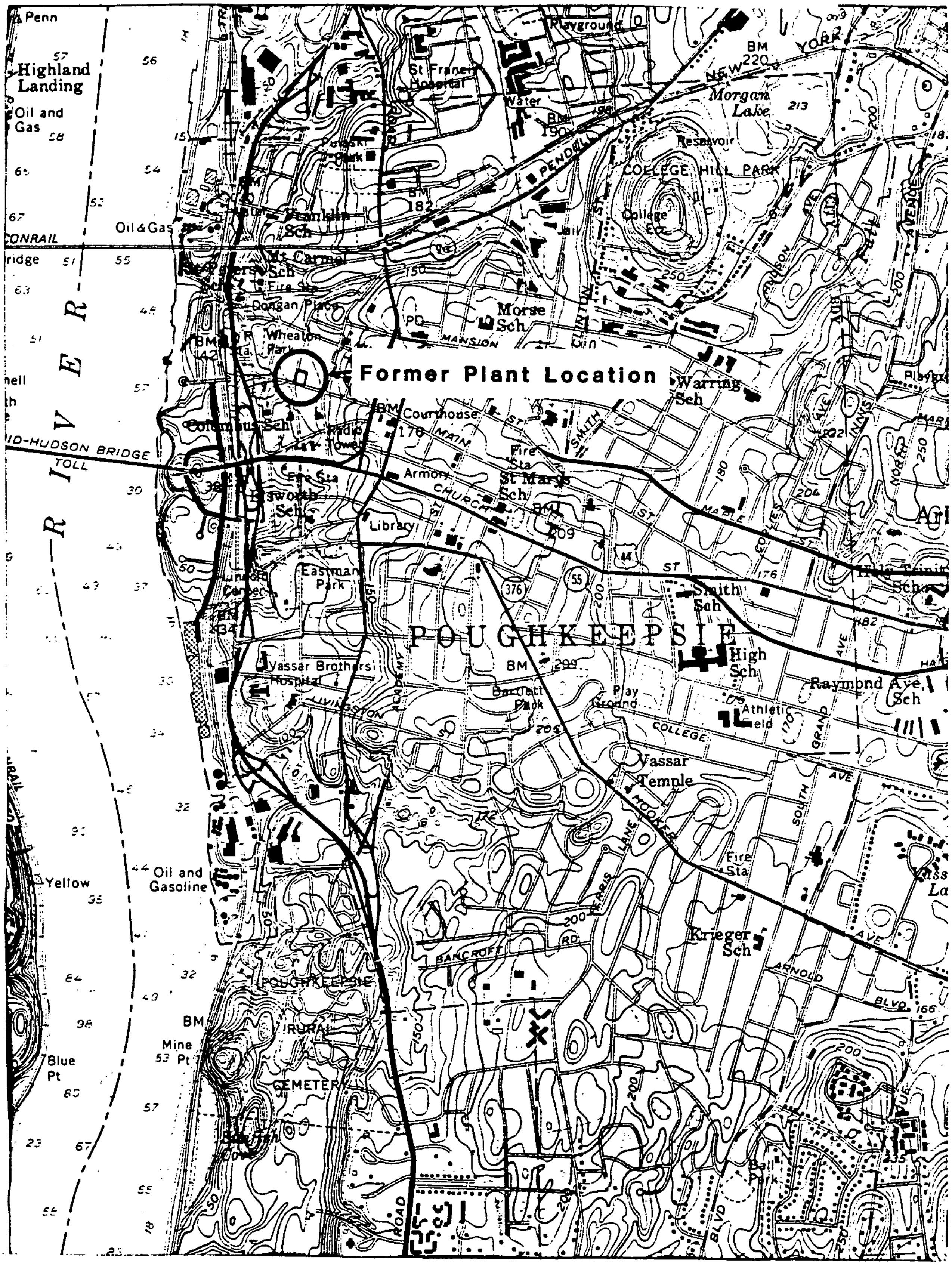


Figure 1-1. Site Locator Map.

north arrow?

Poughkeepsie Quad
USGS 7.5-Minute Series
Photorevised 1982
Scale 1:24,000

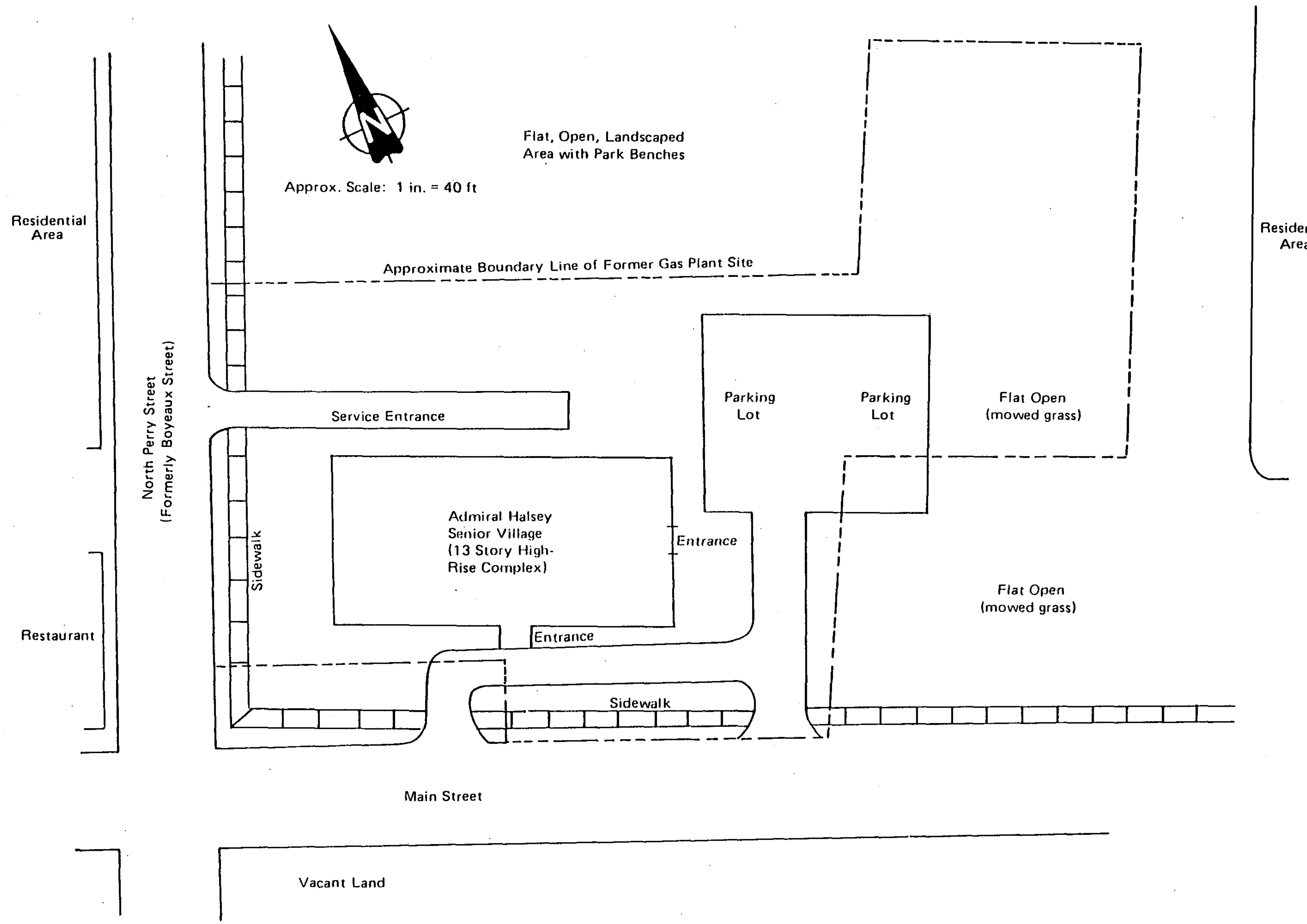
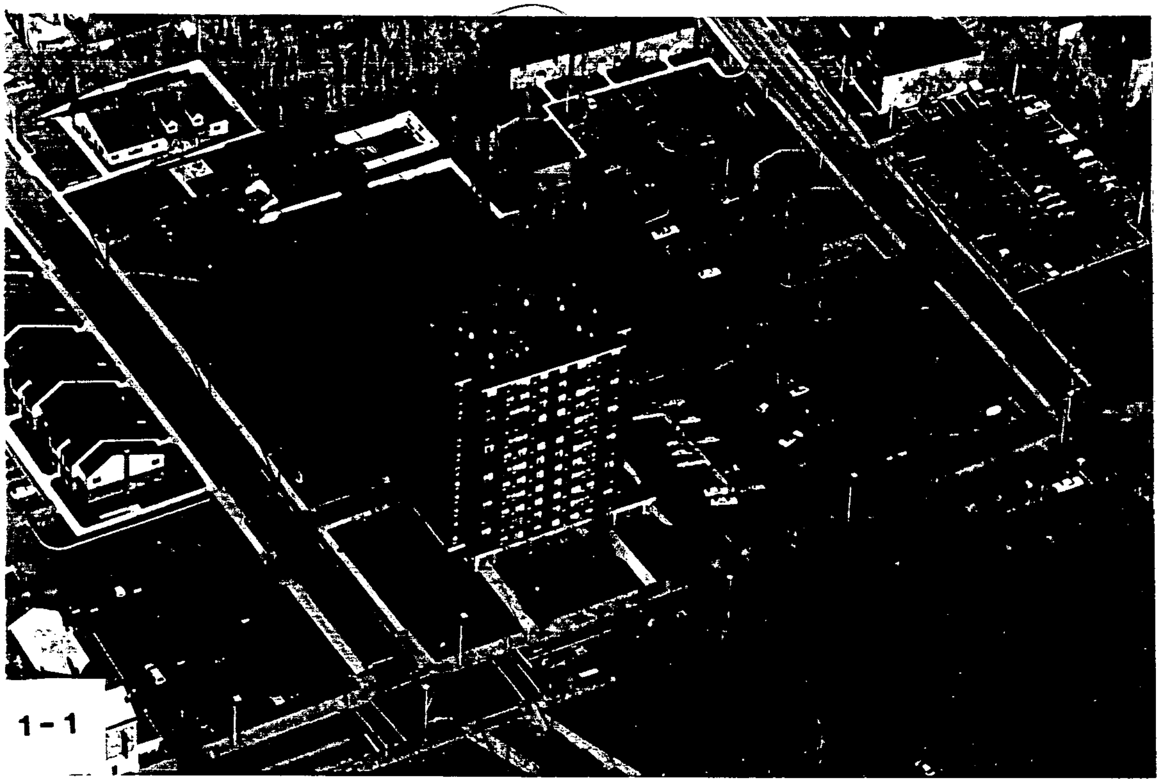
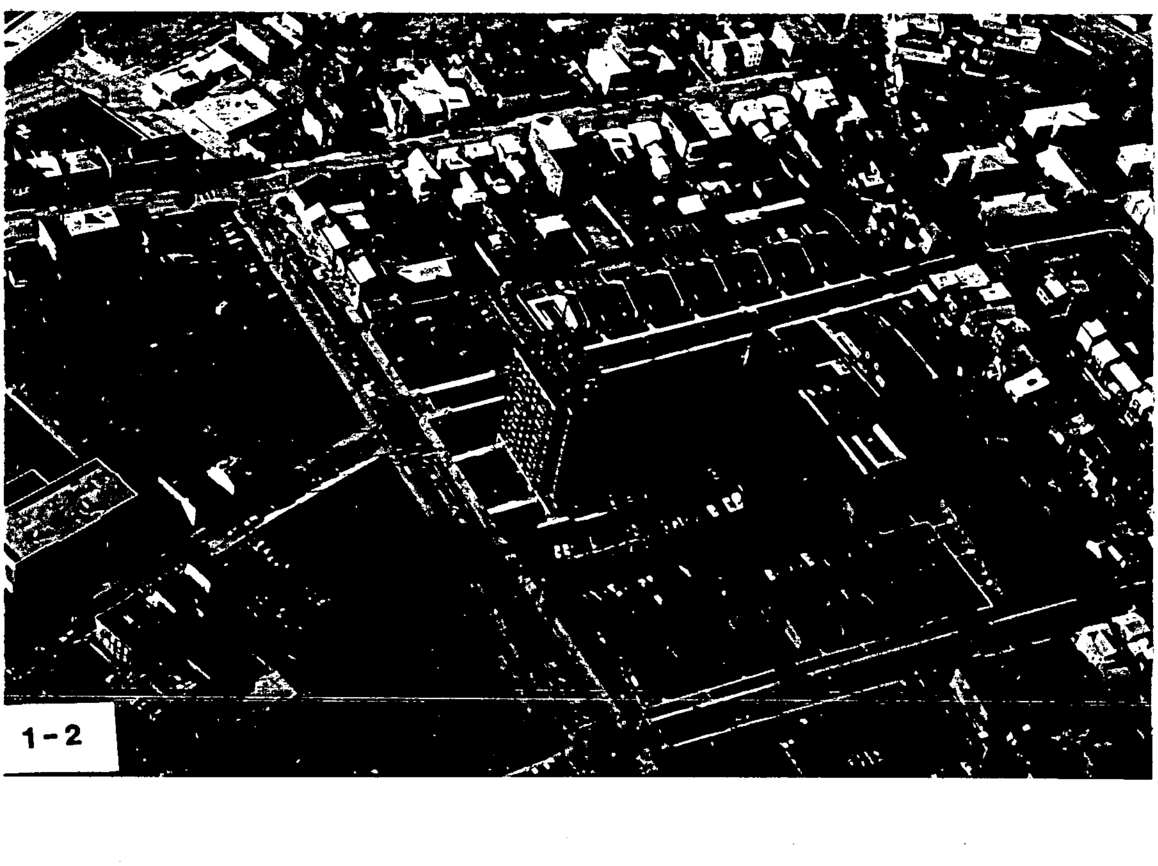


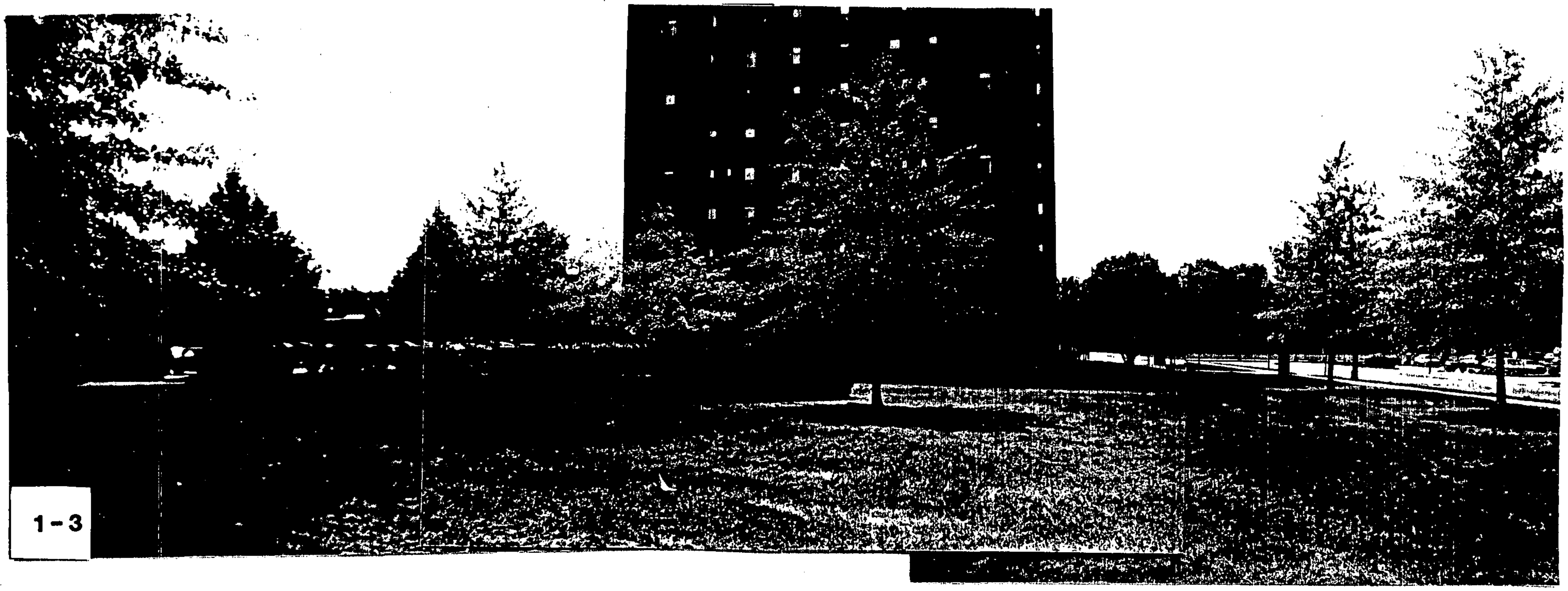
Figure 1-2. Sketch of former Bayeaux Street Gas Plant site.



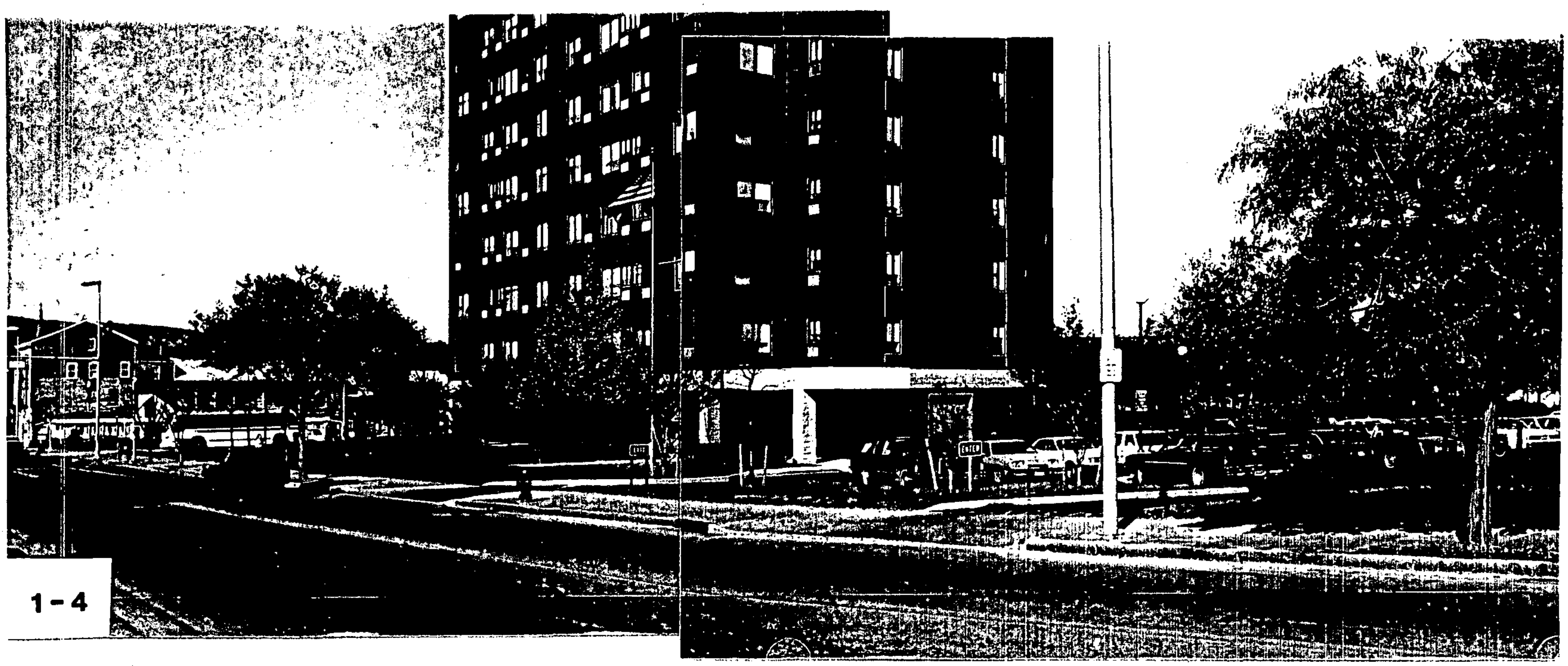
1-1



1-2



1-3



1-4

PHOTO LOG - BAYEAUX STREET GAS PLANT SITE

Photo	Description
1-1	Aerial view of site (high-rise and immediate surrounding area) facing northeast. Road in foreground is Main Street. Road at lower left is North Perry Street (formerly Bayeaux Street). The majority of structures shown are private residences. A commercial establishment is located at lower left in photo.
1-2	Broad aerial view of site and surrounding area facing north.
1-3	Panorama of site facing south.
1-4	Panorama of site from Main Street facing north.

2. Purpose

2. PURPOSE

Coal gas manufacturing operations are known to have generated waste byproducts containing chemical compounds which have the potential to pose a risk to human health or the environment. Little is known with respect to the disposition of wastes generated by the former Bayeaux Street Gas Plant.

The goal of the Phase I investigation of the Bayeaux Street Gas Plant was to: (1) obtain available records on the site history from CHG&E, state, federal, county, and local agencies; (2) obtain information on site topography, geology, local surface water and ground-water use, previous contamination assessments, and local demographics; (3) interview site owners, operators, and other groups or individuals knowledgeable of site operations; (4) conduct a site inspection to observe current conditions; and (5) prepare a Phase I report. The Phase I report includes an assessment of the available information and a recommended work plan for Phase II studies.

3. Scope of Work

3. SCOPE OF WORK

3.1 RECORD SEARCH/DATA COMPILATION

The Phase I investigation of the Bayeaux Street Gas Plant site involved a site inspection by EA Science and Technology, as well as record searches and interviews. The following agencies or individuals were contacted:

Contact	Information Received
Mr. Jeffrey A. Clock Central Hudson Gas & Electric Corporation 284 South Avenue Poughkeepsie, New York 12601 (914) 452-2000	Site file
Mr. Wilbur Peters Central Hudson Gas & Electric Corporation 284 South Avenue Poughkeepsie, New York 12601 (914) 452-2000	No file/information
Ms. Kristen E. Kennedy Central Hudson Gas & Electric Corporation 284 South Avenue Poughkeepsie, New York 12601 (914) 452-2000	Historical documents
Mr. Joseph Warnock (Retiree) Central Hudson Gas & Electric Corporation 284 South Avenue Poughkeepsie, New York 12601 (914) 452-2000	No information
Mr. John Shultz (Retiree) Central Hudson Gas & Electric Corporation 284 South Avenue Poughkeepsie, New York 12601 (914) 452-2000	No information

Contact	Information Received
Mr. Shaminder P. Singh/ Mr. Ramananda Pergadia, P.E. New York State Department of Environmental Conservation 21 South Putt Corners Road New Paltz, New York 12561 (914) 255-5453	No file/information
Mr. Walter E. Demick, P.E. New York State Department of Environmental Conservation Bureau of Site Control 50 Wolf Road Albany, New York 12233-0001 (518) 457-0639	No file/information
Mr. Vance Bryant New York State Department of Environmental Conservation Division of Hazardous Waste Enforcement 50 Wolf Road Albany, New York 12233-0001 (518) 457-4346	No file/information
Mr. Mark Moroukian New York State Department of Environmental Conservation Bureau of Remedial Action 50 Wolf Road Albany, New York 12233-0001 (518) 457-5637	No file/information
Mr. Peter Skinner, P.E. New York State Attorney General's Office Room 221 Justice Building Albany, New York 12224 (518) 474-2432	No file/information
Mr. Louis A. Evans, Atty. New York State Department of Environmental Conservation 202 Mamaroneck Avenue White Plains, New York 10601-5381	No file/information

Contact	Information Received
Mr. Roberto Olazagasti/ Mr. Dennis Farrar Bureau of Hazardous Site Control New York State Department of Environmental Conservation 50 Wolf Road Albany, New York 12233-0001 (518) 457-0747	No file/information
Mr. Jerry Meehan Bureau of Toxic Substance Assessment New York State Department of Health Empire State Plaza Corning Tower Building Albany, New York 12237 (518) 473-8427	No file/information
Mr. James Covey, P.E. New York State Department of Health Nelson A. Rockefeller Empire State Plaza Corning Tower Building Albany, New York 12237 (518) 473-4637	Community Water Supply Atlas
Ms. Carole Petersen NPL Coordinator, Site Compliance Branch U.S. Environmental Protection Agency Region II Room 757 26 Federal Plaza New York, New York 10278 (212) 264-4595	No file/information
Mr. Bryan L. Swift Significant Habitat Unit New York State Department of Environmental Conservation Wildlife Resources Center Delmar, New York 12054-9767	Significant habitat
Mr. Peter Housiak Mapping Information Unit New York State Department of Public Transportation State Campus Building 4 - Room 105 Albany, New York 12232	Aerial photos

Contact	Information Received
Mr. Lloyd A. Wagner U.S. Dept. of the Interior Geological Survey Water Resources Division P.O. Box 1669 Albany, New York 12201	100-year floodplain maps, Topographic maps
Ms. Rebecca Harrison Program Manager Office of Parks, Recreation, and Historical Preservation Empire State Plaza Agency Building One, 13th Floor Albany, New York 12238	Historical and Archaeological information
Mr. Ruff/Mr. Ellis Adams Dutchess County Health Department County Office Building 22 Market Place Poughkeepsie, New York 12601	Site file
Mr. Charlie Shaw Dutchess County Environmental Management Council Route 44 Millbrook, New York 12545	No file/information
Mr. Dennis Amone Planner Dutchess County Planning Department 47 Cannon Street Poughkeepsie, New York 12601	Census data
Real Property Tax Service Agency of Dutchess County 22 Market Street Poughkeepsie, New York 12601 (914) 431-2140	Real property map, site owners and addresses
Mr. Wallace Assistant Civil Engineer City of Poughkeepsie Water Department Howard Street Extension Poughkeepsie, New York 12601 (914) 462-6535	Public water supply information
Mr. Walter Simmons District Secretary Hyde Park Fire and Water District East Market Street Hyde Park, New York 12538 (914) 229-2686	Public water supply information

Contact	Information Received
Mr. Larry Brown, Senior Biologist End Spp. Unit New York State Department of Environmental Conservation Delmar, New York 12054-9767 (518) 439-7486	Habitat information
Mr. Mac Issac Assistant Fire Inspector City of Poughkeepsie Poughkeepsie, New York 12601 (194) 431-8337	Fire/explosion information
Mr. George Knapp Water Maintenance Supervisor Town of Poughkeepsie Water Department Cedar Avenue Poughkeepsie, New York 12601 (914) 462-6535	Water supply information
Ms. Susan Brown Director Dutchess County Historical Society 549 Main Street Poughkeepsie, New York 12601 (914) 471-1630	No file/information

4. SITE ASSESSMENT - BAYEAUX STREET GAS PLANT

4.1 SITE HISTORY

The site of the former Bayeaux Street Gas Plant is located along North Perry (formerly Bayeaux Street) and Main Streets in the City of Poughkeepsie, Dutchess County, New York (Figure 1-1). The site encompasses an area of approximately 1.2 acres (Figure 1-2). As is depicted in Figure 1-2, the former Bayeaux Street Gas Plant site currently consists of a 13-story apartment complex, parking lot, and an open-landscaped area. The majority of the site is currently on property owned by the Admiral Halsey Senior Village. The eastern-most portion of the former gas plant site is currently owned by M. Keefer Newburgh K.G. and Mr. John Bahrenburg (Appendix 1.1-1).

A Poughkeepsie New Yorker news article (dated 19 April 1953) obtained from CHG&E files suggests that the Bayeaux Street Gas Works was constructed by the first light company in the city (Appendix 1.1-2). The Poughkeepsie Gas Company constructed its plant and office on Bayeaux Street, now North Perry Street, in 1850. For 25 years, Poughkeepsie Gas Company was the exclusive gas company in Poughkeepsie until Citizens Gas Company opened a gas works at Laurel Street in 1875. Due to competition with the newly formed electric company, the two gas companies consolidated in 1886, and became the Poughkeepsie Gas Light Company. In 1901, the Poughkeepsie Gas Light Company consolidated with Poughkeepsie Electric Light & Power Company to form Poughkeepsie Light Heat & Power Company (PLH&P) (Appendix 1.1-2).

Realizing in 1904 that the Poughkeepsie Gas Works would not be able to meet future demands for gas, PLH&P decided to construct a new facility in the vicinity of the electric station at Water Street (Appendix 1.1-3). In 1905, the PLH&P began implementing their plans to construct a new gas works by purchasing property in the vicinity of the electric station at Water Street (which later became known as the Riverside or Water Street Gas Works). However, by 1907, unfavorable changes in economic conditions caused PLH&P to curtail their relocation plans, and new equipment was installed at the Laurel Street plant to provide sufficient gas production for the winter (Appendix 1.1-3). In the early part of 1909, steps towards construction of a new gas works at the Water Street location were once again undertaken (Appendix 1.1-3). In 1911, PLH&P consolidated with several smaller gas manufacturing companies to form Central Hudson Gas & Electric Company (Appendix 1.1-4). At this time, construction activities at the Water Street location were completed, and on 15 October 1911, the Water Street (Riverside) Gas Plant began operation. The Laurel Street Gas Works was then shut down (Appendix 1.1-5). The Bayeaux Street Gas Works is believed to have been shut down as well. Gas mains (16-in. and 6-in.) were installed in late 1909, connecting the new gas holder at Water Street to a point on Mill Street just west of Bayeaux Street. The 16-in. line was connected to the existing 16-in. main, and the 6-in. line running along Bayeaux Street was connected to the pumping line between the Gas Works and the Bayeaux Street gas holders (Appendix 1.1-6). On 16 December 1919, the Bayeaux Street Gas Plant property was sold to Mr. Charles Effron (Appendix 1.1-7).

In 1926, Central Hudson Gas & Electric Company consolidated with several other coal gas manufacturing companies to form Central Hudson Gas & Electric Corporation (Appendix 1.1-4).

As part of the effort to determine the history of operations at the Bayeaux Street Gas Plant, EA obtained information from CHG&E's files, interviewed personnel potentially familiar with the plant and its operation, and contacted federal, state, county, and local goverment agencies and officials (Chapter 3). A detailed account of actual waste or byproduct production and management practices for the Bayeaux Street Gas Plant does not exist and could not be developed based upon available information. However, coal gas manufacturing processes and the waste byproducts that were typically generated (coal tar, spent oxide and lime, gas and ammonia liquors, coke etc.) have been documented (Appendix 1.1-8). A review of the technical literature indicates that coal gas manufacturing byproducts and wastes contain chemical compounds (polynuclear aromatic hydrocarbons, phenolics, light aromatics [benzene, toluene, ethylbenzene, xylenes], trace metals, etc.) which have the potential to pose a risk to human health or the environment (Appendix 1.1-8).

On 9 September 1986, EA performed an inspection of the former Bayeaux Street Gas Plant site, and no evidence of the presence of coal gas manufacturing wastes or hazardous chemical compounds was observed, although no samples were taken from the site environs. Furthermore, EA has researched all pertinent agency files and interviewed persons who were affiliated with or knowledgeable of the site, and found no documented hazardous waste or contamination at the site.

4.2 SITE TOPOGRAPHY

The former Bayeaux Street Gas Plant site is situated at the corner of Main Street and North Perry Street (formerly Bayeaux Street) in the City of Poughkeepsie, Dutchess County, New York (Figure 1-1). Currently the site is the location of the Admiral Halsey Senior Village, a 13-story senior citizens apartment complex. The area is generally flat (0-3 percent slope to the west). The property is open, park-like, nicely landscaped and maintained. An asphalt parking lot is located on the southeast side of the apartment building (Figure 1-2). The surface cover at this site is predominantly grass (lawn), however, a large portion of the site surface area is covered by the apartment building, an asphalt parking lot, and concrete sidewalks. During EA's 9 September 1986 site inspection, no signs of potential contamination was evident anywhere in the site area, and no volatile organics were detected above background with an HNU instrument. There is little information available regarding the former Bayeaux Street Gas Plant's operation and layout.

The predominant land use in the area is residential with some commercial use. The nearest commercial building is a restaurant located at the opposite corner of North Perry and Main Streets, approximately 75 ft west of the site. The nearest residence is directly on the site. The nearest surface water is the Hudson River, which is approximately 2,000 ft west of the site (Appendix 1.2-1). The Town and City of Poughkeepsie are served by public water drawn from the Hudson River. Every street in the Town and City of Poughkeepsie is supplied by public water (Appendixes 1.2-2 and 1.2-3). The nearest reported drinking water well is a community well located 2 mi south of the site (Appendix 1.2-4).

4.3 SITE HYDROGEOLOGY

The former Bayeaux Street Gas Plant is underlain by a thick layer of Pleistocene Age glacial lodgement till. This surficial deposit is in turn underlain by a shale and sandstone bedrock. Two wells (not used as drinking water supplies) located approximately 1,000 ft southeast of the site (Du 417 and Du 439), recorded a depth to bedrock of 30 ft. Simmons et al. designates the bedrock as Ordovician Age Hudson River Formation (Appendix 1.3-1). Fisher et al. designates the bedrock under the site as Ordovician Age Austin Glen Formation (graywacke and shale) on the 1:250,000 scale New York State Geologic Map (Appendix 1.3-2).

The glacial till is composed of a heterogeneous mixture of clay, sand, gravel, and some boulders, and is anticipated to have a relatively low permeability. The glacial till is generally considered to be incapable of yielding significant water for the development of wells. The bedrock has reportedly been developed by several commercial and community wells within the 3-mi radius (Appendixes 1.3-1, 1.3-3, and 1.2-4). Most of the area within a 3-mi radius of the site is served by public water, drawn from the Hudson River. The rural areas outside the Town of Poughkeepsie are not serviced by public water companies and thus depend on private wells (Appendixes 1.2-2 and 1.2-3).

Based upon available information, the bedrock (Aquifer Nos. 1, 2, and 4, by Gerber as shown on Appendix 1.3-3) is designated as the aquifer of concern. Within a 3-mi radius of the site, the aquifer of concern is bounded on the west by the Hudson River and on the south by thrust faults. A small thrust sheet (klippe) of shale, argillite, and chert is present to the north of the site (Appendix 1.3-3).

The depth to ground water is unknown, however, the log of Well Du 439 states that it yielded 4 gpm when the well was 75 ft deep. Depth to water in the area is therefore less than 75 ft (Appendix 1.3-1). The available data does not confirm a hydraulic connection between the site, through the glacial till to the bedrock aquifer-of-concern. However, such a connection is possible. Based upon the site topography, the local ground-water flow is probably to the west.

4.4 SITE GONTAMINATION

Waste Types and Quantities

Detailed records of waste generation/disposal practices at the Bayeaux Street Gas Plant do not exist. The amounts and types of waste generated are unknown.

Ground Water

No data available.

Surface Water

No data available.

Soil

No data available.

Air

During EA's 9 September 1986 site inspection, a photoionization detector was used to measure for volatile organics in the air. No readings above background levels were obtained in the breathing zone.

5. Preliminary HRS

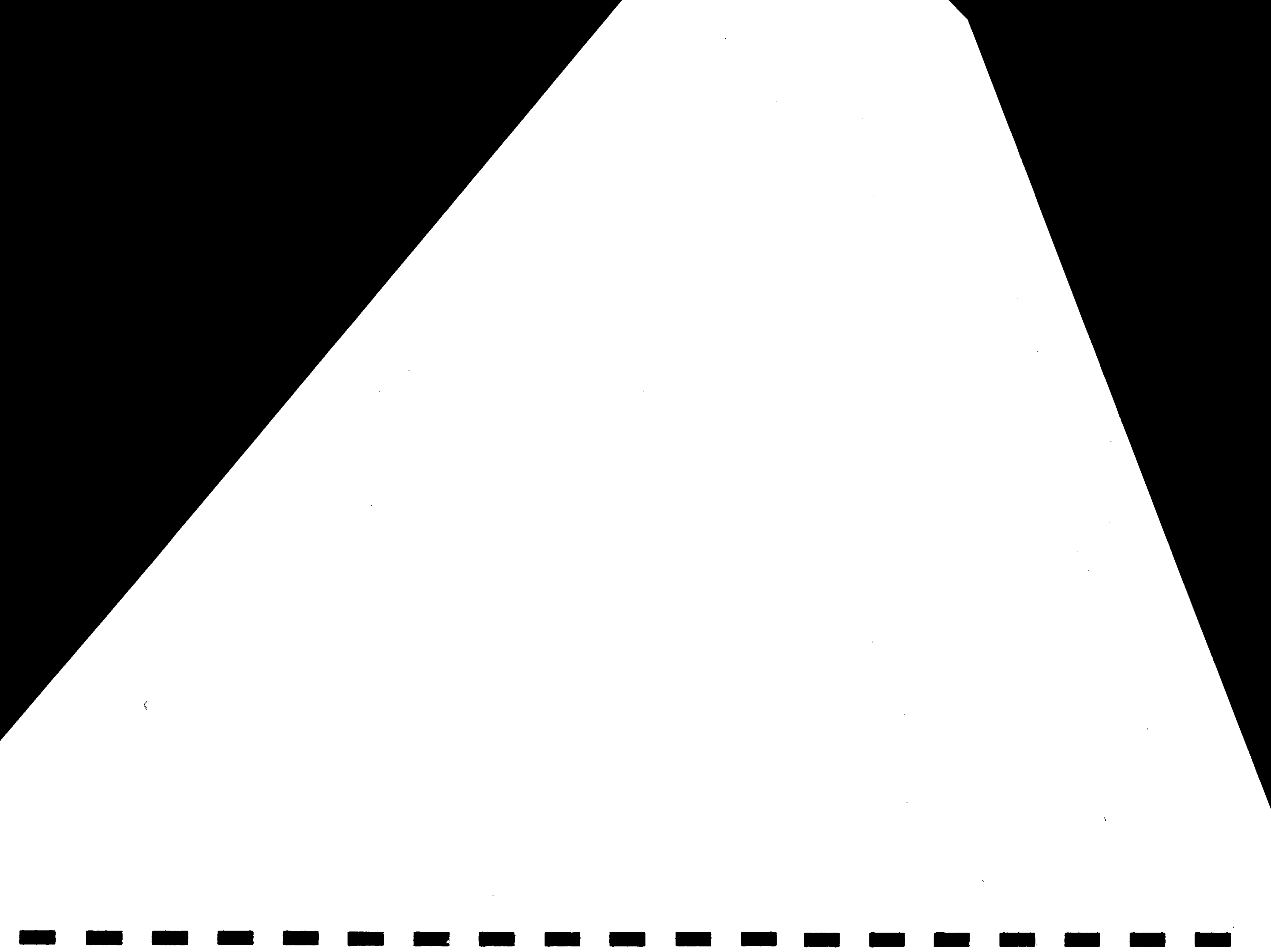
5.1 Narrative Summary

BAYEAUX STREET GAS PLANT
CITY OF POUGHKEEPSIE, DUTCHESS COUNTY

The site of the former Bayeaux Street Gas Plant (inactive) consists of a 1.2-acre parcel of property located at the corner of North Perry Street (formerly Bayeaux Street) and Main Street in the City of Poughkeepsie, Dutchess County, New York. The Bayeaux Street Gas Plant operated from 1850 to around 1911 under the ownership of the following gas companies: Poughkeepsie Gas Company, Poughkeepsie Gas Light Company, Poughkeepsie Light Heat and Power Company, and Central Hudson Gas & Electric Company. The property was sold to Mr. Charles Effron in 1919. Currently, the majority of the Bayeaux Street Gas Works site is on property owned by the Admiral Halsey Senior Village, Inc. A small portion, the eastern-most aspect of the site, is on two additional pieces of property, one owned by M. Keefer Newburgh K.G. and the other by Mr. John Bahrenburg.

On 9 September 1986, EA performed an inspection of the former Bayeaux Street Gas Works site, and no evidence of coal gas manufacturing wastes or hazardous chemical compounds was observed, although no samples were taken from site environs at that time. During the site inspection, a photoionization detector was used to measure for volatile organics in the air. No readings above background were obtained in the breathing zone.

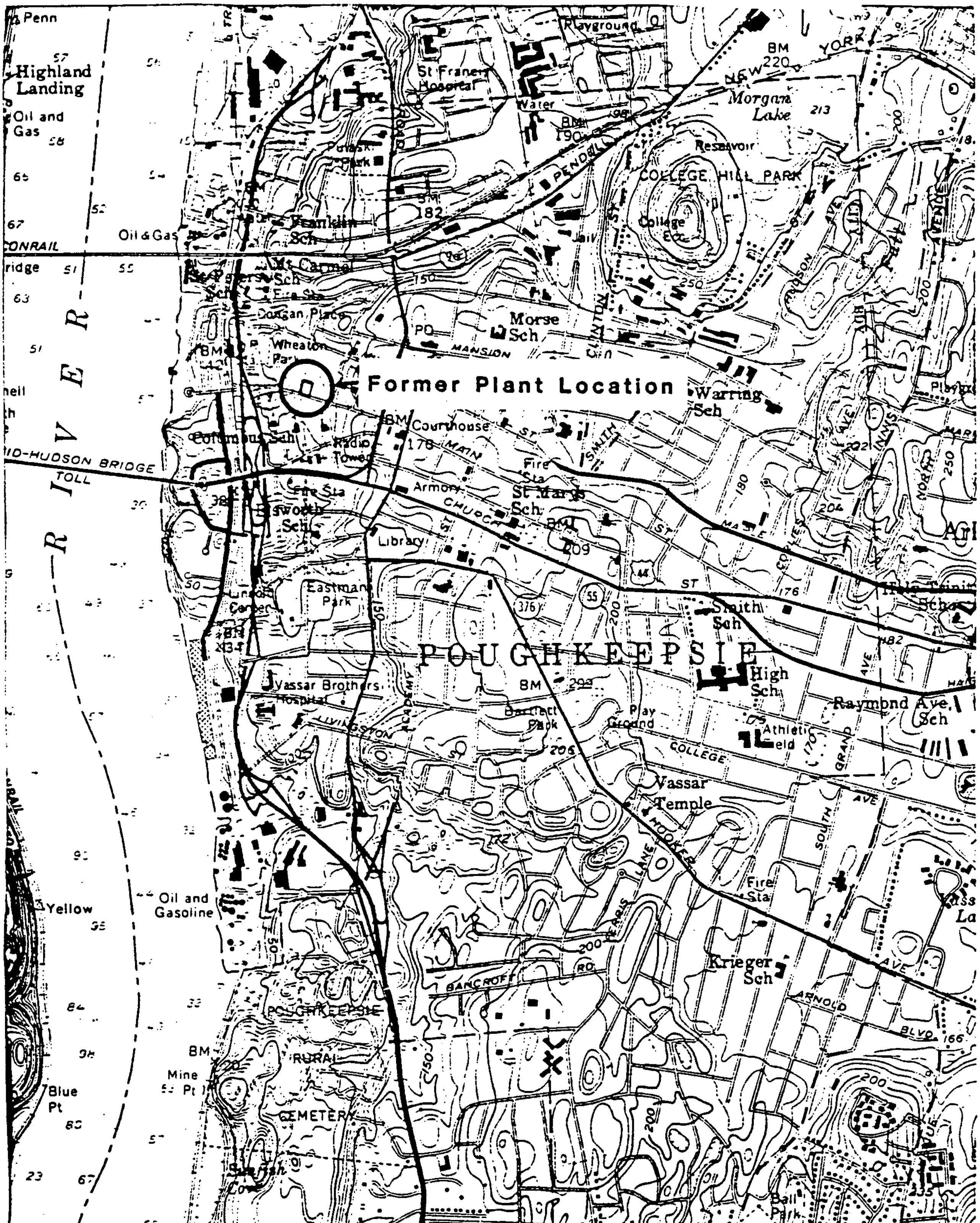
Therefore, because the EPA Hazardous Ranking System is designed to evaluate migration pathways of identified hazardous substances from a site, and because there is no documented hazardous waste or contamination in this case, it is not appropriate to provide a Hazard Ranking Score (or documentation) for this site.



Site Coordinates:

Latitude: 41° 42' 23"
Longitude: 73° 55' 56"

POUGHKEEPSIE BAYEAUX STREET COAL GAS PLANT



Poughkeepsie Quad
USGS 7.5-Minute Series
Photorevised 1982
Scale 1:24,000

Facility name: Bayeaux Street Gas Plant

Location: City of Poughkeepsie, Dutchess County, New York

EPA Region: II

Person(s) in charge of the facility: Admiral Halsey Senior Village
515 Rockaway Boulevard
Valley Stream, New York 11581

Name of Reviewer: EA Science and Technology Date: 12 December 1986

General description of the facility:

(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action, etc.)

The site is the location of the former Bayeaux Street Gas Plant, which operated from 1850 to around 1911. EA has researched all pertinent agency files and interviewed persons who were affiliated with or knowledgeable of the site, and has found no documented hazardous waste or contamination at the site. Therefore, because the EPA Hazardous Ranking System is designed to evaluate migration pathways of identified hazardous substances from a site, and because there is apparently no documented hazardous waste or contamination in this case, it is not appropriate to provide a Hazardous Ranking Score (or documentation) for this site.

Scores: S_M = (S_{gw} = S_{sw} = S_a =)

S_{FE} =

S_{DC} =

FIGURE 1
HRS COVER SHEET

DOCUMENTATION RECORDS
FOR
HAZARD RANKING SYSTEM

INSTRUCTIONS: As briefly as possible, summarize the information you used to assign the score for each factor (e.g., "Waste quantity = 4,230 drums plus 800 cubic yards of sludges"). The source of information should be provided for each entry and should be a bibliographic-type reference. Include the location of the document.

FACILITY NAME: Bayeaux Street Gas Plant

LOCATION: City of Poughkeepsie, Dutchess County

DATE SCORED: 12 December 1986

PERSON SCORING: EA Science and Technology

PRIMARY SOURCES(S) OF INFORMATION (e.g., EPA region, state, FIT, etc.)

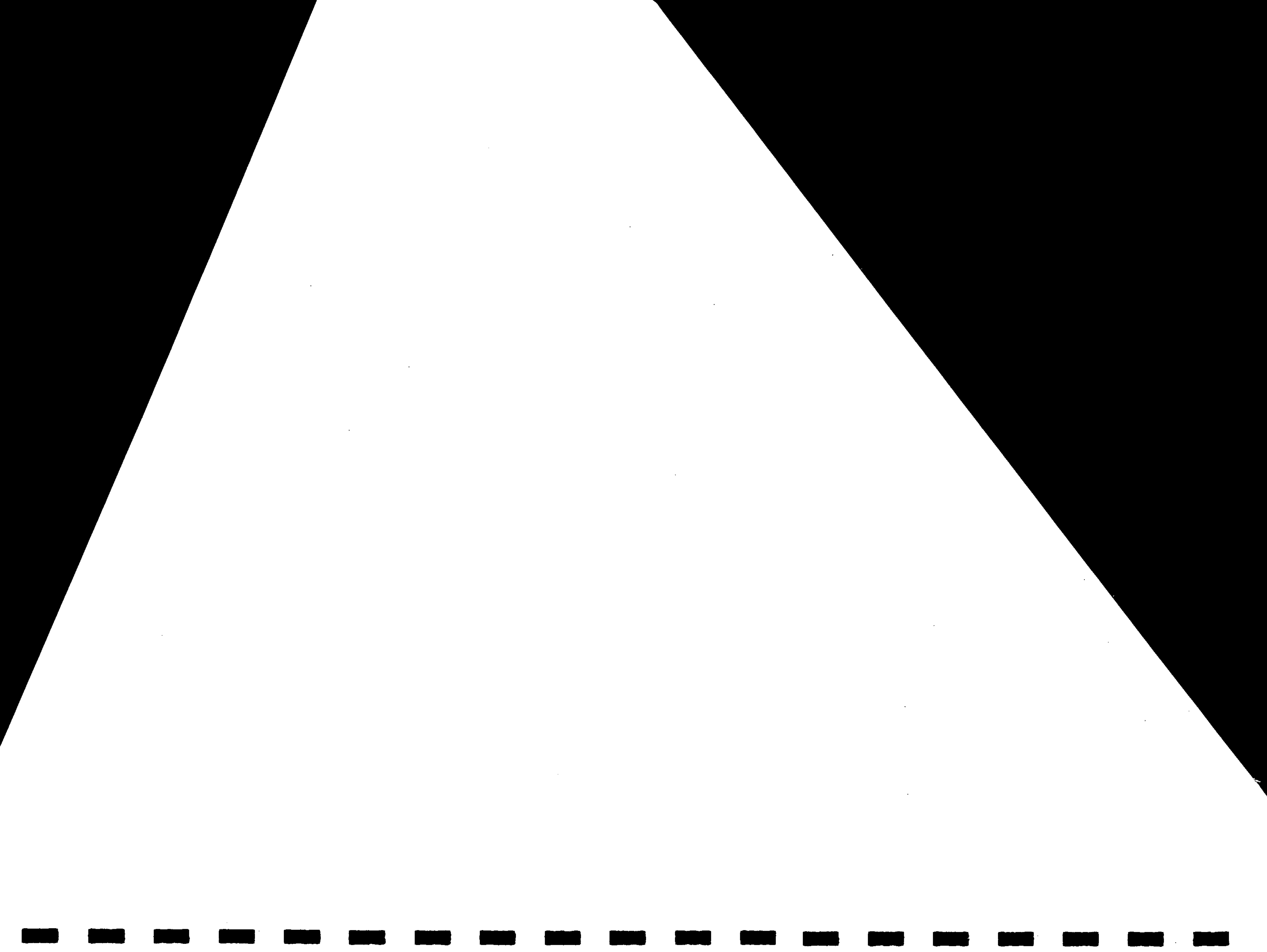
Central Hudson Gas & Electric Corporation (CHG&E) files

FACTORS NOT SCORED DUE TO INSUFFICIENT INFORMATION:

COMMENTS OR QUALIFICATIONS:

EA has researched all pertinent agency files and interviewed persons who were affiliated with or knowledgeable of the site, and found no documentation or contamination at this site. Therefore, because the EPA Hazardous Ranking System is designed to evaluate migration pathways of identified hazardous substances from a site, and because there is no documented hazardous waste or contamination in this case, it is not appropriate to provide a Hazard Ranking Score (or documentation) for this site.

5.5 EPA 2070-12



United States Environmental Protection Agency
Office of Emergency and Remedial Response Washington, DC 20460
EPA Form 2070-12 July, 1981

Bayeaux Street Gas Plant

EPA

Potential Hazardous Waste Site

Preliminary Assessment

EPA

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT
PART 1 - SITE INFORMATION AND ASSESSMENT

I. IDENTIFICATION

01 STATE	02 SITE NUMBER

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site): Bayeaux Street Gas plant
02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER: North Perry Street
03 CITY: Poughkeepsie
04 STATE: N.Y.
05 ZIP CODE: 12601
06 COUNTY: Dutchess
07 COUNTY CODE:
08 CONG DIST:
09 COORDINATES LATITUDE: 41° 42' 23" LONGITUDE: 73° 55' 56"
10 DIRECTIONS TO SITE (Starting from nearest public road): From the City of Poughkeepsie take Main Street west to North Perry Street. Site is located at the corner of Main and North Perry, presently the Admiral Halsey Senior Village.

III. RESPONSIBLE PARTIES

01 OWNER (if known): Admiral Halsey Senior Village, Inc.
02 STREET (Business, mailing, residential): 515 Rockaway Blvd.
03 CITY: Valley Stream
04 STATE: N.Y.
05 ZIP CODE: 11581
06 TELEPHONE NUMBER: ( )
07 OPERATOR (if known and different from owner): Central Hudson Gas & Electric
08 STREET (Business, mailing, residential): 284 South Ave.
09 CITY: Poughkeepsie
10 STATE: N.Y.
11 ZIP CODE: 12601
12 TELEPHONE NUMBER: (914) 452-2000

13 TYPE OF OWNERSHIP (Check one)
☒ A. PRIVATE ☐ B. FEDERAL: ______ (Agency name) ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL
☐ F. OTHER: ______ (Specify) ☐ G. UNKNOWN

14 OWNER/OPERATOR NOTIFICATION ON FILE (Check all that apply)
☐ A. RCRA 3001 DATE RECEIVED: / / (MONTH DAY YEAR) ☐ B. UNCONTROLLED WASTE SITE (CERCLA 103 c) DATE RECEIVED: / / (MONTH DAY YEAR) ☒ C. NONE

IV. CHARACTERIZATION OF POTENTIAL HAZARD

01 ON SITE INSPECTION
☒ YES DATE 9/9/86 (MONTH DAY YEAR)
☐ NO
BY (Check all that apply)
☐ A. EPA ☐ B. EPA CONTRACTOR ☐ C. STATE ☐ D. OTHER CONTRACTOR
☐ E. LOCAL HEALTH OFFICIAL ☒ F. OTHER: EA Science & Technology, Inc. (Specify)
CONTRACTOR NAME(S):

02 SITE STATUS (Check one)
☐ A. ACTIVE ☒ B. INACTIVE ☐ C. UNKNOWN

03 YEARS OF OPERATION
1850 (BEGINNING YEAR) | ~1911 (ENDING YEAR) ☐ UNKNOWN

04 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN, OR ALLEGED
Coal tars are typical waste products of coal gasification plants.

05 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION
Unknown.

V. PRIORITY ASSESSMENT

01 PRIORITY FOR INSPECTION (Check one. If high or medium is checked, complete Part 2 - Waste Information and Part 3 - Description of Hazardous Conditions and Incidents)
☐ A. HIGH (Inspection required promptly) ☐ B. MEDIUM (Inspection required) ☐ C. LOW (Inspect on time available basis) ☐ D. NONE (No further action needed, complete current disposition form)

VI. INFORMATION AVAILABLE FROM

01 CONTACT: Jeff Clock
02 OF (Agency/Organization): Central Hudson Gas + Electric Corp.
03 TELEPHONE NUMBER: (914) 452 2000
04 PERSON RESPONSIBLE FOR ASSESSMENT: Thomas Porter
05 AGENCY:
06 ORGANIZATION: EA
07 TELEPHONE NUMBER: (914) 692-6706
08 DATE: 12/12/86 (MONTH DAY YEAR)

EPA FORM 2070-12 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply) unknown

- ☐ A. SOLID
- ☐ B. POWDER, FINES
- ☐ C. SLUDGE
- ☐ D. OTHER ______ (Specify)
- ☐ E. SLURRY
- ☐ F. LIQUID
- ☐ G. GAS

02 WASTE QUANTITY AT SITE (Measures of waste quantities must be independent)

- TONS unknown
- CUBIC YARDS ______
- NO. OF DRUMS ______

03 WASTE CHARACTERISTICS (Check all that apply) unknown

- ☐ A. TOXIC
- ☐ B. CORROSIVE
- ☐ C. RADIOACTIVE
- ☐ D. PERSISTENT
- ☐ E. SOLUBLE
- ☐ F. INFECTIOUS
- ☐ G. FLAMMABLE
- ☐ H. IGNITABLE
- ☐ I. HIGHLY VOLATILE
- ☐ J. EXPLOSIVE
- ☐ K. REACTIVE
- ☐ L. INCOMPATIBLE
- ☐ M. NOT APPLICABLE

III. WASTE TYPE unknown

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE			
OLW	OILY WASTE			
SOL	SOLVENTS			
PSD	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS			
IOC	INORGANIC CHEMICALS			
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS			

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers) unknown

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION

V. FEEDSTOCKS (See Appendix for CAS Numbers) N/A

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS			FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Central Hudson Gas and Electric Corporation (CHG & E) site files.

5.6 EPA 2070-13

United States
Environmental Protection
Agency

Office of Emergency and
Remedial Response
Washington, DC 20460

EPA Form 2070-13
July, 1981

Bayeaux Street Gas Plant

EPA

Potential Hazardous Waste Site

Site Inspection Report

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 1 - SITE LOCATION AND INSPECTION INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site): Bayeaux Street Gas Plant	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER: North Perry Street

03 CITY	04 STATE	05 ZIP CODE	06 COUNTY	07 COUNTY CODE	08 CONG DIST
Poughkeepsie	NY	12601	Dutchess		

09 COORDINATES: LATITUDE 41° 42' 23" LONGITUDE 73° 55' 56"

10 TYPE OF OWNERSHIP (Check one): ☒ A. PRIVATE ☐ B. FEDERAL ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL ☐ F. OTHER ☐ G. UNKNOWN

III. INSPECTION INFORMATION

01 DATE OF INSPECTION: 9, 9, 86 (MONTH DAY YEAR)

02 SITE STATUS: ☐ ACTIVE ☒ INACTIVE

03 YEARS OF OPERATION: 1850 (BEGINNING YEAR) ~1911 (ENDING YEAR) ___ UNKNOWN

04 AGENCY PERFORMING INSPECTION (Check all that apply): ☐ A. EPA ☐ B. EPA CONTRACTOR ______ (Name of firm) ☐ C. MUNICIPAL ☐ D. MUNICIPAL CONTRACTOR ______ (Name of firm) ☐ E. STATE ☐ F. STATE CONTRACTOR ______ (Name of firm) ☒ G. OTHER EA Science + Technology Inc. (Specify)

05 CHIEF INSPECTOR	06 TITLE	07 ORGANIZATION	08 TELEPHONE NO.
~~Andris Lapins~~	~~Geologist~~	EA S and T	(914) 692-6706
09 OTHER INSPECTORS	**10 TITLE**	**11 ORGANIZATION**	**12 TELEPHONE NO.**
Ellen L. Metzger	Geologist	EA S and T	(914) 692-6706
			( )
			( )
			( )
			( )

13 SITE REPRESENTATIVES INTERVIEWED	14 TITLE	15 ADDRESS	16 TELEPHONE NO
Jeffrey Clock	Envt'l Affairs (CH G&E)	284 South Ave. Poughkeepsie	(914) 452-2000
			( )
			( )
			( )
			( )
			( )

17 ACCESS GAINED BY (Check one)	18 TIME OF INSPECTION	19 WEATHER CONDITIONS
☒ PERMISSION ☐ WARRANT	1000 HRS.	Sunny and Warm

IV. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)	03 TELEPHONE NO.
Jeff Clock	Central Hudson Gas and Electric Corp.	(914) 452-2000

04 PERSON RESPONSIBLE FOR SITE INSPECTION FORM	05 AGENCY	06 ORGANIZATION	07 TELEPHONE NO.	08 DATE
Thomas Porter		EA S & T	(914) 692-6706	12, 12, 86 (MONTH DAY YEAR)

EPA	POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT PART 2 - WASTE INFORMATION	I. IDENTIFICATION 01 STATE / 02 SITE NUMBER

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply) unkown

- ☐ A. SOLID
- ☐ B. POWDER, FINES
- ☐ C. SLUDGE
- ☐ D. OTHER ______ (Specify)
- ☐ E. SLURRY
- ☐ F. LIQUID
- ☐ G. GAS

02 WASTE QUANTITY AT SITE (Measures of waste quantities must be independent)

TONS unknown

CUBIC YARDS ______

NO. OF DRUMS ______

03 WASTE CHARACTERISTICS (Check all that apply) unknown

- ☐ A. TOXIC
- ☐ B. CORROSIVE
- ☐ C. RADIOACTIVE
- ☐ D. PERSISTENT
- ☐ E. SOLUBLE
- ☐ F. INFECTIOUS
- ☐ G. FLAMMABLE
- ☐ H. IGNITABLE
- ☐ I. HIGHLY VOLATILE
- ☐ J. EXPLOSIVE
- ☐ K. REACTIVE
- ☐ L. INCOMPATIBLE
- ☐ M. NOT APPLICABLE

III. WASTE TYPE unknown

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE			
OLW	OILY WASTE			
SOL	SOLVENTS			
PSD	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS			
IOC	INORGANIC CHEMICALS			
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS			

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers) unknown

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION

V. FEEDSTOCKS (See Appendix for CAS Numbers)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS	COAl		FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Central Hudson GAs And Electric Corporation files.
Section 3

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 STATE	02 SITE NUMBER

II. HAZARDOUS CONDITIONS AND INCIDENTS none known

01 ☐ A. GROUNDWATER CONTAMINATION — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: ______ — 04 NARRATIVE DESCRIPTION

01 ☐ B. SURFACE WATER CONTAMINATION — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: ______ — 04 NARRATIVE DESCRIPTION

01 ☐ C. CONTAMINATION OF AIR — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: ______ — 04 NARRATIVE DESCRIPTION

01 ☐ D. FIRE/EXPLOSIVE CONDITIONS — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: ______ — 04 NARRATIVE DESCRIPTION

01 ☐ E. DIRECT CONTACT — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: ______ — 04 NARRATIVE DESCRIPTION

01 ☐ F. CONTAMINATION OF SOIL — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
03 AREA POTENTIALLY AFFECTED: ______ (Acres) — 04 NARRATIVE DESCRIPTION

01 ☐ G. DRINKING WATER CONTAMINATION — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: ______ — 04 NARRATIVE DESCRIPTION

01 ☐ H. WORKER EXPOSURE/INJURY — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
03 WORKERS POTENTIALLY AFFECTED: ______ — 04 NARRATIVE DESCRIPTION

01 ☐ I. POPULATION EXPOSURE/INJURY — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: ______ — 04 NARRATIVE DESCRIPTION

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued) None Known

01 ☐ J. DAMAGE TO FLORA — 02 ☐ OBSERVED (DATE: __________) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ K. DAMAGE TO FAUNA — 02 ☐ OBSERVED (DATE: __________) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION (include name(s) of species)

01 ☐ L. CONTAMINATION OF FOOD CHAIN — 02 ☐ OBSERVED (DATE: __________) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ M. UNSTABLE CONTAINMENT OF WASTES (Spills/Runoff/Standing liquids, Leaking drums) — 02 ☐ OBSERVED (DATE: __________) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: __________ 04 NARRATIVE DESCRIPTION

01 ☐ N. DAMAGE TO OFFSITE PROPERTY — 02 ☐ OBSERVED (DATE: __________) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs — 02 ☐ OBSERVED (DATE: __________) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ P. ILLEGAL/UNAUTHORIZED DUMPING — 02 ☐ OBSERVED (DATE: __________) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

III. TOTAL POPULATION POTENTIALLY AFFECTED: __________

IV. COMMENTS

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Central Hudson GAs And Electric Corporation File.
Section 3

EPA FORM 2070-13 (7-81)

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION
PART 4 - PERMIT AND DESCRIPTIVE INFORMATION

EPA

I. IDENTIFICATION

01 STATE	02 SITE NUMBER

II. PERMIT INFORMATION

01 TYPE OF PERMIT ISSUED (Check all that apply)	02 PERMIT NUMBER	03 DATE ISSUED	04 EXPIRATION DATE	05 COMMENTS
☐ A. NPDES				
☐ B. UIC				
☐ C. AIR				
☐ D. RCRA				
☐ E. RCRA INTERIM STATUS				
☐ F. SPCC PLAN				
☐ G. STATE (Specify)				
☐ H. LOCAL (Specify)				
☐ I. OTHER (Specify)				
☒ J. NONE				

III. SITE DESCRIPTION

01 STORAGE/DISPOSAL (Check all that apply)	02 AMOUNT	03 UNIT OF MEASURE
☐ A. SURFACE IMPOUNDMENT		
☐ B. PILES		
☐ C. DRUMS, ABOVE GROUND		
☒ D. TANK, ABOVE GROUND	unknown	
☒ E. TANK, BELOW GROUND	unknown	
☐ F. LANDFILL		
☐ G. LANDFARM		
☐ H. OPEN DUMP		
☐ I. OTHER (Specify)		

04 TREATMENT (Check all that apply)

- ☐ A. INCENERATION
- ☐ B. UNDERGROUND INJECTION
- ☐ C. CHEMICAL/PHYSICAL
- ☐ D. BIOLOGICAL
- ☐ E. WASTE OIL PROCESSING
- ☐ F. SOLVENT RECOVERY
- ☐ G. OTHER RECYCLING/RECOVERY
- ☐ H. OTHER (Specify)

05 OTHER

- ☐ A. BUILDINGS ON SITE

06 AREA OF SITE: 1.2 (Acres)

07 COMMENTS

Site is a former coal gasification plant site... All of the original structures/equipment have been removed... little is known of past operational practices or about final disposition of waste from historical operations.

IV. CONTAINMENT unknown

01 CONTAINMENT OF WASTES (Check one)

☐ A. ADEQUATE, SECURE ☐ B. MODERATE ☐ C. INADEQUATE, POOR ☐ D. INSECURE, UNSOUND, DANGEROUS

02 DESCRIPTION OF DRUMS, DIKING, LINERS, BARRIERS, ETC.

V. ACCESSIBILITY

01 WASTE EASILY ACCESSIBLE: ☐ YES ☒ NO

02 COMMENTS

No documented hazardous waste or contamination at surface of the site.

VI. SOURCES OF INFORMATION (Cite specific references, e.g. state files, sample analysis, reports)

CHG&E Corp. Files
Section 3
EA Science and Technology. 9 september 1986. Site inspection.

EPA FORM 2070-13 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION

01 STATE	02 SITE NUMBER

II. DRINKING WATER SUPPLY

01 TYPE OF DRINKING SUPPLY (Check as applicable)

02 STATUS unknown

03 DISTANCE TO SITE

	SURFACE	WELL	ENDANGERED	AFFECTED	MONITORED	DISTANCE TO SITE
COMMUNITY	A. ☒	B. ☐	A. ☐	B. ☐	C. ☐	A. 1.25 (mi)
NON-COMMUNITY	C. ☐	D. ☒	D. ☐	E. ☐	F. ☐	B. 2.0 (mi)

III. GROUNDWATER

01 GROUNDWATER USE IN VICINITY (Check one)

☒ A. ONLY SOURCE FOR DRINKING
☐ B. DRINKING (Other sources available) COMMERCIAL, INDUSTRIAL, IRRIGATION (No other water sources available)
☐ C. COMMERCIAL, INDUSTRIAL, IRRIGATION (Limited other sources available)
☐ D. NOT USED, UNUSEABLE

02 POPULATION SERVED BY GROUND WATER 1134

03 DISTANCE TO NEAREST DRINKING WATER WELL 2.0 (mi)

04 DEPTH TO GROUNDWATER < 75 (ft)

05 DIRECTION OF GROUNDWATER FLOW ——

06 DEPTH TO AQUIFER OF CONCERN ~30 (ft)

07 POTENTIAL YIELD OF AQUIFER unknown (gpd)

08 SOLE SOURCE AQUIFER ☐ YES ☐ NO

09 DESCRIPTION OF WELLS (Including useage, depth, and location relative to population and buildings)

Reported wells within a 3-mile radius of the site are completed in bedrock (Hudson River Formation). A private well for Tai Apartments serves 14 people and is about 2.0 miles south of the site. There are 3 additional community wells within the 3-mile radius with a total population served of 1120. Thirty homes outside the Town of Poughkeepsie are on private wells the nearest is 2.3 mile north of the site

10 RECHARGE AREA ☒ YES ☐ NO COMMENTS

11 DISCHARGE AREA ☐ YES ☐ NO COMMENTS

IV. SURFACE WATER

01 SURFACE WATER USE (Check one)

☒ A. RESERVOIR, RECREATION DRINKING WATER SOURCE
☐ B. IRRIGATION, ECONOMICALLY IMPORTANT RESOURCES
☐ C. COMMERCIAL, INDUSTRIAL
☐ D. NOT CURRENTLY USED

02 AFFECTED/POTENTIALLY AFFECTED BODIES OF WATER No viable route for surface water contamination

NAME:	AFFECTED	DISTANCE TO SITE
Hudson River	☐	0.4 (mi)
	☐	(mi)
	☐	(mi)

V. DEMOGRAPHIC AND PROPERTY INFORMATION

01 TOTAL POPULATION WITHIN

ONE (1) MILE OF SITE	TWO (2) MILES OF SITE	THREE (3) MILES OF SITE
A. 14,878 NO. OF PERSONS	B. 46,660 NO. OF PERSONS	C. 58,240 NO. OF PERSONS

02 DISTANCE TO NEAREST POPULATION on site (mi)

03 NUMBER OF BUILDINGS WITHIN TWO (2) MILES OF SITE ______

04 DISTANCE TO NEAREST OFF-SITE BUILDING 75 feet ~~(mi)~~

05 POPULATION WITHIN VICINITY OF SITE (Provide narrative description of nature of population within vicinity of site, e.g., rural, village, densely populated urban area)

Site is located within the City of Poughkeepsie, a densely populated urban area. The landuse in the area of the site is predominantly residencial, with some commercial use.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER

VI. ENVIRONMENTAL INFORMATION

01 PERMEABILITY OF UNSATURATED ZONE (Check one)

☐ A. $10^{-6} - 10^{-8}$ cm/sec ☒ B. $10^{-4} - 10^{-6}$ cm/sec ☐ C. $10^{-4} - 10^{-3}$ cm/sec ☐ D. GREATER THAN 10^{-3} cm/sec

02 PERMEABILITY OF BEDROCK (Check one) unknown

☐ A. IMPERMEABLE (Less than 10^{-6} cm/sec) ☐ B. RELATIVELY IMPERMEABLE ($10^{-4} - 10^{-6}$ cm/sec) ☐ C. RELATIVELY PERMEABLE ($10^{-2} - 10^{-4}$ cm/sec) ☐ D. VERY PERMEABLE (Greater than 10^{-2} cm/sec)

03 DEPTH TO BEDROCK	04 DEPTH OF CONTAMINATED SOIL ZONE	05 SOIL pH
~30' (ft)	unknown (ft)	unknown

06 NET PRECIPITATION	07 ONE YEAR 24 HOUR RAINFALL	08 SLOPE: SITE SLOPE	DIRECTION OF SITE SLOPE	TERRAIN AVERAGE SLOPE
12 (in)	2.5 (in)	0-3 %	west	6 %

09 FLOOD POTENTIAL SITE IS IN NA YEAR FLOODPLAIN

10 ☐ SITE IS ON BARRIER ISLAND, COASTAL HIGH HAZARD AREA, RIVERINE FLOODWAY

11 DISTANCE TO WETLANDS (5 acre minimum) none

ESTUARINE A. ______ (mi) OTHER B. ______ (mi)

12 DISTANCE TO CRITICAL HABITAT (of endangered species) 0.4 (mi)

ENDANGERED SPECIES: Shortnosed Sturgeon

13 LAND USE IN VICINITY

DISTANCE TO:

COMMERCIAL/INDUSTRIAL	RESIDENTIAL AREAS; NATIONAL/STATE PARKS, FORESTS, OR WILDLIFE RESERVES	AGRICULTURAL LANDS: PRIME AG LAND	AG LAND
A. 0.01 (mi)	B. 0 (mi)	C. ______ (mi)	D. ______ (mi)

14 DESCRIPTION OF SITE IN RELATION TO SURROUNDING TOPOGRAPHY

Site area is relatively flat (0-3 %).

VII. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

USGS Poughkeepsie Quad, 7.5 Minute Series (Topographic), 1982 Photorevised.
NYSDOH. 1982. New York State Atlas of Community Water System Sources.
NYSDOT. 1983. New York State Map Gazetteer.
Simmon, et Al, 1961, Ground Water Resources of Dutchess County, New York.
EA Science And Technology. 9 September 1986. Site Inspection.

EPA

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT PART 6 - SAMPLE AND FIELD INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER

II. SAMPLES TAKEN None

SAMPLE TYPE	01 NUMBER OF SAMPLES TAKEN	02 SAMPLES SENT TO	03 ESTIMATED DATE RESULTS AVAILABLE
GROUNDWATER			
SURFACE WATER			
WASTE			
AIR			
RUNOFF			
SPILL			
SOIL			
VEGETATION			
OTHER			

III. FIELD MEASUREMENTS TAKEN

01 TYPE	02 COMMENTS
Site Slope	Suunto Clinometer
Tot. Volatile Organic Vapors	HNu - photo ionizer. No readings above background

IV. PHOTOGRAPHS AND MAPS

01 TYPE ☒ GROUND ☒ AERIAL

02 IN CUSTODY OF EA Science and Technology
(Name of organization or individual)

03 MAPS ☒ YES ☐ NO

04 LOCATION OF MAPS EA Science and Technology

V. OTHER FIELD DATA COLLECTED (Provide narrative description)

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

EA Science and Technology 9 September 1986 site inspection.

EPA FORM 2070-13 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 7 - OWNER INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER

II. CURRENT OWNER(S)

01 NAME	Admiral Halsey Senior Village Inc	The M. Keefer Newburch K. G	John Bahrenburg	
02 D+B NUMBER				
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	515 Rockaway Blvd.	c/o John Bahrenburg 35 Manchester Circle	35 Manchester Circle	
04 SIC CODE				
05 CITY	Valley Stream	Poughkeepsie	Poughkeepsie	
06 STATE	NY	NY.	NY	
07 ZIP CODE		12601	12601	

PARENT COMPANY (If applicable)

08 NAME				
09 D+B NUMBER				
10 STREET ADDRESS (P.O. Box, RFD #, etc.)				
11 SIC CODE				
12 CITY				
13 STATE				
14 ZIP CODE				

III. PREVIOUS OWNER(S) (List most recent first)

01 NAME	Mr. Charles Effron	Central Hudson Gas & Electric Company	Poughkeepsie Light, Heat & Power Company
02 D+B NUMBER			
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	Unknown		
04 SIC CODE			
05 CITY			
06 STATE			
07 ZIP CODE			

IV. REALTY OWNER(S) (If applicable, list most recent first)

01 NAME			
02 D+B NUMBER			
03 STREET ADDRESS (P.O. Box, RFD #, etc.)			
04 SIC CODE			
05 CITY			
06 STATE			
07 ZIP CODE			

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Real Property Tax Service Agency of Dutchess County, N.Y.
CHG & E Corp. files

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 8 - OPERATOR INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER

II. CURRENT OPERATOR (Provide if different from owner)

01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

08 YEARS OF OPERATION	09 NAME OF OWNER

OPERATOR'S PARENT COMPANY (If applicable)

10 NAME	11 D+B NUMBER

12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

III. PREVIOUS OPERATOR(S) (List most recent first; provide only if different from owner)

01 NAME	02 D+B NUMBER
Central Hudson Gas and Electric Company	

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD

01 NAME	02 D+B NUMBER
Poughkeepsie Light Heat and Power Company	

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD

01 NAME	02 D+B NUMBER
Poughkeepsie Gas Company	

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD

PREVIOUS OPERATORS' PARENT COMPANIES (If applicable)

10 NAME	11 D+B NUMBER

12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

10 NAME	11 D+B NUMBER

12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

10 NAME	11 D+B NUMBER

12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

IV. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

CHG&E Corp. files,

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 9 - GENERATOR/TRANSPORTER INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER

II. ON-SITE GENERATOR

01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

III. OFF-SITE GENERATOR(S)

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

IV. TRANSPORTER(S)

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

V. SOURCES OF INFORMATION *(Cite specific references, e.g., state files, sample analysis, reports)*

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER

II. PAST RESPONSE ACTIVITIES None

01 ☐ A. WATER SUPPLY CLOSED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ B. TEMPORARY WATER SUPPLY PROVIDED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ C. PERMANENT WATER SUPPLY PROVIDED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ D. SPILLED MATERIAL REMOVED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ E. CONTAMINATED SOIL REMOVED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ F. WASTE REPACKAGED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ G. WASTE DISPOSED ELSEWHERE — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ H. ON SITE BURIAL — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ I. IN SITU CHEMICAL TREATMENT — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ J. IN SITU BIOLOGICAL TREATMENT — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ K. IN SITU PHYSICAL TREATMENT — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ L. ENCAPSULATION — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ M. EMERGENCY WASTE TREATMENT — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ N. CUTOFF WALLS — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ O. EMERGENCY DIKING/SURFACE WATER DIVERSION — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ P. CUTOFF TRENCHES/SUMP — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ Q. SUBSURFACE CUTOFF WALL — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

EPA

POTENTIAL HAZAROOUS WASTE SITE
SITE INSPECTION REPORT
PART 11 - ENFORCEMENT INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER

II. ENFORCEMENT INFORMATION

01 PAST REGULATORY/ENFORCEMENT ACTION ☐ YES ☒ NO

02 DESCRIPTION OF FEDERAL, STATE, LOCAL REGULATORY/ENFORCEMENT ACTION

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analyses, reports)

Chapter 3.

6. ASSESSMENT OF DATA ADEQUACY AND RECOMMENDATIONS

6.1 ADEQUACY OF EXISTING DATA

The available data are considered insufficient to prepare a final HRS score for this site. There is no documentation of hazardous waste or contamination at the former Poughkeepsie Bayeaux Street Coal Gas Plant site. Ground-water and soil quality data are lacking.

6.2 RECOMMENDATIONS

In order to prepare a final HRS score for this site, analytical data regarding the quality of the ground-water and soil, and characterization of waste (if present), will be necessary, thus requiring performance of a Phase II investigation. The proposed Phase II study would include the performance of a soil vapor survey, the installation of 4 observation wells, and the collection and analysis of ground-water and soil samples.

6.3 PHASE II WORK PLAN

6.3.1 Task 1 - Mobilization and Site Reconnaissance

Project mobilization includes review of the Phase I report and updating the site database with any new information made available since completion of the Phase I report. Based on that review, a scope of work for this site will be agreed to and a project schedule developed. At this time, a draft Quality Assurance/Quality Control (QA/QC) document will be prepared in accordance with the most up-to-date NYSDEC guidelines.

Site reconnaissance will be performed to examine general site access for Phase II studies. Site reconnaissance will familiarize key project personnel with the site, enable the project geologists to evaluate current accessibility to tentative boring/well locations, and enable the project Health and Safety Officer to develop specific health and safety requirements for the field activities. Emergency, fire, and hospital services will be identified. Based on the Phase I study, it is expected that field activities will require only Level D health and safety protective measures.

6.3.2 Task 2 - Preparation of Final Sampling Plan

All data collected during Tasks 1 and 2 will be evaluated to finalize sampling and boring/well locations. The final sampling plan will be developed and submitted to CHG&E for approval. The plan will include final drilling and sampling locations and methods, boring and well specifications, and reference pertinent portions of the QA/QC Plan. A final budget will be developed to complete the drilling and sampling program.

6.3.3 Task 3 - Soil Vapor Survey

Performance of a soil vapor survey at the former Bayeaux Street Gas Plant site is recommended to obtain preliminary data with respect to potential subsurface volatile organic contaminant conditions at the site. The results of this survey will aid in the selection of final test boring/monitoring well locations.

The soil vapor survey will be initiated by griding the site. The site dimensions and data needs indicate that an approximately 40-ft soil vapor sample grid spacing should be appropriate. The grid spacing and site configuration would yield approximately 20 sampling locations.

After the grid is established, soil vapor samples will be obtained through a 3/4-in. diameter stainless steel point sampler. The sampler will be driven to an anticipated depth of 2-3 ft below grade with a slide hammer. Following the installation of the point sampler, a vacuum will be applied to the sampler head with a portable pump until a near steady state condition is established within the sampling apparatus. After a near steady state condition is established, a sample will be collected and analyzed using a 2-phased approach.

The first phase will consist of obtaining a gross organic vapor level reading using a Photovac TIP, or similar instrument. The data generated will be used both as direct input into the assessment, and as a means to determine the appropriate volume of soil vapor to inject into the gas chromatograph (second phase). The second phase will consist of soil vapor analysis using a portable gas chromatograph. For quality control, this instrument will be calibrated by injecting standards and ambient air blanks approximately every 2-4 hours of use throughout the day. Selected samples will be analyzed in duplicate.

6.3.4 Task 4 - Test Borings and Observations Wells

Based upon currently available information, the drilling program is proposed to include the installation of a total of 4 observation wells (one upgradient and 3 on the downgradient side of the site). Tentative boring/well locations are shown on Figure 6-1. The results of the soil vapor survey (Task 3) will aid in final location of the borings/wells. Each well is proposed to be completed within the upper 10-15 ft of the first ground water encountered, currently anticipated to be within the bedrock. The available data indicates that the bedrock surface may be 30 ft below grade, and the depth to ground water is probably less than 75 ft below grade (Section 4.3). This work would be performed under the fulltime supervision of a geologist. It is anticipated that hollow-stem auger drilling method will be used in the unconsolidated sediment and NX-coring in bedrock. Prior to the drilling of each boring/well, and at the completion of the last boring/well, the drilling equipment which comes in contact with subsurface materials will be steam-cleaned, as well as the split-spoon after obtaining each sample. In order to better evaluate the potential presence of coal gas manufacturing wastes, soil sampling will be performed continuously using a split-spoon sampler to a depth of approximately 15 ft below grade, and thereafter, at about 5-ft intervals. An HNU would be used to monitor the potential organic vapors emitted during drilling operations and from each soil sample. Soil samples exhibiting high HNU readings, unusual coloration, or visible waste will be considered for chemical analysis. Samples of major soil/unconsolidated sediment layers will be collected for grain-size and/or Atterburg Limits analysis.

Standard construction of each well completed in bedrock would include 4-in. diameter steel pipe set approximately 5 ft into bedrock, grouted to ground surface, and completed with a locked steel cap. The bedrock well would be continued as an open NX-core hole below the protective steel pipe.

Upon completion and development of the wells by air surging/pumping, the vertical elevation of the upper rim of each well casing and the horizontal location will be surveyed in order to aid in evaluation of the ground-water flow direction. Depending upon the yield of each Phase II well, a short-term, low-yield pumping test will be performed in each well.

6.3.5 Task 5 - Sampling

All sampling and analysis will be conducted in accordance with the project QA/QC Plan. The analytical program for every water and sediment sample will include: cyanide, ammonia, sulfate, trace metals, volatile organic compounds, and base/neutral and acid extractable organic compounds. Based upon the currently available information, collection and analysis of the following numbers and types of samples is recommended:

4 Ground-water samples (one from each Phase II well).

In addition, any soil samples obtained during monitoring well installation which exhibit high gross organic vapor readings, unusual coloration, or visible waste will also be considered for analysis. Tentative sampling locations are shown in Figure 6-1.

6.3.6 Task 6 - Contamination Assessment

The data obtained during the records search and field investigation will be evaluated and used to: prepare final HRS scores and documentation forms; complete EPA Form 2070-13; summarize site history, site characteristics, available sampling and analysis data; and determine the adequacy of the existing data to confirm release, and if there is a population at risk.

6.3.7 Task 7 - Remedial Cost Estimate

Remedial alternatives for the site will be evaluated and a list of potential options will be developed based on the information available on the nature and extent of contamination. Approximate costs estimates for the selected potential remedial options will be computed. This work is not intended to be, or a substitute for, a formal cost effectiveness analysis of potential remedial actions.

6.3.8 Task 8 - Final Phase II Report

In accordance with current (January 1985) NYSDEC guidelines, the Phase II report will include:

a. The results of the Phase II investigation, complete with boring logs, photos, and sketches developed as part of the Phase II field work.

b. Final HRS scores with detailed documentation.

c. Selected potential remedial alternatives and associated cost estimates.

6.3.9 Task 9 - Project Management/Quality Assurance

A Project Manager will be responsible for the supervision, direction, and review of the project activities on a day-to-day basis. A Quality Assurance Officer will ensure that the QA/QC Program protocols are maintained and that the resultant analytical data are accurate.

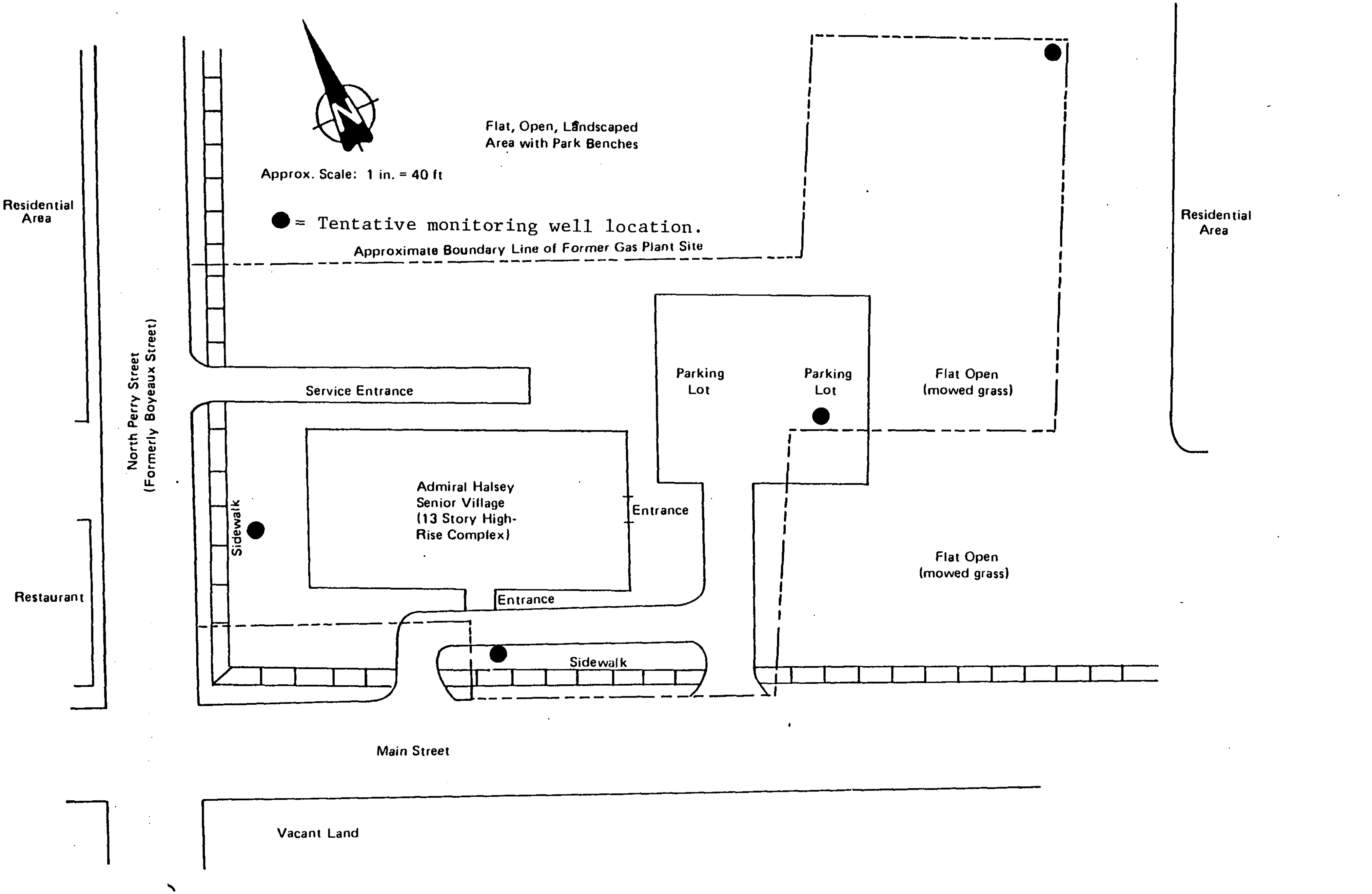
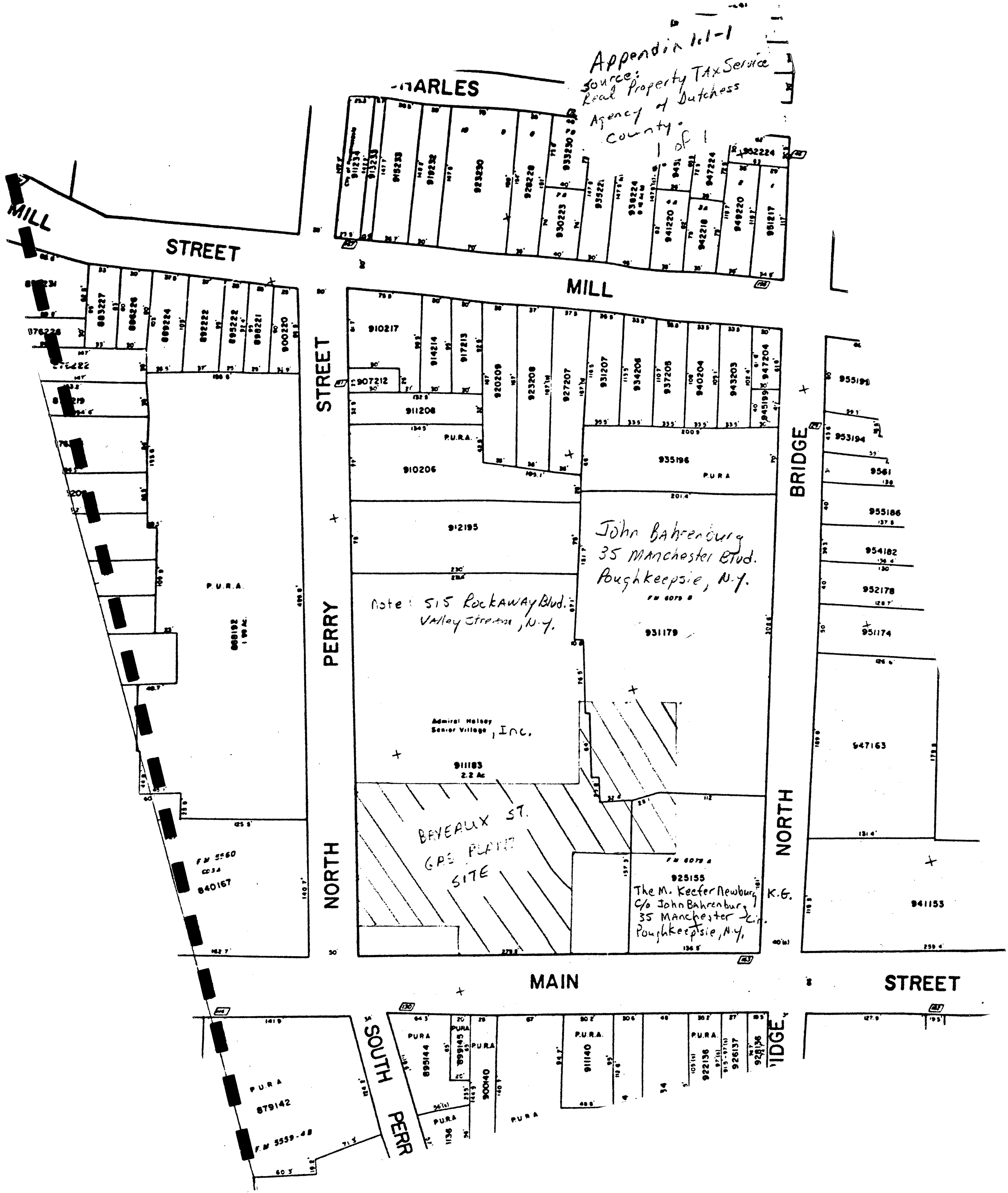


Figure 6-1. Sketch of the former Bayeaux Street Gas Plant site. Proposed monitoring well/sampling locations for Phase II studies.

Appendix 1


Appendix I.I-1
Source: Real Property TAx Service Agency of Dutchess County.
1 of 1
CHARLES
MILL STREET
MILL
PERRY STREET
NORTH
BRIDGE
NORTH
MAIN
STREET
SOUTH PERR
IDGE
John Bahrenburg
35 MAnchester Blvd.
Poughkeepsie, N.Y.
note: 515 RockAway Blvd.
Valley Stream, N.Y.
Admiral Halsey Senior Village, Inc.
911183
2.2 Ac
BAYEAUX ST.
GAS PLANT
SITE
925155
The M. Keefer Newburg K.G.
C/o John Bahrenburg
35 MAnchester Cir.
Poughkeepsie, N.Y.
931179
935196
P.U.R.A.
888192
840167
879142
947163
941153

Appendix 1.1-2
p. 1 of 3

POUGHKEEPSIE NEW YORKER

APR 19 1953

Struggle Against Terrific Odds Marked Early Days
Long Life of Still Expanding Central Hudson Firm

Co History

FILED MAY 7 - 1953

DUPE

Do Not Return To Record Retention

[illegible]

[illegible] The new building is a great improvement over the [illegible] the corporation has occupied at 50 Market street since [illegible] an improvement over the first light company in the city [illegible]

[illegible] Poughkeepsie Gas Co. [illegible] [illegible] street in 1850. [illegible] pipes were laid in the principal village streets, with the authorization of the Village Board of [illegible], as a preliminary step to a switch from oil to gas lights.

It looked for a while as if [illegible]keepsie wouldn't have the [illegible] gas lights after all. [illegible] no pipes, village taxpayers voted down a proposition to [illegible] the village with gas at a special meeting on Dec. 10.

Instead of accepting defeat, the [illegible] of gas lights asked the Legislature to set up a lamp [illegible] in the village. That was [illegible] July, 1851. Sept. 1 the [illegible] of the new district voted [illegible] gas-lighting project again, just as stockholders of a corporation [illegible] according [illegible] size of their holdings [illegible] they voted [illegible] total assessment [illegible] was $641,700 [illegible] lights. [illegible] village trustees levied [illegible] mill per dollar on the district and accepted the Gas Co.'s [illegible] to furnish 47 lamp[illegible] and gas at $2.50 per 1,000 [illegible]

[illegible] 1854 the Gas Co. was [illegible] gas to private homes. A [illegible] folder of rules issued to con[illegible] that year stated that gas [illegible] and fitting could be in[illegible] private homes by "any [illegible] mechanic."

* * *

[illegible] FOLDER ALSO advised [illegible] to notify the Bayeaux [illegible] office immediately if any [illegible] gas was noticed. Be[illegible] escaping gas was dangerous? [illegible] because "no deduction will [illegible] from the bills rendered [illegible] passing through the meter." [illegible] Poughkeepsie Gas Co. sold [illegible] which it made by heating [illegible] After a quarter [illegible] the exclusive [illegible] 1875 [illegible] that year the [illegible] Gas Co. was organized [illegible] company bought eight [illegible] in Laurel street and [illegible] a plant for the manu[illegible] of "water gas," made by [illegible] steam in heated coke. The [illegible] Co. claimed that water [illegible] a clearer light than coal [illegible]

[illegible] Civil War [illegible] price was $2.70 in 1876. [illegible] is one good reason why the Citizens' Co. was able to get the street lighting contract away from the original gas company.

Both companies probably regarded the first electric lights in the city as a joke. They were produced by Dorsey Neville with a dynamo he set up in Bullard's foundry in Main street in 1884. In April of the next year, a group of local residents who had incorporated as the Poughkeepsie Electric Light and Power Co. bought out his interests and built a little power station at 10 Winnikee avenue.

Captain John Brinckerhoff, who owned the local ferry boat company, was the president of this first electric company. Edward H. Goff built the 30-foot building [illegible]

[illegible]

IN THE SPRING of 1886, Mr. Goff and two other stockholders sold their holdings in the little company to a syndicate from Waterbury, Conn., which just about forced the local organizers out.

The new management promptly offered to light local streets for about the same price the gas company had charged the year before. As soon as it got this contract from the Common Council, the company borrowed $30,000 and set about making a series of improvements.

It doubled the size of the Winnikee avenue building and trebled its facilities. It set up 500 poles and strung 25 miles of wire. By June 1 it had more than 100 arc lights in operation in the streets. All this activity forced a consolidation of the two gas companies [illegible]

[illegible] 1889 Poughkeepsie [illegible] electric company [illegible] Poughkeepsie [illegible] has the reputation of being the best lighted city in the world, and it is the only [illegible] know whose streets [illegible] lighted by electricity [illegible] about 225 arc lights [illegible] suspended over the middle of [illegible] streets . . . so as to give light in all directions."

The company then had a lot with a 295-foot front, the Eagle said, 100 feet of this covered by a new building, and facilities to light 371 arc lamps and 1,500 incandescents.

* * *

[illegible] Children loved the discarded carbons. You could make such nice black marks on the sidewalks with them.

By the turn of the century there were about 60 little electric companies in the mid-Hudson river valley, most of them companies that limited their service to the night hours.

John W. Candee was the manager of the Poughkeepsie Electric Light and Power Co. until it was consolidated with the gas company in 1901. It is said that he resigned then because he didn't think there was any future in the work.

The same year, 1901, William R. Beal, John L. Wilkie and their associates acquired the controlling interest in the consolidated local company, the Poughkeepsie Light, Heat and Power Co. The year before the same men had consolidated two small Newburgh companies into the Newburgh Light, Heat and Power Co.

Ernest R. Acker, now the president of the Central Hudson Gas and Electric Corp., is a grandson of Mr. Beal, and John Wilkie, now vice president and treasurer of the corporation, is the son of Mr. Wilkie.

In 1902 the office of the Poughkeepsie Light, Heat and Power Co. was in the old Hooker mansion, [illegible] where the Young Men's Christian association building [illegible]

Customers paid their bills and transacted any other necessary business in the old parlor, where one gas stove, a fireplace with a gas log and a five-horsepower motor were on display.

[illegible]

[illegible] closet, and Mr. Beal's was a former bedroom.

* * *

THE ROLLING STOCK of the company consisted of one horse and wagon used by the electric department and two horses and wagons used by the gas department. One of the company officials had the habit of borrowing a horse and carriage for afternoon drives with his family until Mr. Beal put a stop to it.

In that period, company officers used the gas and electricity that the company produced, but they had no meters, and hence no bills. [illegible] business [illegible] better [illegible] for a year and a half without [illegible]

p. 3 of 3

[illegible] bookkeeper; that
he had to put in that
he was doing his
. For months on
from 8 a. m. until
ding at his work in
clothes closet. During
he wrote letters to
any creditors, asking
a little longer for

of Main street from
ilton then had a line
of 30 feet high, with
nted sidearms. Lines
homes and stores ran
walk to the center of

* * *

UGH CONDITIONS

the company con-
improvements dur-
years and to acquire
more customers. It
new and larger
the electric plant,
that was overloaded al-
as it was installed.
rhees, superintendent
department, furnish-
mation about that
[illegible]

[illegible] contract. The company had no franchise in the Town of Hyde Park, and it had no rights of way from the property owners. And those rights of way weren't easy to acquire, since there were some estates in that area that ran from the river to Violet avenue, and the owners did not want their property disfigured with electric lines.

Mr. Voorhees had his own way of solving the dilemma. He hired a team of horses and loaded the wagon they pulled with poles. Then he drove up the North road and dropped off a few poles near the entrances to the various estates.

"This created some commotion," Mr. Voorhees wrote. "The telephone wires were hot." But as a result of that commotion, the company was able to hold a conference with the property owners that afternoon. At that conference the property owners agreed to permit the company to build its line through the woods, and cart its poles to the places where they were needed.

Meanwhile, the [illegible]

WITHIN A SHORT TIME the company office was moved again, this time to 50 Market street. At the time of this move, in 1907, the building fronting 50 Market street was separated by a narrow alley from a rear building. There was a roller skating rink on the second floor of this building, where a parking lot is today.

In 1909 the appearance of Poughkeepsie's streets was im-[illegible] instead in time for the Hudson-Fulton celebration. Those poles are still in use, with a larger single light on top.

In 1910 the gas plant was still at Laurel and Gate streets, but the company was planning to build a new and larger one on the river front, just north of the Poughkeepsie railroad bridge. The old Winnikee avenue electric plant had been abandoned, and a new one, one of the largest in the state, stood nearly under the railroad bridge.

The company then was lighting 373 street lamps, supplying power to the trolley company, the city and Town of Poughkeepsie, and the Villages of Hyde Park and Highland with 188 miles of wires.

The gas department was doing as well. It was proud that it had 5,300 customers, and that "about 3,000 of them use gas ranges for cooking as well as gas for lighting."

* * *

BY 1911 THE VARIOUS com[illegible] consolidated into the Central Hudson Gas and Electric Co.

The day of the personal little local company with three horses and wagons was only a humorous memory. Since then it has been a complicated story of expansion of facilities, expansion of service.

The figures give a hint of that expansion. When the office at 50 Market street opened, the Poughkeepsie Light, Heat and Power Co. had 4,322 gas customers, all in the

city, and [illegible]
and ne[illegible]
distric[illegible]
have 2[illegible]
and T[illegible]
Hyde [illegible]
Rhineb[illegible]

LAUREL

Appendix 1.1-3

DUPLICATE
Do Not Return To Record Retention

December 31, 1910. p. 1 of 4

Source: Central Hudson Gas And Electric Corporation Files.

Mr. T. R. Beal,

General Manager.

Dear Sir:-

I beg to submit herewith the following report on construction of the New Gas Works; summarizing the history of the development previous to 1910, the construction and plans as carried forward during the past year and the construction requirements for the coming year.

Realizing in 1904 that at some near future date the plant situated at Gate and Laurel Street would not be able to meet the future demands for gas and that it would be necessary, in order to meet the increasing demand, to rebuild the entire plant, the feasibility of erecting a new works at some other location was considered.

In deciding to construct a new works, and in choosing the location adjacent to the electric station, the following were the influencing factors;-

1, The City authorities were anxious to have the plant removed from the vicinity of buildings where the majority of the same were dwellings; the plant at that time being considered a nuisance and a menace to health and safety on account of explosions or fires which had taken place, the odor of gas, tar and oil and the annoyances incident to gas manufacture.

2. The existing plant could not meet the future demands without entirely rebuilding; larger apparatus, buildings and more ground area being required.

3. Rebuilding being necessary an entirely new plant could be erected on a well located site at very little extra cost over rebuilding on the old site; and the rebuilding at another location could be

accomplished without any of the risks and extra expense to operation incident to remodelling an existing plant. P 2074

4. The Laurel Street property, on account of its topography and small area, would not admit of coal gas manufacture and at some future time it might be advisable to manufacture either coal gas or a mixed gas.

5. A plant located on the river front, or on the railroad, would effect economies in operation.

6. In locating a gas plant adjacent to the electric station, there would be economies in steam generation, fuel, coal handling apparatus, superintendence etc.

On account of these facts, and the fact that the operating costs could be reduced to a minimum in a plant equipped with modern apparatus of sufficient capacity, it was decided to purchase (if possible) property adjacent to the electric station and construct upon such property a new gas plant to manufacture both coal and water gas.

In accordance with this decision the Maloney property was purchased in 1905 and a water grant obtained of about one-third of an acre along that portion of the property just south of Dock Street.

In laying out plans for the actual construction work it was found that in order to secure sufficient room for the ultimate plant, it would be advisable to secure other adjacent property. To this end in 1909 a parcel of land 195 x 180 was purchased from Good and Knight and during this year a strip approximately 250 x 50 has been obtained by purchasing the rights and title of the Poughkeepsie Glass Company a piece of property lying west of Hudson Street, which was originally laid out by the City as a street in the year 1870, but never taken by them for that purpose.

Another piece of property, consisting of a house and lot, has been purchased from Tuttle at a reasonable price. This parcel makes it quite possible for us to close up another section of Dock Street and use the same, giving us an extra strip about 225' x 50' and practically connecting up the various parcels of land into one unit.

For the winter of 1907, it was decided that the existing plant would not be capable of producing sufficient gas to meet the increasing demands, so that proposals, plans etc., were called for to furnish apparatus for the new location. Before any contracts were let the condition of the money market made it imperative that all new work be abandoned and that sufficient apparatus be installed in the Laurel Street works to safely hold over the winter season. To this end a purifying box was erected at a total cost of about $2600.

During 1907 the only progress made towards the new plant was the filling in of about one-third of the water grant by blasting rock from the cliff and filling in along the river front at a cost of about $5000.

During 1908 money conditions were still unsettled and no progress whatever was made towards a new works, but again the Laurel Street works was handicapped and a new 7'-6" generating apparatus and boiler capacity for the same had to be installed. This improvement cost $10,200.

In the early part of 1909 active steps were again taken to start the construction of the new plant. Plans, specifications and bids were called for to furnish a new storage holder, gas benches, condensing apparatus, meters, purifiers etc., but again it was decided to abandon all new construction work with the exception of a storage holder and the work necessary in connection with same.

Progress for the year 1909 amounted to the purchase of a holder site, construction of a 500,000 foot holder, governor house

P. 4074

and contents, and necessary main feeders to connect with the Laurel Street works, and the city. This work cost veryclose to $50,000.

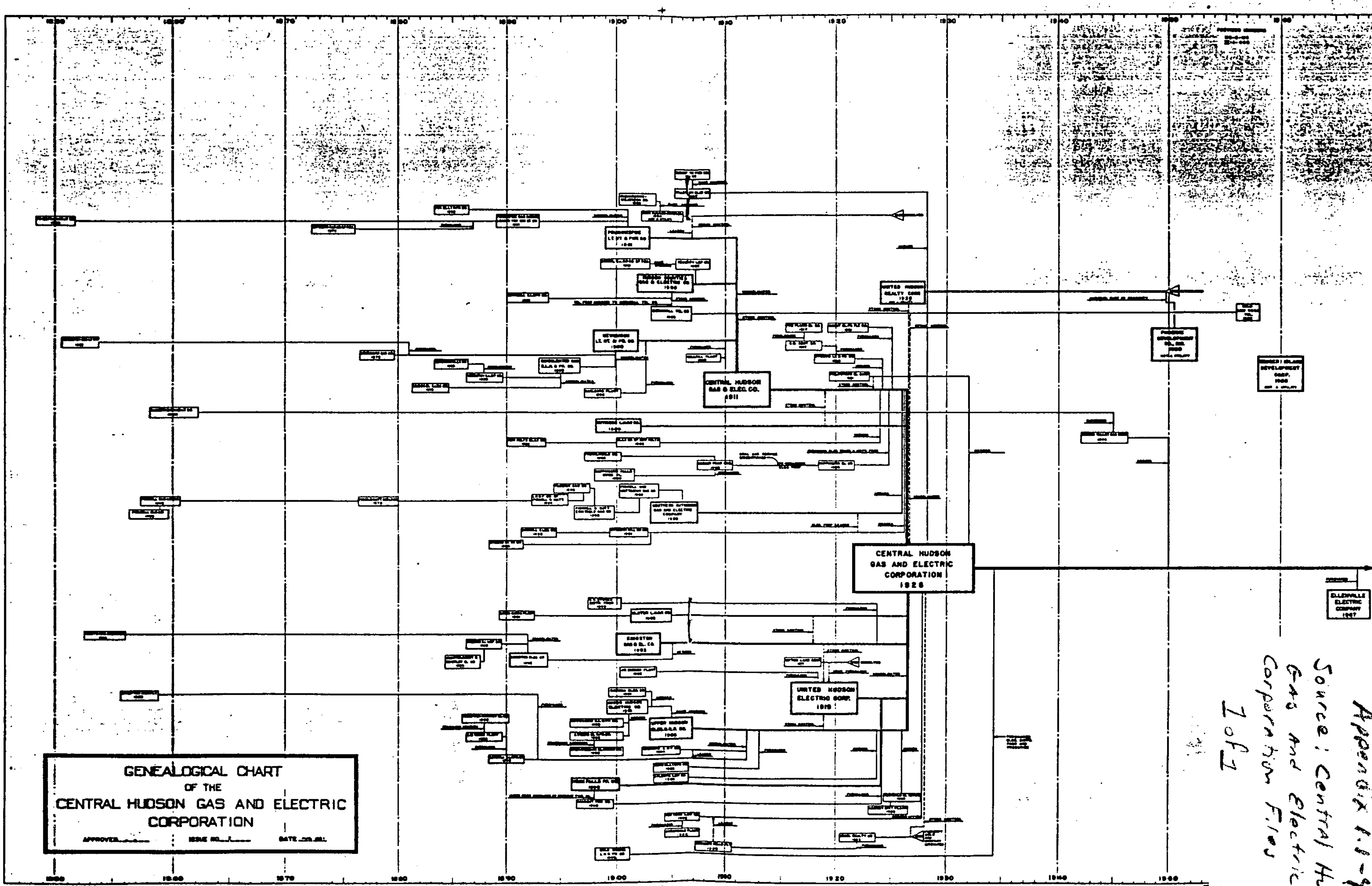
Again in February 1910 steps were taken to proceed with the new works construction, with the idea of completing the plant for use this winter. Bids and estimates for the new work were again called for and submitted. Up to this time we had been working along the lines of constructing a mixed coal and water gas plant, but upon a closer survey of the facts and data collected in regard to the manufacture of a mixed gas, it was thought advisable to revise our plans and build at present only a water gas plant, making all plans and allowances for the addition of coal gas operation at some future date, when conditions, which, at present, do not exist, might warrant the manufacture of coal gas along with the water gas which will have been provided for.

The reasons for advocating the construction, at present, of the water gas plant only, have been subject to a special report, under date of July 15, 1910, copy of which attached hereto shows the following:-

That the cost of erecting a plant for manufacturing a mixed coal and water gas would be about $78,000. more than that of erecting a water gas plant and also that a coal gas plant would cost about $67,000. in excess of a water gas plant.

These extra expenditures for plant would be subject to fixed charges, which, added to the cost of manufacture at the works, would show a loss in operation of at least 4 cents per thousand cubic feet in the case of the mixed process and of about one cent per thousand feet for a coal gas, with no assurances that these costs could be materially reduced.

Appendix 1.1-4
Source: Central Hudson Gas and Electric Corporation Files
1 of 1



Feb.19,1913. Appendix 1.1-5 Source: CHG&E Corp. Files. 1 of 1

CONSTRUCTION COMPLETED JANUARY 1, 1911 TO DATE.

In 1911 a strip of land 40 feet wide running from Hudson Street to the [river] and adjacent to our property on the north was purchased from the Pough[keepsi]e Glass Works at a cost of $2,000.

During 1912 a house and lot was purchased from Robert Good and another [house] and lot from William Curran; these parcels being acquired at a small cost.

Future plans call for the purchase of the property bounded by our [prope]rty on the south, Hudson Street, Dutchess Avenue and the Hudson River.

Blue print 11-P-2360 shows all property acquired to date including [property p]urchased for investment or protective purposes.

During 1911 the remaining construction work necessary to put the works [in o]perating condition was completed and the actual manufacture of gas started [...]ber 15th, 1911. Since that time the works has been operating successfully [w]ithout interruption, allowing the Laurel Street works to be shut down except [for s]torage purposes.

During 1911 the ground and foundation for relief holder were prepared; [r]elief holder was constructed, two purifying boxes installed and a third [...] from the Laurel Street works, deepened and re-erected; 7'-6" generating set [...]eted from Laurel Street works and new generator with steam and air meters [insta]lled; oil tank in concrete pit; wooden separating tank; rotary meter; oil [...]house at R.R. siding; concrete pipe tunnel; high pressure steam main; exhauster; [...] water, gas, yard, drip, steam and miscellaneous piping; beside these con[sider]able improvement was made to the property in the way of grading fences, etc.

A list of the more important pieces of apparatus and equipment follows:

1	-	8'-6" D.S. Lowe Generating Set	1250 M
1	-	7'-6" " " " "	750 M
1	-	Scrubber (U.G.I.)	1250 M
1	-	Condensor (Isbell-Porter Co.)	1500 M
1	-	2 light relief holder in steel tank (Cruse-Kemper Co.)	100 M

Report of Construction of 16" and 6" Lines - New Holder to Bay   Appendix 1.1-6
Source: CHG&E Corp. Files
p. 174

PERTINENT FACTS   12/31/09

Cross section of trench = ½ cu. yd. per lineal foot

Rock trenching = 653 lin. ft. or 326.5 cu. yds.

Earth trenching = 1785 lin. ft. for combined work

" " =20 ft. for spurs and drips.

Earth excavation cost 49 cents / ft. or 98 cents / yard (This includes removing surface material.

Removing asphalt pavement cost 12 cents / lin. ft. (640 ft.)

Rock trenching cost - Drilling .73 ¢/ ft. trench

- Excavating .97 ¢/ " "
1.70 ¢/ " " or $3.40/ yard

Note,- Rock trench blown out was on average 3 ft. wider on top than sectional area figured allows.

Estimated cost of repaving with cobbles = .30 ¢ lin. ft.

Backfill, including extra tamping about pipes, also cleaning up rubbish and extra material, cost 32 ¢/ ft., exclusive of resurfacing charge but including 640 ft. of cobble repaving.

250# dynamite used at a cost of 17.3 cents a lb.

400 Exploders used costing 4.2 cents each

About 400 holes were shot.

4/10 lbs. of dynamite used per ft. of rock trench

Explodes averaged one for each 1½ ft. of trench.

Cost of holes drilled averaged $1.20 each (2 strikers, 1 driller and portion of foreman and timekeeper's time)

16" specials cost $265.83, or $5.21 per foot of special laid

223-16" joints were made averaging 30# of lead per joint and 1.2# tarred yarn per joint.

p. 214

Mr. T. R. Beal,

General Manager.

Dear Sir:

I wish to submit the following report on the laying of the 16" and 6" gas mains from the new holder to a point on Mill Street just west of Bayeaux Street, at which point the 16" line connects with the previously existing main system, the 6" line running southerly through Bayeaux Street and connecting with the 6" pumping line between the gas works and Bayeaux Street holders.

The laying of these mains presented no peculiar features, although the construction work presented all the construction features which could be encountered in such work, except soft foundations.

The trenching in Dutchess Avenue was for about one half the distance through rock and a steady flow of water into and down the trench gave considerable trouble. The work in this section was paralleled for about 700 ft. by an old 3" cast iron live gas main which was at no point more than 2 ft. distant from the work and for the greater part of the distance it ran directly on the north edge of the trench. The proximity of this pipe made extreme care necessary with the blasting in order not to completely destroy it, and even though precautions were taken, the main was broken through blasting at several different points. On account of this damage and the general condition of the main, it was thought advisable to abandon the 3" main and change over the twelve services depending upon it to the 16" main as soon as it was completed. Provisions for these changes were made during the work, and after completion all the services were changed over to the 16"

Of. in Reg. p. 374

main as previously planned. The cost of this work is included in cost report under heading (3) - "Laying & Testing 16" Pipe and Specials."

The bridge work presented no special features outside of the design of the I-Beam construction used to cross the Fallkill Creek. It may, however, be necessary to change the line as run over the Hudson River Railroad tracks as they contemplate alterations and improvements in this vicinity in the near future. In crossing their bridge no agreement has been entered into as no attachments were made to their property, the lines simply resting upon blocks of wood which in turn were laid on the flooring. The City had originally given us permission to construct the lines as explained in our petition to them for a permit, and their permit was considered sufficient for such crossing.

After the original estimate was made, changes were authorized in the plans for the Fallkill Creek crossing which necessitated an extra expenditure of $80.

At North Water Street, Cataract Place and North Clover Street, spurs not over three feet long were laid from the 16" line as provision for future extension or connection.

The mains are laid to grade so as to drain to drip pots and drip connections so that no collection of condensation is possible in the mains themselves. Insufficient records of data on elevation and locations of water main and a few of the older gas mains gave considerable trouble on Mill Street, it being necessary at one point to give the 16" and 6" mains six feet of cover for about 80 ft., in order to get past a 6" water main and a 4" gas main. At another point the line of the trench had to be changed

P444

for about 40 ft. in order to avoid obstacles.

The resolutions adopted by the Board of Public Works in regard to Hudson Fulton Celebration forced us to fill and reopen a stretch of trench for about 150 ft. and remove all materials from the streets in preparation for the parade. This work cost $150, which is included in item (4) of cost comparisons.

The City charges for resurfacing of streets opened are 11% of the cost of the entire work and exceed the original estimate by $301.45. This excessive amount for the greater part is due to their attitude in classification of surfacing material, the remaining $45 being due to having to relocate the line of the trench on account of unforseen obstacles encountered on Mill Street near North Clover Street.

The 16" line was tested throughout with 5 lbs. of air pressure and the 6" line with 30 lbs. At the final test of each line no leakage could be detected by the guage on a four hour test. Air pressure was obtained with small expense from the contractors on the erection of the new holder at Dock Street.

The 6" line in Bayeaux Street necessitated trenching through 105 ft. of rock.

A complete analysis of the costs of the work follows with certain pertinent facts.

EVA-AHR.

Respectfully,

Edgar V. Anderson.

Supt. of Construction.

Bayeux St Gas Works

Pok-42-2

N GAS & ELECTRIC CORPORATION

Journal Voucher No. 6333

For Month of 1922

	PARTICULARS	DEBIT	CREDIT
	...ation of Capital Gas	2 331 07	
	...ion Structures Gas - Bayeaux St.	13 870 67	
	" " " - Laurel St.	460 40	
51-...	...to Gas Operations		13 000 00

Being entry to adjust amortization of site of Bayeaux St. Gas Works and works structure and Laurel St. Works structure in accordance with detail on reverse of this voucher. The Bayeaux St. property was sold to Chas. Effron, Dec. 16, 1919 W.O. G-1968 and the Laurel St. property to W.O. Lloyd Dec. 9, 1919 W.O. G-1956, and no balance (debit nor credit) should remain on our books in connection with either of these properties.

DUPLICATE
Do Not Return To Record Retention

P. A. B.
7/6/22

Approved ....

By (Sgd.) H. V. Dutcher 7/1/22

Appendix 1.1-7
Source: CHG&E Corp. Files
1 of 1

Appendix 1.1-8
p. 1 of 20

EA Report CHG61B

THE MANUFACTURED COAL GAS INDUSTRY
A WHITE PAPER PERSPECTIVE

Prepared for

Central Hudson Gas and Electric Corporation
284 South Avenue
Poughkeepsie, New York 12602

Prepared by

EA Science and Technology
R.D. 2, Goshen Turnpike
Middletown, New York 10940

May 1986

2. MANUFACTDRED GAS INDUSTRY HISTORY

The manufactured gas industry had its birth in Europe in about 1792 when several researchers from Belgium (Minckelers), France (Lebon), and Britain (Murdoch) conceived the idea of using gas from coal for illumination (Wilson and Stevens 1981). Murdoch, however, is usually given credit for development of the concept. By 1805, several factories in the Salford area of England were illuminated by manufactured gas. It was about this time that the first public gas works was erected, also in Salford (Parkington 1946). From 1805 until the early twentieth century, the coal gas industry in Europe grew. This growth developed to the extent that nearly every town and village had its own gas manufacturing facility. Until 1933, when the use of electricity for domestic illumination became common, illumination was the primary use for manufactured gas. The advent of electricity spawned the development of appliances and heating systems that used manufactured gas. In the late 1950s and early 1960s, many of the manufactured gas plants in England were converted from coal to oil, and by 1979 the country had converted entirely to natural gas.

The manufactured gas industry in the United States had a similar history. The first gas plant in the United States was constructed in Baltimore, Maryland, in 1816. From this time until the early twentieth century, the manufactured gas industry grew rapidly. The largest and most dense distribution of gas manufacturing facilities was concentrated near large metropolitan centers such as New York and Philadelphia. The advent of natural gas pipelines and petroleum distribution systems in the late 1950s and early 1960s brought an end to the manufactured gas industry in the United States. Most plants have now been demolished or have at least been retired.

2.1 PROCESSES USED TO MANUFACTURE GAS

Gas was produced from coal using a variety of processes. Among these, the following were employed most commonly:

- Carbonization
- Blue gas
- Water gas
- Producer gas

These four processes are described in the sections that follow.

2.1.1 The Carbonization Process

Gas was produced through the carbonization process by heating coal to an incandescent state at which time a gas composed primarily of carbon monoxide, methane, and hydrogen was liberated. Coke was a by-product of the carbonization process. Carbonization was initially carried out in retorts of various configurations and the gas produced was termed retort gas (Table 2-1). Early retorts were of horizontal configuration and operated continuously. As the

TABLE 2-1 TYPICAL RETORT GAS COMPOSITION

Constituent	Intermittent Retort (Volume %)	Continuous Retort (Volume %)
Carbon dioxide	2.1	3.0
Illuminants[(a)]	3.4	2.8
Oxygen	0.4	0.2
Carbon monoxide	13.5	10.9
Hydrogen	51.9	54.9
Methane	24.3	24.2
Nitrogen	4.4	4.4
BTU/ft^3	520	532
Specific gravity	0.42	0.42

(a) Likely included: ethylene, propylene, butylene, acetylene, and unsaturated aromatic hydrocarbon.

Source: ERT and Koppers (1984).

process evolved, the retorts were designed in a vertical orientation and had the capability to operate continuously or intermittently. Continuously operated retorts featured a continuous feed of coal from storage bins at the top of the retort and a continuous discharge of coke from the bottom. An intermittently operated retort featured coal fed into the process in batches from which coke was discharged after each carbonization cycle. Vertical retorts were generally constructed in settings of four to six. The retorts proper were constructed of interlocking silica bricks. The retorts were heated with producer or coke oven gas which was a low quality gas often a by-product of commercial coke production. The primary by-product of retort gas production was coke which was used for domestic heating.

Vertical retorts were manufactured by a number of companies. Among these were United Gas Improvement (UGI) and the Koppers Corporation. Examples of the intermittent and continuous retort processes used by these two companies are depicted in Figures 2-1 and 2-2, respectively.

As the coal gas industry evolved, the coke oven gas production process became more prevalent. In this process, bituminous coal was carbonized at high temperatures in by-product coke ovens. The gas produced was generally treated to remove tar, ammonia, naphthalene, and sulfur. Figure 2-3 is a representation of the coking gas process. Gas produced for commercial purposes was a by-product of the coking process. The primary products were coke and gas to operate the coke oven. The heating value of coke oven gas was improved by removal of light oils, benzene, toluene, and xylenes through a process known as debenzolization. The typical coke oven gas composition is given in Table 2-2.

2.1.2 <u>The Blue Gas Process</u>

Blue gas was a gas rich in carbon monoxide and hydrogen produced by passing steam over a bed of molten coke. The process, which coupled the steam-carbon reaction with carbonization, produced a gas with a heating value of about 300 BTU/ft^3. The process was generally operated in a cyclic manner. After the coke had been heated to incandescence, a blast of steam was passed over the coke bed to produce the blue gas. The steam blast drove the steam-carbon reaction

$$C + H_2O \rightleftharpoons CO + H_2$$

which is endothermic. In order to restore the incandescent state in the coke bed, air was blasted into the apparatus. This steam/air cycling was necessary, not only to maintain the required temperature, but also to reduce the concentration of nitrogen in the product gas. The blue gas generation process is depicted in Figure 2-4. The typical blue gas composition is given in Table 2-3.

2.1.3 <u>The Water Gas Process</u>

Water gas, which is also known as carburetted water gas or carburetted blue gas, is produced by cracking bunker C oil or gas oil in the presence of blue gas and steam. The product of this process is an enriched blue gas. While blue gas has a typical beating value of about 300 BTU/ft^3, water gas can have a

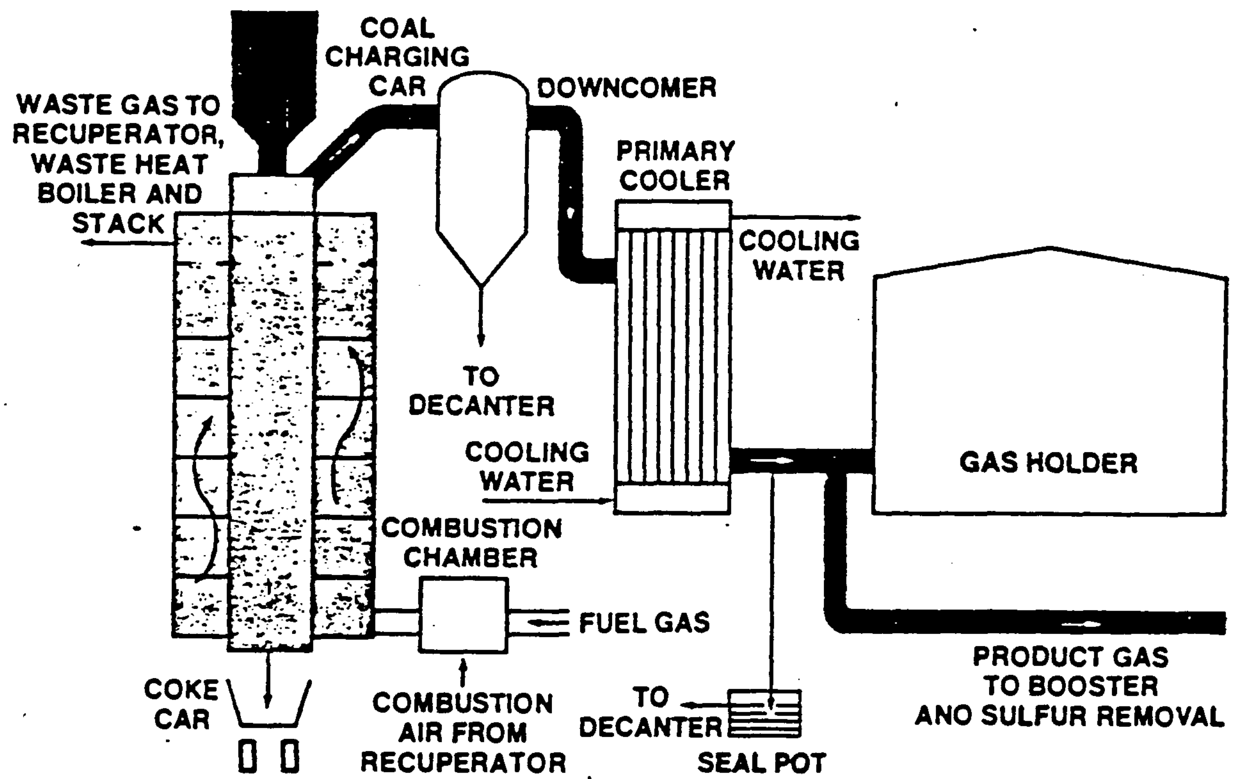


Figure 2-1. UGI Intermittent Retort (source: ERT and Koppers 1984).

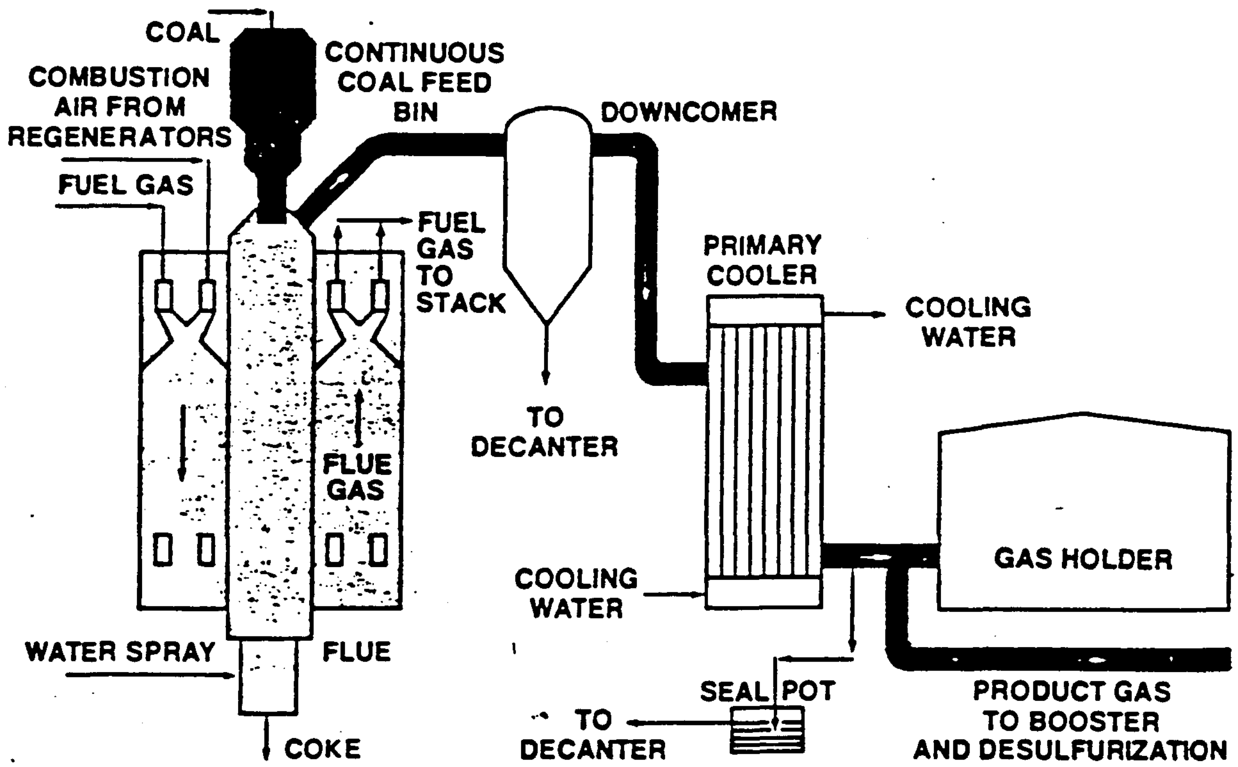


Figure 2-2. Koppers-vanAckeren Continuous Retort (source: ERT and Koppers 1984).

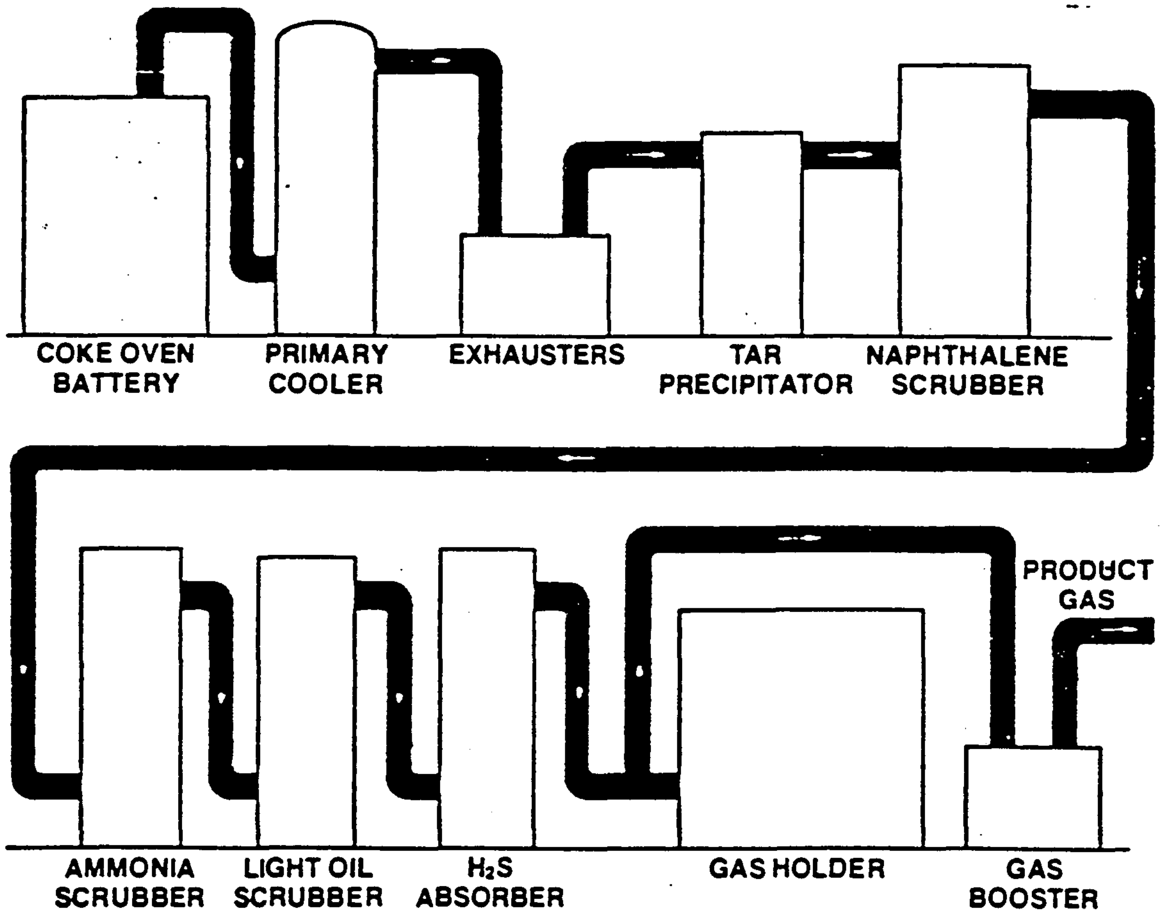


Figure 2-3. Coke Oven Gas Process (source: ERT and Koppers 1984).

TABLE 2-2 TYPICAL COKE OVEN GAS COMPOSITION

Constituent	Coke Oven (Volume %)
Carbon dioxide	2.0
Illuminants(a)	3.0
Oxygen	0.6
Carbon monoxide	6.9
Hydrogen	55.0
Methane	27.5
Nitrogen	5.0
BTU/ft^3	544
Specific gravity	0.38

(a) Likely included: ethylene, propylene, butylene, acetylene, and unsaturated aromatic hydrocarbons.

Source: ERT and Koppers (1984).

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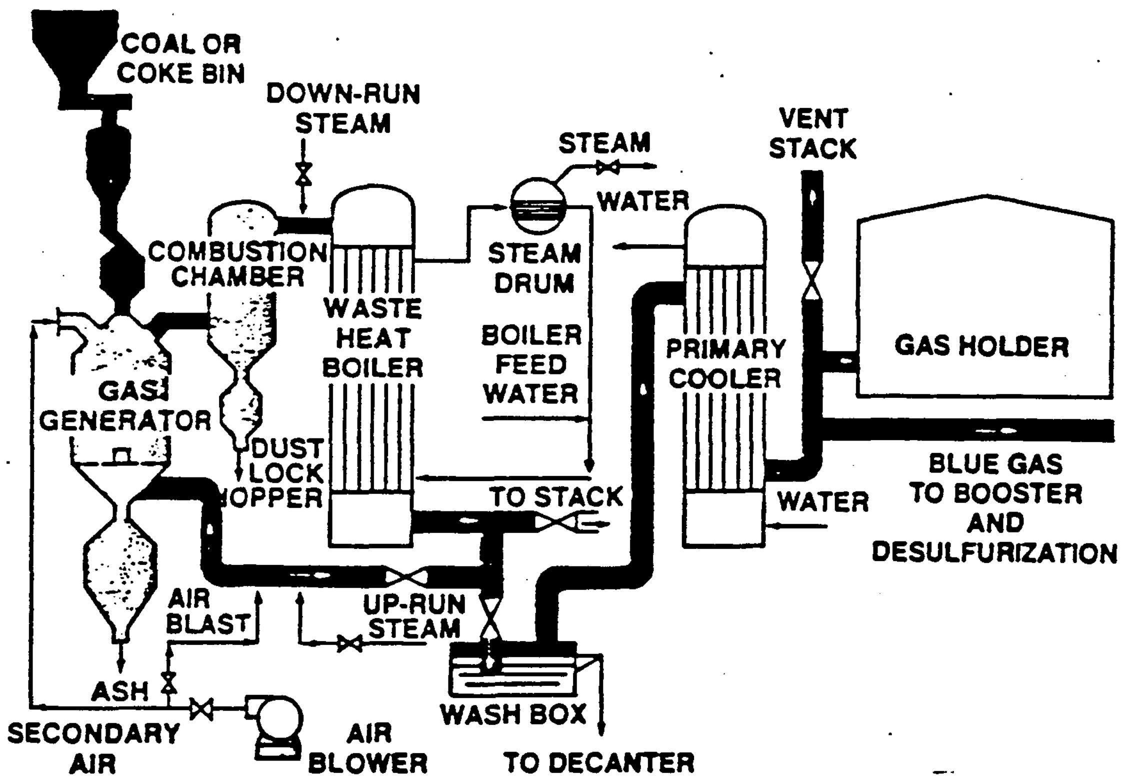

Figure 2-4. Blue Gas Process (source: ERT and Koppers 1984).

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TABLE 2-3 TYPICAL BLUE GAS COMPOSITION

Constituent	Blue Gas (Volume %)
Carbon dioxide	5.5
Carbon monoxide	37.3
Hydrogen	47.6
Methane	1.2
Nitrogen	8.4
BTU/ft3	287
Specific gravity	0.57

Source: ERT and Koppers 1984.

heating value of over 1,000 BTU/ft3, although the typical heating value was about 530 BTU/ft^3. This enhancement in heating value resulted from increased concentrations of methane, ethane, and propane which resulted from the oil cracking process. Table 2-4 is a listing of typical water gas composition.

Water gas was produced in an apparatus similar to that depicted in Figure 2-5. The apparatus consisted principally of a generator, a carburetor, and a super heater. The generator was similar to that used to produce blue gas. It used coke or coal as its feed stock. The orientation was vertical and steam was injected into the coal gas stream in the generator. The generator was in turn interfaced with the carburetor in which oil was sprayed into the gas/steam product. The gas/steam/oil mixture passed into the super heater where the oil was cracked to liberate the more simple gases as indicated in Table 2-4 which lists the typical water gas composition. As was the case with blue gas, the water gas process was operated in a cyclic manner in which steam and air were alternately blasted into the fuel bed.

2.1.4 The Producer Gas Process

As was mentioned previously, producer gas was a by-product of coke production. Approximately 40 percent of the low quality gas produced was recycled through the plant and used to fire the coke ovens. Because coke was the primary fuel in this type of operation, producer gas facilities were generally associated with coking operations. Producer gas operations were generally vertically oriented operations in which fuel was fed through a hopper at the top of the device and air and steam were introduced through the bottom. The process was operated continuously and the air:steam ratio was carefully controlled to balance the exothermic and endothermic aspects of the reaction. A typical producer gas apparatus is depicted in Figure 2-6. Table 2-5 is a listing of the typical producer gas composition generated from a coke fueled unit.

2.1.5 Gas Cleanup Techniques

The gas generated in the coal gas industry was not generally of adequate quality for domestic use without cleanup. The objective of the cleanup process was to remove impurities produced with the gas to yield a product that was relatively clean burning, and did not corrode or foul the distribution system and domestic appliances. The impurities of primary concern included sulfur and its compounds, tars, ammonia, and water.

The first step in gas cleansing was cooling which caused much of the tar, water, and ammonia to condense. Additional tar and ammonia were removed by passing the gas through recirculating tar scrubbers containing tar liquor and recirculating ammonia scrubbers containing ammonia liquor, respectively. Ammonia removal also provided partial sulfur cleanup as the ammonia reacted with sulfate to produce ammonium sulfate.

Initial sulfur removal occurred during the initial gas production step with the liberation of SO_2 into the stack gases. However, it was necessary to remove additional sulfur. This removal was accomplished by passing the gas through purifiers that contained iron oxide. The sulfide in the gas stream reacted with the iron oxide in the purifiers according to the following reaction:

TABLE 2-4 TYPICAL WATER GAS COMPOSITION

Constituent	Water Gas (Volume Percent)			
Carbon Dioxide	3.4	4.3	1.6	4.4
Illuminants(a)	8.4	12.6	18.9	27.4
Oxygen	1.2	0.7	0.2	1.1
Carbon Monoxide	30.0	30.2	21.3	9.1
Hydrogen	31.7	29.3	28.0	19.9
Methane	12.2	17.8	20.7	21.8
Ethane	0.0	0.0	4.3	5.3
Propane	0.0	0.0	0.0	0.3
Nitrogen	13.1	5.1	5.0	10.7
BTU/ft^3	540	695	850	1010
Specific Gravity	0.64	0.68	0.69	0.85

(a) Likely included: ethylene, propylene, butylene, acetylene and unsaturated aromatic hydrocarbons.

Source: ERT and Koppers (1984).

TYPICAL WATER GAS PROCESS

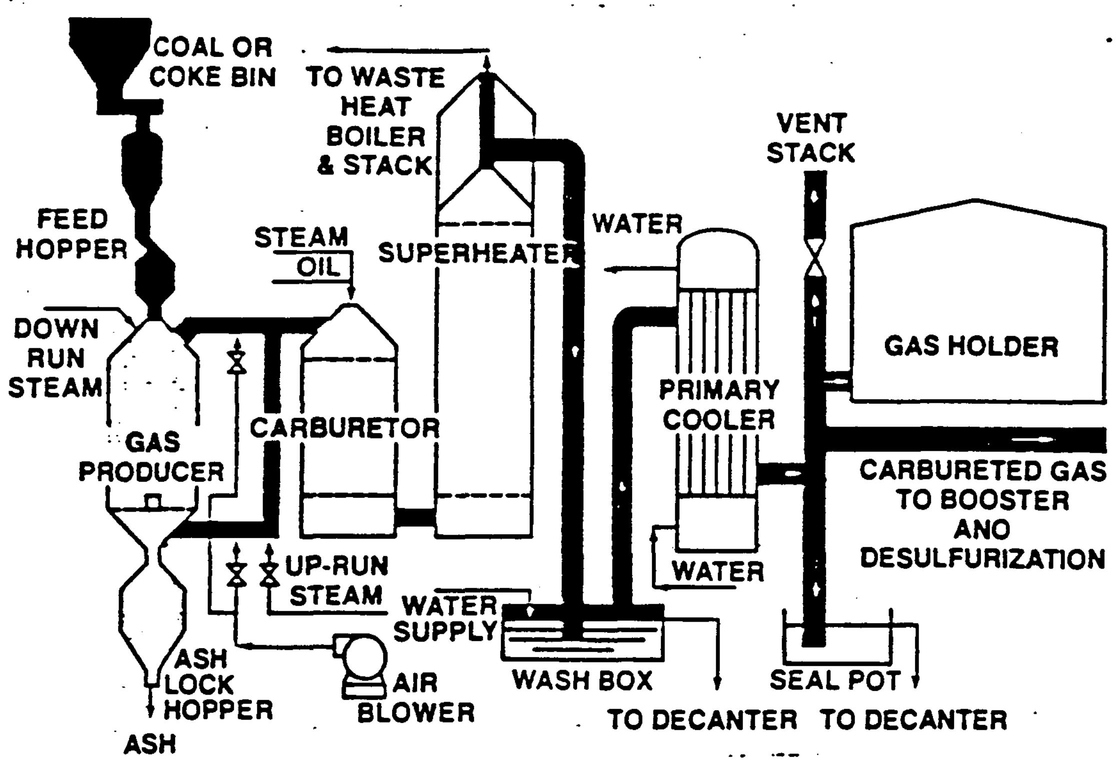

Figure 2-5. Water Gas Process (source: ERT and Koppers 1984).

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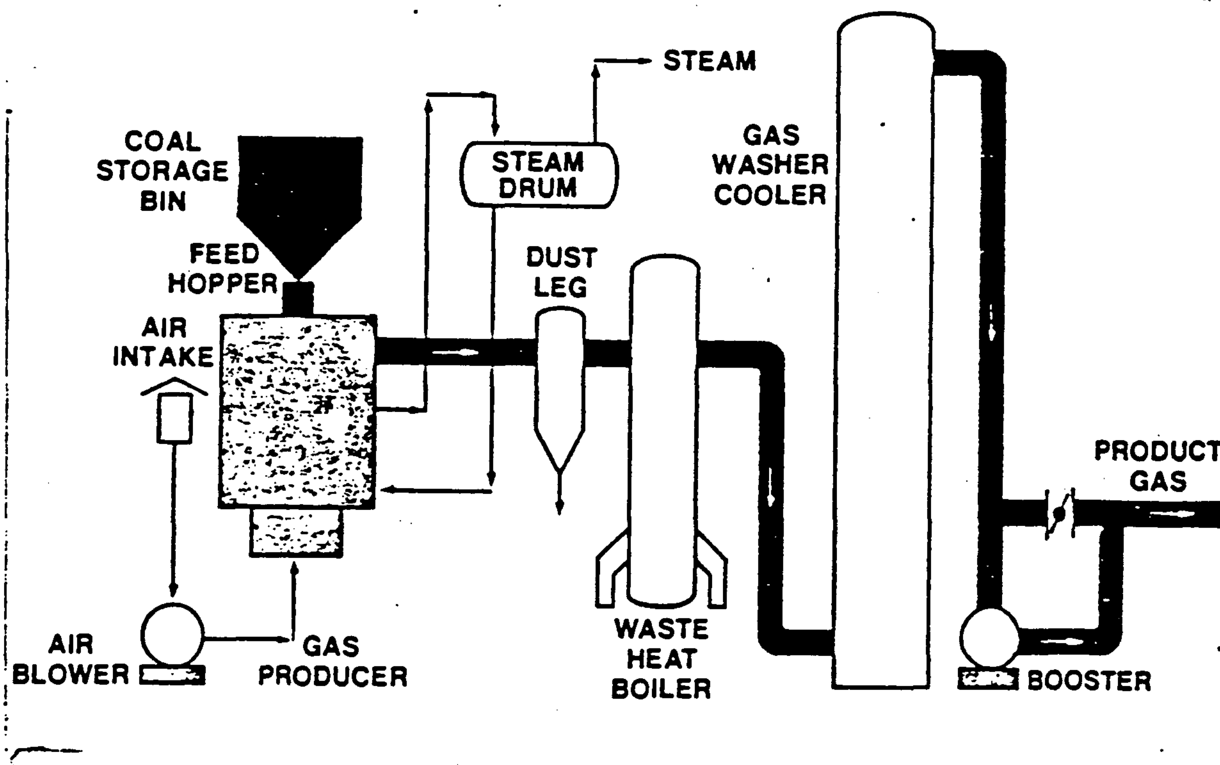

Figure 2-6. Producer Gas Process (source: ERT and Koppers 1984).

$Fe_2O_3 \cdot H_2O + 3H_2S \qquad Fe_2S_3 \cdot H_2O + 3H_2O$

In addition to the efficiency of the process as a sulfide scavenger, the true utility of the process was founded in the capacity of the oxide to be regenerated. Regeneration was accomplished by passing clean air through the spent oxide which resulted in the following reaction:

$2Fe_2S_3 + H_2O + 3O_2 \qquad 2\ Fe_2O_3 + H_2O + 6S$

The regeneration process was carried out numerous times on a given batch of oxide. However, when the sulfur content of the regenerated oxide reached 45 percent it was generally considered spent and handled as a waste.

An adjunct to the sulfide removal accomplished by oxide treatment was cyanide removal. Cyanogen and hydrogen cyanide in the crude gas reacted with the iron oxide and iron sulfide according to the following reactions:

$xFeO + yFe_2O_3 + 6\ HCN \qquad 3\ Fe(CN)_2 + H_2O$

$3FeS + 2Fe_2S_3 + 18\ HCN \qquad Fe_4[Fe(CN)_6]_3 + 9\ H_2S$

$9Fe(CN)_2 + 3O \qquad Fe_2O_3 + Fe_4[Fe(CN)_6]_3$

Prussian Blue, or ferrous-ferric cyanide coated the iron oxide thereby reducing its efficiency. The intensity of the blue color was considered an indicator of oxide quality. The cyanide contaminated oxides were regenerated by roasting, often with wood chips or sawdust.

Lime treatment was also used to remove hydrogen sulfide, hydrogen cyanide, and carbon dioxide from crude gas. These cleanups were accomplished according to the following reactions:

$Ca(OH)_2 + 2H_2S \qquad Ca(HS)_2 + 2H_2O$

$Ca(OH)_2 + CO_2 \qquad CaCO_3 + H_2O$

$Ca(OH)_2 + 2HCN \qquad Ca(CN)_2 + 2H_2O$

The products of these reactions were termed "foul limes" which often emitted a bad odor.

3. TYPES OF WASTES GENERATED IN COAL GAS PRODUCTION

The manufacture of coal gas resulted in production of a number of primary wastes, including:

- Tars
- Sludges
- Gas Liquor and Ammonia Liquor
- Ash, Slag, and Clinker
- Dust, Off-Grade Coal and Coke

The types of wastes that may have been produced at a given plant were, to a large extent, a function of the process-type employed. The following is a series of discussions of the sources of the primary wastes and the principle elements and compounds that may have been present in them.

Tars and tar sludges were produced to a greater or lesser extent at all coal gas manufacturing facilities. Tars were generated in large quantities in the coke production operation. Tars were also produced, but in greatly reduced quantities, when coke was heated to produce gas. Tars were a by-product of oil injection and cracking in facilities in which coal gas was enriched via this process. Tars were also by-products of the gas cleanup process. Most tars produced in the coal gas industry contained very high concentrations of polynuclear aromatic hydrocarbons (PAH). They also contained oils, creosote (phenolics), and aromatic hydrocarbons (benzene, toluene, xylenes).

A variety of sludges was produced in the coal gas manufacturing process particularly during the gas cleanup process. Examples of such sludges include spent oxide waste, tar sludge, and "foul lime." These wastes contained PAH, sulfur compounds, ammonia compounds, cyanide compounds, and to a lesser extent oils and aromatics.

Tar liquor and ammonia liquor were also produced as a function of gas cleanup. Most facilities generated these types of wastes. Tar liquor was oily and contained PAH, phenolics, and aromatics. Ammonia liquor contained ammonia and sulfur compounds.

Ash, slag, and clinker were the residues remaining after the feed stock had been consumed. The constituents of primary concern in these wastes were toxic and mobil trace metals.

Dust, off-grade coke and coal were by-products of nearly all coal gas production operations. These generally contained trace metals and sulfur compounds.

4. TYPICAL WASTE DISPOSAL PRACTICES

Much of the waste generated in the coal gas industry was not truly waste but was recycled. A prime example of this was tar. Because the tar was highly organic and thus relatively heavy, it was frequently used as feed stock in the production of chemicals including toluene, xylenes, benzene, creosote, road oils, and coal tar based cosmetics. The tars were generally stored in tar wells until an adequate volume was accumulated at which time it was removed from the site. In some instances tar was also used as a fuel. Some larger coal gas facilities had tar distilling as a part of their operations. When sites were very small and/or remote and low volumes of tars were produced the tars were sometimes spread on the roads to control dust.

Like the tars, the ammonical wastes were valuable. The liquors form a raw product from which nitrogenous fertilizers were produced. However, when facilities were small and/or remote, ammonia liquor was sometimes spread over the site and surrounding environs. Plants that were located near waterbodies often discharged directly to them. Plants proximate to sewers often discharged directly to local sewer systems.

Spent oxide and "foul lime" were sources of sulfur and in some instances the wastes were used as resources. However, in most instances these products were considered wastes and were either disposed of on site or were removed for offsite disposal.

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5. CURRENT PERSPECTIVE

Most former coal gas manufacturing facilities have been demolished or exist as other types of operations. In some instances, the above grade aspects of the plants have been razed and the site has been overbuilt. At these locations, the subsurface aspects of the plants have often been backfilled and left in place. In other instances, some of the original manufacturing structures have been renovated and now exist as integral parts of new operations. It is frequently impossible to determine that a coal gas operation ever existed on the site when viewed from the surface.

The former coal gas manufacturing facilities are of concern today as a result of presence of waste and by-product residues left in place where the plants were retired. Six classes of compounds comprise the primary concerns at former coal gas manufacturing facilities. These include:

- Polynuclear aromatic hydrocarbons (PAH)
- Phenolics
- Light aromatics (benzene, toluene, ethylbenzene, xylenes)
- Inorganic nitrogen species
- Inorganic sulfur species
- Trace metals

Many of these constituents occur naturally and are ubiquitous in the environment. However, excessive exposure to high concentrations pose a risk to human health and the environment and are generally the focus of site investigations and risk assessments.

5.1 POLYNUCLEAR AROMATIC HYDROCARBONS

PAH as a class are relatively insoluble in water and have a very strong affinity for organic matrices. These characteristics render PAH relatively immobile in the environment. That is, they generally migrate from their site of origin very slowly, if at all. This in turn helps to reduce the population that could be exposed to them.

5.2 PHENOLICS

Phenolics are highly water soluble and are therefore highly mobil in the environment. They are readily leached from source materials that contain them and they readily biodegrade. These latter two characteristics, therefore, make the occurrence of high concentration phenolics at former coal gas manufacturing facilities less common.

The primary potential health hazard associated with phenolic compounds is acute poisoning. As little as a few grams of ingested phenol can be fatal. Phenolics are also readily absorbed through the skin and can produce toxic effects via this route of exposure. There is limited evidence from animal testing that phenolics may act as tumor promoters for carcinogenic PAH, although the relevance of this to human exposures has not been established.

Phenolics exhibit moderate toxic effects on aquatic organisms. Bioaccumulation is not a concern. There is little information on the terrestrial effects of phenolics, since they partition strongly into aquatic systems.

5.3 LIGHT AROMATICS

Benzene, toluene, ethylbenzene, and xylenes are relatively mobil in the environment. They are moderately soluble in water and have affinities for an organic matrix much lower than that of PAH. This class of compounds therefore has the potential to travel some distance from a site of generation. However, increased volatility and biodegradeability make the class somewhat less persistant in the environment.

Human exposures to light aromatics (benzene, toluene, ethylbenzene, and xylenes) occur primarily via inhalation of vapors, and ingestion of contaminted water, although skin absorption can also occur. The primary concern with chronic exposures to benzene is an increased risk of leukemia. The primary concern relative to excessive exposure to toluene, ethylbenzene, and xylenes is central nervous system dysfunction.

Light aromatics are moderately toxic to fish and other aquatic organisms. Little information is available on their terrestrial effects.

5.4 INORGANIC NITROGEN SPECIES

The primary human health concerns associated with inorganic nitrogen species are acute exposures to ammonia, hydrogen cyanide and compounds that readily liberate free cyanide. While these concerns exist, the predominant form of cyanide found at former coal gas plants is combined (i.e., metalocyanide) which is much less toxic than the ionized form. All of these compounds exhibit high acute toxicity, while chronic effects are minimal. There is, however, a potential concern with chronic exposures to nitrate in drinking water, which can cause methemoglobinemia, particularly in infants.

The aquatic toxicity of ammonia and cyanide has been studied extensively. Un-ionized ammonia is acutely toxic to aquatic species, although the ionized form (NH_4+) generally predominates in natural waters. Terrestrial effects of inorganic nitrogen species are usually not major concern, since they are part of the natural environment. While the inorganic nitrogen species can be toxic to aquatic organisms they can also serve as stimulants to aquatic plant communities thereby increasing the rate of eutrophication.

5.5 INORGANIC SULFUR SPECIES

The primary human health concern for airborne exposures to inorganic sulfur species is hydrogen sulfide, which is an irritating, malodorous and acutely toxic gas. Inorganic sulfur compounds are of but limited concern for drinking water exposures. Various sulfide and sulfate salts that may be associated with former gas plants exhibit moderate to high acute toxicity by ingestion, depending on the particular compound.

The toxicity of sulfide to aquatic life is well documented, with the undissociated form (H_2S), which predominates under acidic conditions, being the toxic species. Sulfate toxicity in aquatic systems is usually not a concern.

Sulfate and sulfide can produce toxic effects on plants at relatively low concentrations (mg/kg), but such effects are ill defined. A potential concern with high sulfate concentrations in soils (0.1 percent) is that sulfate attacks building materials, particularly concrete.

5.6 TRACE METALS

The health and ecological effects of trace metals are widely variable, depending on the specific element, species and route of exposure. Many of the trace metals are essential for normal metabolism and growth of organisms, including humans. However, exposure to excessive concentrations can cause toxic effects. Moreover, while numerous trace metals occur in coal, they are not expected to pose major problems at former gas plant sites. Trace elements that would be of most concern are those which have been listed as priority pollutants, namely, antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium and zinc. Of these, arsenic, chromium, copper, lead, nickel and zinc are most likely to be associated with former gas plant sites.

Appendix 1.2-1
1 of 1
USGS Poughkeepsie Quad
7.5 Minute Series
Photorevised 1982
Scale 1:24,000
N
site
NC
NR
NW
Clearwater
Pumping Sta
Sewage Disposal
HUDSON RIVER
Water
VIOLET
Violet Ave Sch
Dutchess County Community College
The Childrens Home
FULTON STREET
Bowne Hospital
Inwood Lake
Playground
CEDAR ST
Radio Tower (WEOK)
Coes
BM 23
Sewage Disposal
Water Works
Marist College
Penn
Fairview
WEST CEDAR ST
EAST CEDAR ST
Playground
NEW YORK
UNDERHILL
Highland Landing
Oil and Gas
St Francis Hospital
Water
BM 190
BM 220
Morgan Lake
Reservoir
PENDELL
COLLEGE HILL PARK
Pulaski Park
Franklin Sch
College Hill
Jail
CONRAIL
Oil & Gas
Bridge
Mt Carmel Sch
St Peters Sch
Fire Sta
Dongan Place
Wheaton Park
Morse Sch
PO
MANSION
Mansion Square Park
Warring Sch
Playground
Cornell
North Base
Columbus Sch
Radio Tower
Courthouse
MAIN
MID-HUDSON BRIDGE TOLL
MARPLE RD
Fire Sta
Ellsworth Sch
Armory
CHURCH
St Marys Sch
Library
South Base
RIVER
Arlington
Union Corners
Eastman Park
Smith Sch
Holy Trinity Sch
POUGHKEEPSIE
Vassar Brothers Hospital
BM 209
High Sch
Bartlett Park
Play Ground
Raymond Ave Sch
Athletic Field
HAIGHT AVE
LIVINGSTON
ACADEMY
COLLEGE
GRAND
SOUTH AVE
RAYMOND
Vassar Temple
HOOKER
Fire Sta
Vassar Lake
Oakes
Yellow
Oil and Gasoline
BANCROFT RD
POUGHKEEPSIE RURAL CEMETERY
Mine Pt
Blue Pt
CONRAIL

Appendix 1.2-2

1 of 1

EA SCIENCE AND TECHNOLOGY

A Division of EA Engineering, Science, and Technology, Inc.

COMMUNICATIONS RECORD FORM

Distribution: ( ) ____________, ( ) ____________

( ) ____________, ( ) ____________

( ) Author

Person Contacted: Mr. Wallace Date: 8 December 86

Phone Number: (914) 485-3430 Title: Assistant Civil Engineer

Affiliation: City of Poughkeepsie Water Dept Type of Contact: Phone

Address: Howard Street Ext Person Making Contact: Ellen B. Metzger

Poughkeepsie NY

Communications Summary: The streets within the designated city boundary are all supplied by public water. The Town of Poughkeepsie, whose water supply is the same, except for back-up wells, supplies outside the City. The source of water is the Hudson River

(see over for additional space)

Signature: Ellen B. Metzger

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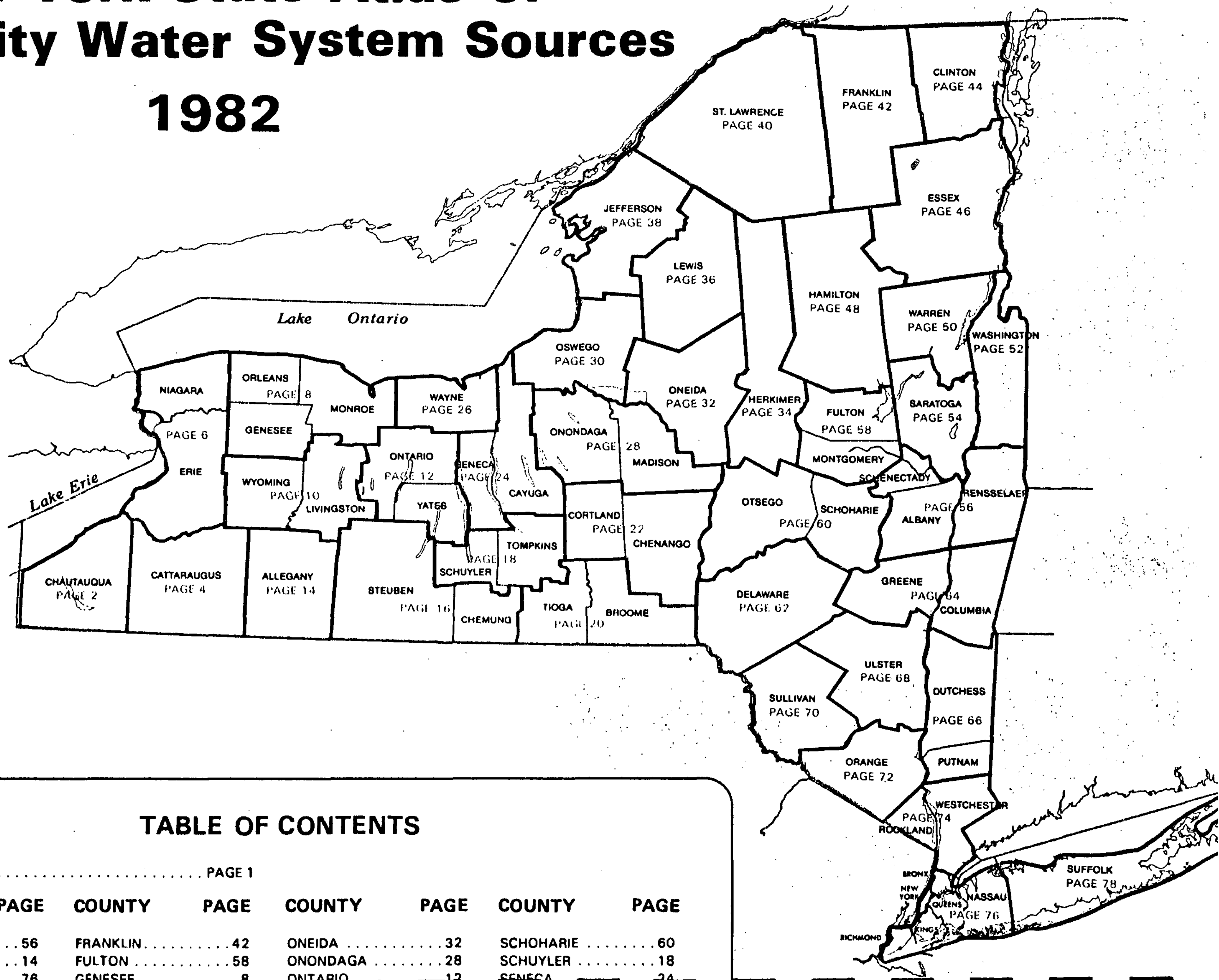
New York State Atlas of Community Water System Sources

1982

NEW YORK STATE
DEPARTMENT OF HEALTH



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Rhinebeck
NORTHEAST
STANFORD
Stanfordville
CLINTON
Clinton Hollow
Clinton Corners
Amenia
ESOPUS
Esopus
ROSENDALE
Rosendale
West Park
WASHINGTON
Salt Point
HYDE PARK
Hyde Park
Haviland
PLEASANT VALLEY
Millbrook
South Millbrook
NEW PALTZ
New Paltz
Ohioville
Hope Farm
Dover Plains
SITE
Fairview
Poughkeepsie
Arlington
JAMES BAIRD STATE PARK
CLOVE MOUNTAIN STATE FIRE TOWER
UNION VALE
LA GRANGE
Spackenkill
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Cornwall
STORM KING STATE PARK
N
SCALE 1:250,000

DUTCHESS COUNTY

Municipal Community

ID NO	COMMUNITY WATER SYSTEM	POPULATION	SOURCE
1	Amenia Water District #1	1000	Wells
2	Annandale Water Company	1008	Wells
3	Atlas Water Company	1300	Wells
4	Beacon City (See also No 3 Putnam Co)	5000	Mt. Beacon & Melzinga Reservoirs, Wells
5	Beekman Country Club	300	Wells
6	Brettview Acres Water Company	920	Wells
7	Brinkerhoff Water Company	3500	Wells
8	Central Wappinger Improvement Area	1800	Wells
9	Deerfield Estates Water District	900	Wells
10	Dogwood Knolls	600	Wells
11	Dover Plains Water Company	1500	Wells
12	Dover Ridge Estates	60	Wells
13	Dutchess Estates Inc	700	Wells
14	Fishkill Village	6000	Wells
15	Fleetwood Manor Water District	850	Wells
16	Grandview Water District	160	Wells
17	Greenfield Water District	1250	Wells
18	Greenmeadow Park Water Company	350	Wells
19	Harbourd Hills Water Company Inc	900	Wells
20	Hopegard, Inc	275	Wells
21	Hopewell Services Inc	900	Wells
22	Hyde Park Fire & Water District	4000	Crum Elbow Creek, Wells
23	Kensington Park Water Company	65	Wells
24	La Grange Club Estates	120	Wells (Infiltration Gallery)
25	Little Switzerland Water Company	600	Wells
26	Millbrook Village	1735	Wells
27	Millerton Village	1600	Wells
28	Noxon Knolls Water District	250	Wells
29	Oakwood Knolls	310	Wells
30	Pawling Village	2000	Pawling Reservoir, Wells
31	Pine Plains Water Company	1060	Wells
32	Pinewood Knolls	265	Wells
33	Poughkeepsie City	30000	Hudson River
34	Quaker Hill Estates Water District	424	Wells
35	Red Hook Village	2000	Wells
36	Revere Park Water Company	560	Wells
37	Rhinebeck Village	4200	Hudson River
38	Rockingham Farms	3000	Wells
39	Rokeby Homes, Inc	184	Wells
40	Schreiber Water Works	110	Wells
41	Shorehaven Civic Association	300	Wells
42	South Cross Road Water Company Inc	572	Wells (Infiltration Gallery)
43	Staatsburgh Water Company	1072	Indian Kill Reservoir, Wells
44	Taconic Estates	185	Wells
45	Tall Trees	250	Wells
46	Titusville Water District	700	Wells
47	Tivoli Village	713	Wells
48	Valley Dale Water Company	380	Wells
49	Wappinger Park Homes	400	Wells
50	Wappingers Falls Village	5300	Wells
51	Willow Lake Water Company	126	Wells
52	Windermere Highlands	375	Wells

Non-Municipal Community

ID NO	COMMUNITY WATER SYSTEM	POPULATION	SOURCE
53	Angels Trailer Park	40	Wells
54	Arbor Arms Apartments	50	Wells
55	Arvans Mobile Court #1	72	Wells
56	Bard College	NA	Sawkill Creek
57	Beckwith Trailer Park	26	Wells
58	BGB Mobile Home Park	137	Wells
59	Birchwood Mobile Home Park	42	Wells
60	Brooks Mobile Home Park	25	Wells
61	Cannons Trailer Park	16	Wells
62	Canterbury Carden Apartments	600	Wells
63	Cedar Hollow Mobile Home Park	90	Wells
64	Cedar Lane Mobile Home Park #2	28	Wells
65	Charlotte Grove Mobile Trailer Park	110	Wells
66	Chateau Hyde Park Home for Adults	120	Wells
67	Chelsea Ridge Apartments	1800	Wells
68	Clove Branch Apartments	19	Wells
69	Colonial Maples Trailer Park	30	Wells
70	Cooper Road Trailer Park	35	Wells
71	Cove View Apartments	48	Wells
72	Oaytop Village	70	Wells

ID NO	COMMUNITY WATER SYSTEM	POPULATION	SOURCE
91	Hi Vu	50	Wells
92	Hickory Hill Mobile Home Park	250	Wells
93	Hidden Hollow Apartments	850	Wells
94	Hidden Valley Mobile Court	30	Wells
95	High Meadows Park Inc	196	Wells
96	Hoffman Trailer Park	26	Wells
97	Hudson River Psychiatric Center	2000	Hudson River
98	Hudson View Water Works	1800	Wells
99	Hyde Park Mobile Manor Estates	NA	Wells
100	Hyde Park Terrace Apartments	70	Wells
101	Kent Hollow Apartments	24	Wells
102	Kommel Trailer Park	20	Wells
103	Lake Ellis Mobile Home Park	81	Wells
104	Lake Lodges Apartments	24	Wells
105	Lake Walton Park	62	Wells
106	Lakeview Mobile Home Park	NA	Wells
107	Lamplight Court Mobile Estates	23	Wells
108	Ledges Apartments	460	Wells
109	Little Falls Trailer Park	163	Wells
110	M and D Mobile Home Park	108	Wells
111	Maple Lane Trailer Park	150	Wells
112	May Lane Mobile Park	30	Wells
113	Maynards Mobile Manor	101	Wells
114	McCartha's Trailer Park	42	Wells
115	Mobile Home Gardens	30	Wells
116	Montclair Townhouse Apartments	660	Wells
117	Mountain View Mobile Estates	55	Wells
118	Northeastern Conference Nursing Home	120	Wells
119	Northern Dutchess Mobile Home Park	31	Wells
120	Odells Trailer Park	19	Wells
121	Osborne Trailer Park	15	Wells
122	Palmer Apartments	27	Wells
123	Parkway Apartments	16	Wells
124	Partridge Hill Apartments	150	Wells
125	Phillips Trailer Park	45	Wells
126	Pine Grove Mobile Home Park	39	Wells
127	Powell Road Mobile Park	115	Wells
128	Ramsey's Trailer Park	28	Wells
129	Red Church Trailer Park	12	Wells
130	Rhinebeck Country Village	100	Wells
131	Rhinebeck Mobile Court	120	Wells
132	Roberts Running Creek Trailer Park	88	Wells
133	Route 82 Trailer Park	26	Wells
134	Royal Crest Apartments	158	Wells
135	Sabo Trailer Park	45	Wells
136	Saith Mobile Home Park	26	Wells
137	Scenic Apartments	432	Wells
138	Scenic View Mobile Home Park	27	Wells
139	Shady Acres Trailer Park	26	Wells
140	Shady Homes Trailer Park	42	Wells
141	Shady Lane Trailer Park	13	Wells
142	Simpson Mobile Home Site	27	Wells
143	Springhill Mobile Home Park	NA	Wells
144	Sunset Farms Mobile Home Park	35	Wells
145	Sunset Knolls	50	Wells
146	Taconic Motor Lodge	22	Wells
147	Tally Ho Mobile Estates	NA	Wells
148	Tai Apartments	14	Wells
149	The Lodge at Rhinebeck	NA	Wells
150	Unification Theological Church	150	Wells
151	Val Kill Park East	72	Wells
152	Valley Forge Mobile Home Park	60	Wells
153	Venture Lake Estates	44	Wells
154	Village Crest Apartments	600	Wells
155	Wappingers Falls Trailer Park	50	Wells
156	Wassaic Developmental Center	2300	Wells
157	Willow Tree Park	30	Wells
158	Wingdale Village Park	72	Wells
159	Woodcrest Manor Adult Home	NA	Wells
160	Woodfield Apartments	7	Wells

Appendix 1.3-1

STATE OF NEW YORK
DEPARTMENT OF CONSERVATION
WATER RESOURCES COMMISSION

Ground-Water Resourses of Dutchess County, New York

By

E. T. SIMMONS, I. G. GROSSMAN, AND R. C. HEATH
Geologists, U. S. Geological Survey

Prepared by the
U. S. GEOLOGICAL SURVEY
in cooperation with the
NEW YORK WATER RESOURCES COMMISSION

BULLETIN GW-43

ALBANY, N. Y.

1961

probably about 1,000 feet in most places in the county. The Stockbridge limestone weathers readily and commonly forms valley and lowland areas. In the valley of Fishkill Creek, solution cavities filled with clay and sand have been reported.

Hudson River formation.--The Hudson River formation is the most extensive bedrock unit in the county. As may be seen from plate 2, it extends from the Hudson River in the west to the Connecticut State line in the east, interrupted by only a few relatively narrow limestone belts. The name "Hudson River slate group" was first used by Mather (1840, p. 212, 256-258) for the slaty rocks in the southeastern part of the State. Gordon (1911) mapped these rocks in the Poughkeepsie quadrangle as the "Hudson River group." Berkey and Rice (1921) mapped the same rocks in southwestern Dutchess County as "Hudson River shales and phyllites." In the southeastern part of the county these rocks are referred to as "Hudson River pelite" in publications by Balk (1936) and Barth (1936). In the Copake quadrangle in southeastern Columbia County, the names Elizaville shale (mainly Cambrian, possibly including some Lower Ordovician), Berkshire schist (Ordovician), and Trenton black slate (Ordovician) have been used by Weaver (1957, pl. 1) for rocks that extend southward into northeastern Dutchess County. Ruedemann (1942) divided the predominantly argillaceous rocks in the Catskill quadrangle, in northwestern Dutchess County, into the Nassau beds and Schodack shale (including Bomoseen grit) of Cambrian age, and the Deepkill shale and Normanskill shale (including the Mount Merino member and the Austin Glen member) of Ordovician age. As used in this report, the Hudson River formation includes all the argillaceous and schistose rocks in Dutchess County.

Although the Hudson River formation is preponderantly argillaceous, it includes a large variety of rock types. The lower part of the unit contains much sandstone ("grit") and is locally called bluestone by some well drillers. The unit also contains chert and beds of sandstone, limestone, and conglomerate. Quartz veins are very abundant. The shale itself is locally black, gray, red, or green.

The metamorphism of the Hudson River formation increases in intensity from northwest to southeast, just as in the Stockbridge limestone. At Red Hook, in the northwestern part of the county, the unit is a shale. The shale grades imperceptibly southeastward into a slate and then into a lustrous phyllite. Between the valley of Wappinger Creek and the headwaters of Fishkill Creek, it is chiefly a phyllite. Farther southeast, between Fishkill Creek and the Harlem Valley it is predominantly a garnet-bearing schist. In the extreme southeastern part of the county, east of Pawling, it is a gneissic schist. The gneissic schist in this area contains amphibolite lenses and pegmatite intrusions.

The change in metamorphism is accompanied by a change in mineral composition. In the relatively unmetamorphosed phases of the formation in the northwestern and central parts of the county, the chief minerals are quartz and mica. In the strongly metamorphosed phase in the southeast, feldspar is an important additional constituent. Table 4 includes chemical analyses of rocks from various parts of the Hudson River formation, ranging from the relatively unmetamorphosed "slate" near Lagrangeville to the highly metamorphosed gneiss east of Pawling. There appear to be no radical chemical differences among the different samples. From the standpoint of mineral composition, however, the gneiss shows a greater percentage of feldspar (plagioclase) and a smaller percentage of white mica (muscovite) than does the slate and phyllite.

The structure of the Hudson River formation, like the mineral composition, changes progressively from northwest to southeast. In the relatively unmetamorphosed rocks between the valleys of Wappinger Creek and Fishkill Creek small closely spaced subparallel joints resulting from slaty cleavage are numerous. The spacing of these joints ranges from a fraction of an inch to several inches, and is wider in the more sandy parts of the formation. Openings of the bedding-plane type can be recognized in this area and to the northwest. In the southeastern part of the county, slaty cleavage is absent and the rocks are massive. Joints that are present are spaced from a few inches to several feet apart, rather than inches or fractions of an inch.

The thickness of the Hudson River formation is unkown because the beds in the southeast and east have been severely folded and faulted and because elsewhere individual beds can not be traced over long distances. The apparent thickness of the formation in Dutchess County ranges from a few feet to several thousand feet. Most wells of average depth drilled in this unit are not likely to penetrate other rocks unless they are drilled near the contact with the underlying limestone.

Unconsolidated Deposits

Unconsolidated material deposited chiefly by glaciers and glacial melt water in Pleistocene time, lies on the bedrock in Dutchess County. Minor amounts of stream-laid material of Recent age mantle the Pleistocene deposits in a few narrow, discontinuous valley areas and in some lakes and swamps. The unconsolidated deposits are widespread and relatively thick, at least in lowland areas. The greatest thickness occurs in the gorge of the Hudson River, where borings for the Catskill Aqueduct of New York City penetrated several hundred feet of fill, most of which is probably of glacial origin. The deepest boring was at the Storm King crossing, near the Putnam County line, where bedrock reportedly was encountered at a depth of 608 feet below river level. If this reported depth is correct, the deepest part of the bedrock gorge probably is somewhat below 608 feet because it is unlikely that the drill was situated at exactly the deepest point. The layers penetrated by these borings ranged in composition from a mixture of clay and boulders to sand and gravel.

The Pleistocene drift is divided into three units, shown on plate 3: (1) till (unstratified drift), consisting of a mixture of rock materials deposited directly by the ice; (2) lacustrine deposits, consisting of silt and clay laid down in lakes; and (3) sand and gravel deposited in lowlands and in lakes from glacial melt water.

<u>Till.</u>--Till consists of a heterogeneous mixture of rock fragments of all sizes from microscopic particles of clay to large boulders several feet in diameter. As may be seen on plate 3, it is the most widespread of the Pleistocene deposits.

The till was laid down directly from the glacial ice, which was thick enough to pass over the highest peaks in the county, as well as the highest peaks of the Catskill and Taconic Mountains. The ice moved in a southerly direction, as indicated by the alinement of grooves and striations on exposed rock surfaces. Erosion was the dominant process in upland areas. Thus, the present-day cover of glacial debris in these areas is generally thin (less than 30 feet thick) or absent. Exceptions exist where thick deposits of till were laid down beneath the ice in the form of elliptical hills known as drumlins. These hills may contain as much as 200 feet of clay till. In lowland areas, the dominant process was that of deposition and the glacial deposits in these areas are relatively thick. For example, well Du 758, about 2 miles southwest of Wappingers Falls, penetrated 140 feet of unconsolidated material before reaching the Hudson River formation.

The rock fragments composing the till were derived mainly from the bedrock in the immediate area. In areas underlain by shale, slate, phyllite, and schist, the till consists largely of clay. In areas underlain by limestone, dolomite, or marble, the till contains numerous calcareous pebbles. Six mechanical analyses were made by the U.S. Department of Agriculture (Secor and others, 1955, p. 128) of samples of soil in the county

Most of the sand and gravel consists of stream-laid deposits, called outwash, laid down by melt water streams. The deposits range from layers of relatively clean sand to layers composed of a mixture of sand and gravel. The alternation of layers of coarse and fine material reflect changes in the conditions under which the beds were laid down.

Stratified sand and gravel in the county occurs in four principal forms: kames, kame terraces, valley trains, and deltas. Kames, in the form of small conical hills, are relatively common in the extreme southern part of the county at the northern margin of the Hudson Highlands. They are present also between the Hudson River and U.S. Highway 9, about 3 miles south of Poughkeepsie. Kame terraces, relatively flat topped deposits of sand and gravel on the sides of valleys are prominent in the valley of Swamp River. They have also been observed by Woodworth (1905, p. 121) along the Hudson River between Poughkeepsie and the mouth of Wappinger Creek. Valley-train deposits are long and narrow deposits of sand and gravel underlying valley floors. These deposits underlie parts of many of the principal stream valleys, including those of Wappinger Creek, Fishkill Creek, Webatuck Creek, Crum Elbow Creek, and Tenmile River (pl. 3). Delta deposits laid down where melt water streams entered glacial lakes, have been mapped at New Hamburg, at the mouth of Wappinger Creek, by Woodworth (p. 119) and have been observed also in the Valley of Swamp River. There are large deltas also at Rhinebeck and Red Hook. Deposits of sand and gravel in the principal stream valleys of the county are discussed in greater detail in the section devoted to the occurrence of water in unconsolidated deposits.

GROUND WATER

Source and Movement

Ground water occurs in all the consolidated and unconsolidated deposits of Dutchess County. Records of 675 wells (table 13) and about 50 springs (table 9) provide information on its occurrence in the different deposits.

Practically all ground water in the county is derived from local precipitation. An inch of rain, or snow having a water content equivalent to 1 inch of rain, falling on an area of 1 square mile yields about 17 million gallons of water. The average annual precipitation is about 45 inches, or about 1.6 billion gallons per day, on the 816 square miles of the county.

A large part of the precipitation returns to the atmosphere by evaporation, is transpired by vegetation, or runs off to streams. The remainder percolates into the ground. The amount of precipitation entering the ground depends chiefly on (1) the porosity, permeability, and water content of the surficial deposits, (2) the slope of the land, (3) the amount and kind of vegetal cover, and (4) the intensity and amount of precipitation. It is evident that more infiltration occurs where rain falls at a slow steady rate on flat land than where it falls at a rapid rate on steeply sloping land.

Some of the water that percolates into the ground is held by molecular attraction in the zone of aeration, where some interstices contain air or other gases, in addition to water. Water not held by molecular attraction percolates downward to the zone of saturation--the zone in which pore spaces are filled with water under hydrostatic pressure. Only water in this zone is referred to as ground water and is available to supply wells and springs.

Water in the zone of saturation may be unconfined or confined. Where the water only partially fills a permeable bed, its surface, called the water table, is free to rise and fall and the water is said to be under water-table (unconfined) conditions. Where water completely fills a permeable bed that is overlain by a relatively impermeable bed, its surface is not free to rise and fall (although the hydrostatic pressure of the water may fluctuate) and the water is said to be under artesian (confined) conditions. Water under artesian conditions will rise in a well above the zone in which it was encountered, though not necessarily above the land surface. The total number of flowing wells in Dutchess County is quite small; only 20 of the 675 wells listed in table 13 are reported to flow for all or part of the year. The remaining wells either tap artesian water that is not under sufficient pressure to rise above the land surface or tap water that is under water-table conditions.

The top of the zone of saturation, the water table, follows the configuration of the land surface and is at a higher altitude beneath hills than beneath valleys. However, the top of the zone of saturation is generally at a greater depth beneath hills than beneath valleys, and therefore the water table is flatter than the surface topography. Depths to water have been reported for about 470 of the 675 wells in table 13.

Ground-water levels fluctuate in response to changes in the amount of water in storage in the ground. This quantity reflects the balance between recharge and discharge. Thus, recharge from rain or melting snow causes a rise in water levels. Discharge from wells, springs, or seepage into streams in excess of recharge results in a decline in water levels. The fluctuation of ground-water levels follows a fairly regular pattern. Normally, water levels begin to rise in the late fall when plant growth stops and evaporation losses are reduced. The levels remain relatively unchanged during the winter or decline slightly. Precipitation in the spring before evapotranspiration losses have become significant generally causes a rise in ground-water levels. Water levels begin to decline in the late spring when the transpiration of plants and evaporation losses consume most of the precipitation. However, the extent of these seasonal fluctuations differs markedly, both between different types of deposits and between different topographic situations. The largest fluctuations, ranging from 10 to 20 feet, generally occur in wells in the relatively impermeable deposits, such as till, and in wells in bedrock underlying the hills. The smallest fluctuation, ranging from 5 to 10 feet, generally occur in wells in the more permeable unconsolidated deposits, such as sand and gravel, and in wells in bedrock in the valleys.

In an effort to obtain information on the fluctuation of water levels in Dutchess County, observations were begun in the fall of 1948 in well Du 321 on the Vanderbilt Mansion National Historical Site in the village of Hyde Park about 5 miles north of Poughkeepsie. The observations were temporarily discontinued between 1950 and 1953. In April 1953, a continuous water-stage recorder was installed on the well which is 128 feet deep; the depth to which it is cased and the type of material penetrated by the well are unknown. A graph of monthly water-level measurements at the well and monthly precipitation at Poughkeepsie are shown in figure 4. The graph of the water level from 1948 to 1950 more or less follows the expected seasonal pattern. However, soon after measurements were resumed in 1953 it became apparent that the water-level fluctuations depart considerably from the normal seasonal pattern. A graph of cumulative departures of precipitation from the monthly average is also shown on figure 4. It may be observed that there is a relatively close correlation between the water level in the well and the cumulative departure of precipitation. The water level in the well fluctuates in response to changes in barometric pressure. The charts from the continuous water-stage recorder show also the presence of tidal fluctuations. Although there is a possibility that these fluctuations result in part, at least, from tides in the Hudson River, a preliminary study indicates that they are due principally to earth tides.

The water-bearing characteristics of the unconsolidated deposits and the bedrock differ widely. Much of this difference is due to the type of openings in which the water is stored-- primary openings, consisting of intergranular pore spaces, or secondary openings, developed along joints, bedding planes, and faults. Most, if not all, of the water in the unconsolidated deposits is contained in primary openings. In the bedrock, on the other hand, most of the primary openings have been reduced in size by cementation, compaction, and crystallization. Thus, most of the water in bedrock occurs in secondary openings. The quantity of water that may be stored in a deposit depends on the porosity, or the percentage of the total volume of the deposit that is occupied by pores and other openings. Although no porosity determinations have been made for the deposits in Dutchess County, it may be assumed, on the basis of determinations made on similar deposits in other parts of the country, that the porosity of the unconsolidated deposits ranges from about 10 to 20 percent for till to about 15 to 35 percent for sand and gravel. The porosity of the bedrock, on the other hand, is considerably lower, probably not exceeding 2 or 3 percent in most places. Therefore, the quantity of water stored in a given volume of bedrock is 5 to 15 times less than the quantity stored in an equal volume of unconsolidated deposits.

The rate at which water moves through deposits, and thus the readiness with which it is available for withdrawal from wells, is controlled by the permeability of the material. Permeability, which is related to the size and degree of interconnection of pore spaces and other openings, is normally very low in bedrock, till, and fine-grained unconsolidated deposits, such as silt and clay. It is moderately high in deposits of coarse sand and in deposits of sand and gravel.

In view of these significant differences between the water-bearing characteristics of the unconsolidated deposits and those of the bedrock, the following discussion of the occurrence of ground water in Dutchess County is divided into two sections, one devoted to the unconsolidated deposits and one devoted to the bedrock.

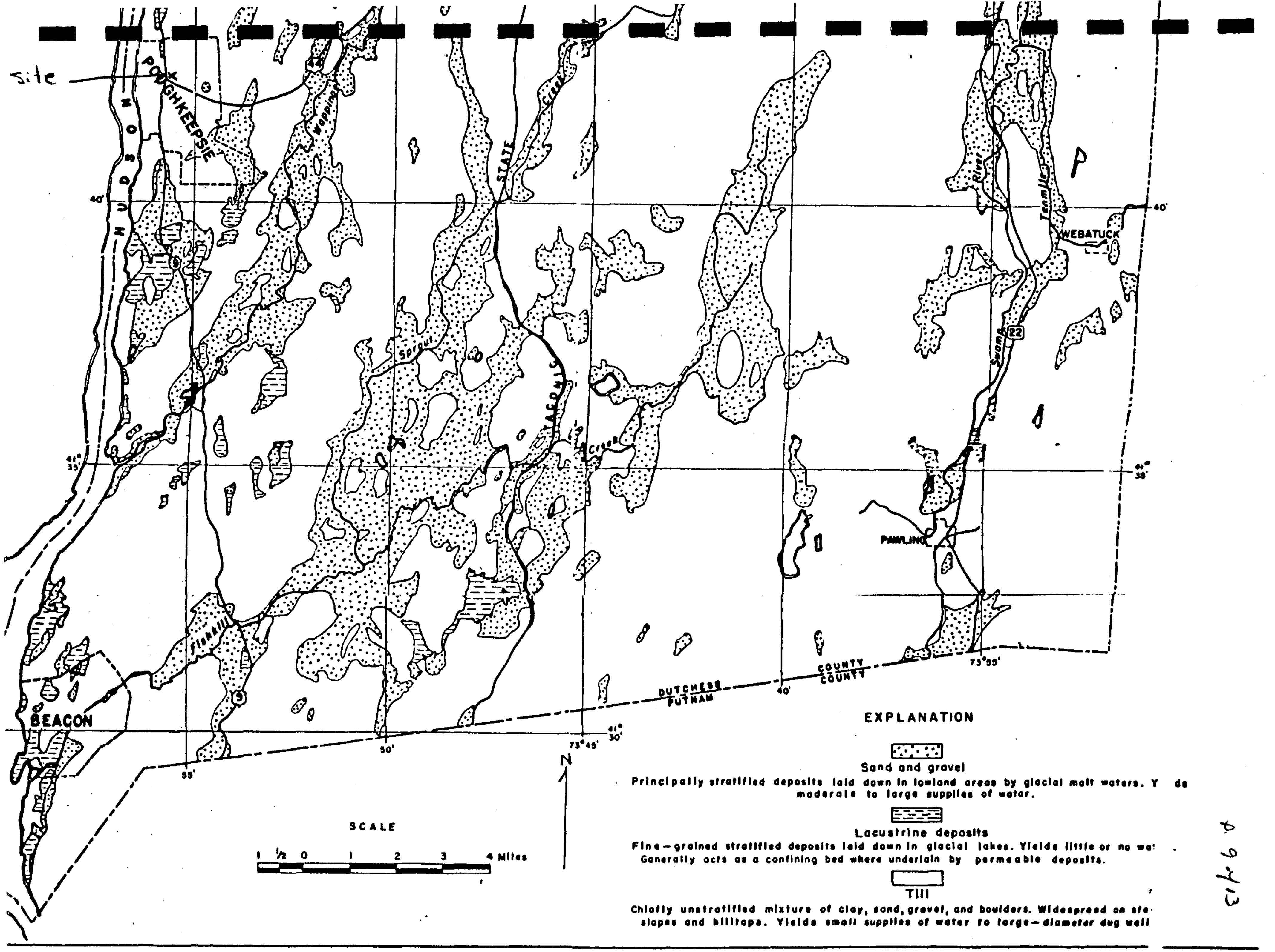
Occurrence of Water in Unconsolidated Deposits

Unconsolidated surficial deposits overlie the bedrock almost everywhere in Dutchess County. These are divided into two units on the basis of their water-bearing characteristics. The first consists of unstratified deposits termed "till," which predominate in upland areas, and the second consists of stratified deposits of gravel, sand, silt, and clay, which predominate in valley areas.

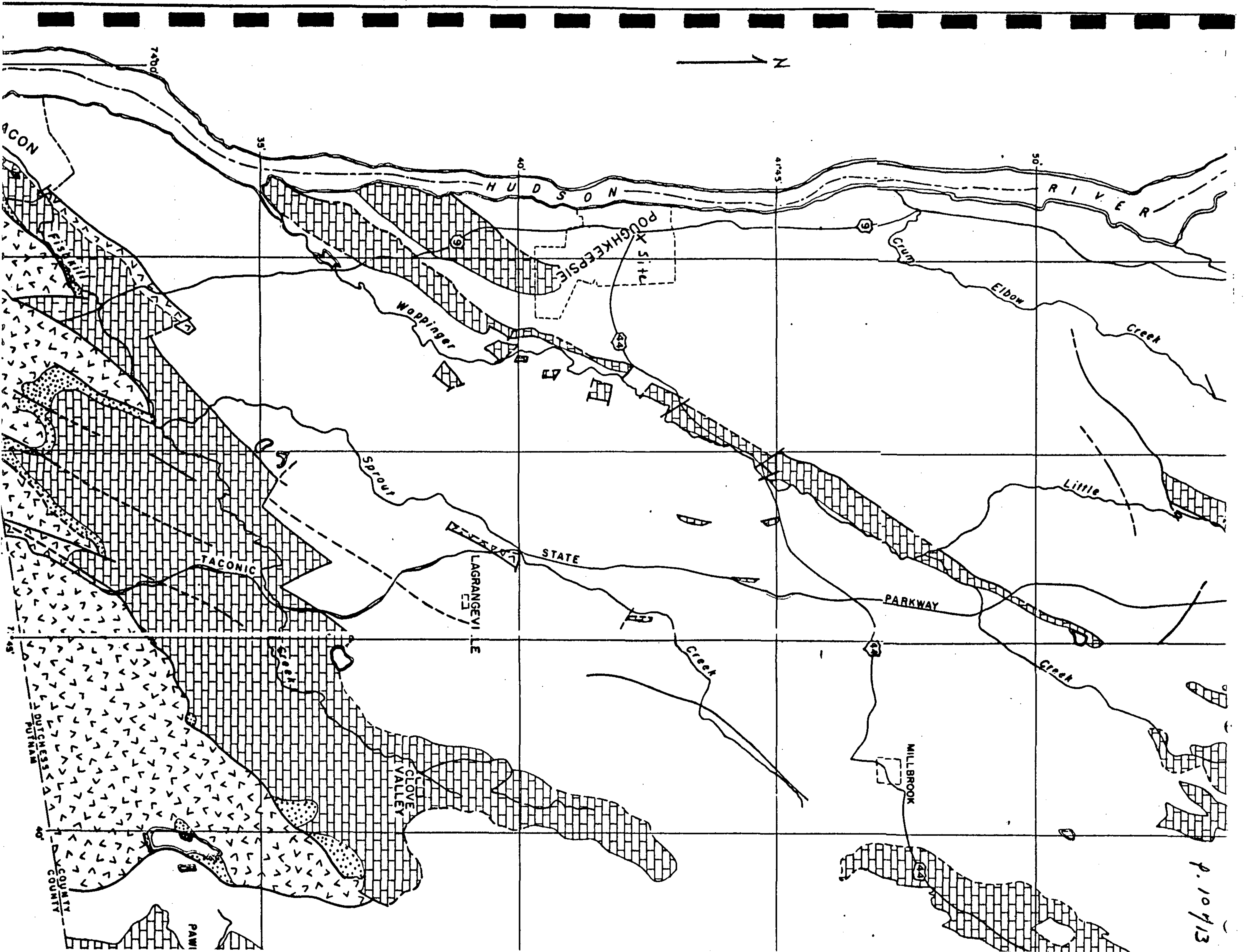
Deposits in Uplands

Till, a mixture of rock materials ranging in size from clay to large boulders, is the principal unconsolidated deposit on the hills (pl. 3). Although till is generally unsorted and unstratified, in a few areas it contains lenses or irregular bodies of sand and gravel. Till overlying limestone generally consists of clay mixed with grains, pebbles, and cobbles of limestone, whereas till overlying slate and schist consists principally of clay mixed with a little quartz sand, and a small percentage of sandstone pebbles and cobbles. Granite and gneiss are generally overlain by a sandy till containing an abundance of large boulders. Till generally ranges in thickness from 10 to 20 feet on hilltops to 20 to 40 feet on the slopes. However, in a few valley areas and other places it is more than 100 feet thick. Its greatest thicknesses are generally found in drumlins-- low, elliptical hills shaped by the Pleistocene ice sheet. Osborne Hill, about 4 miles north-northeast of Beacon in the southwestern part of the county (pl. 1), is believed to be a drumlin. Well Du 455, on the east side of this hill, penetrated about 120 feet of till, as shown in the log in table 12.

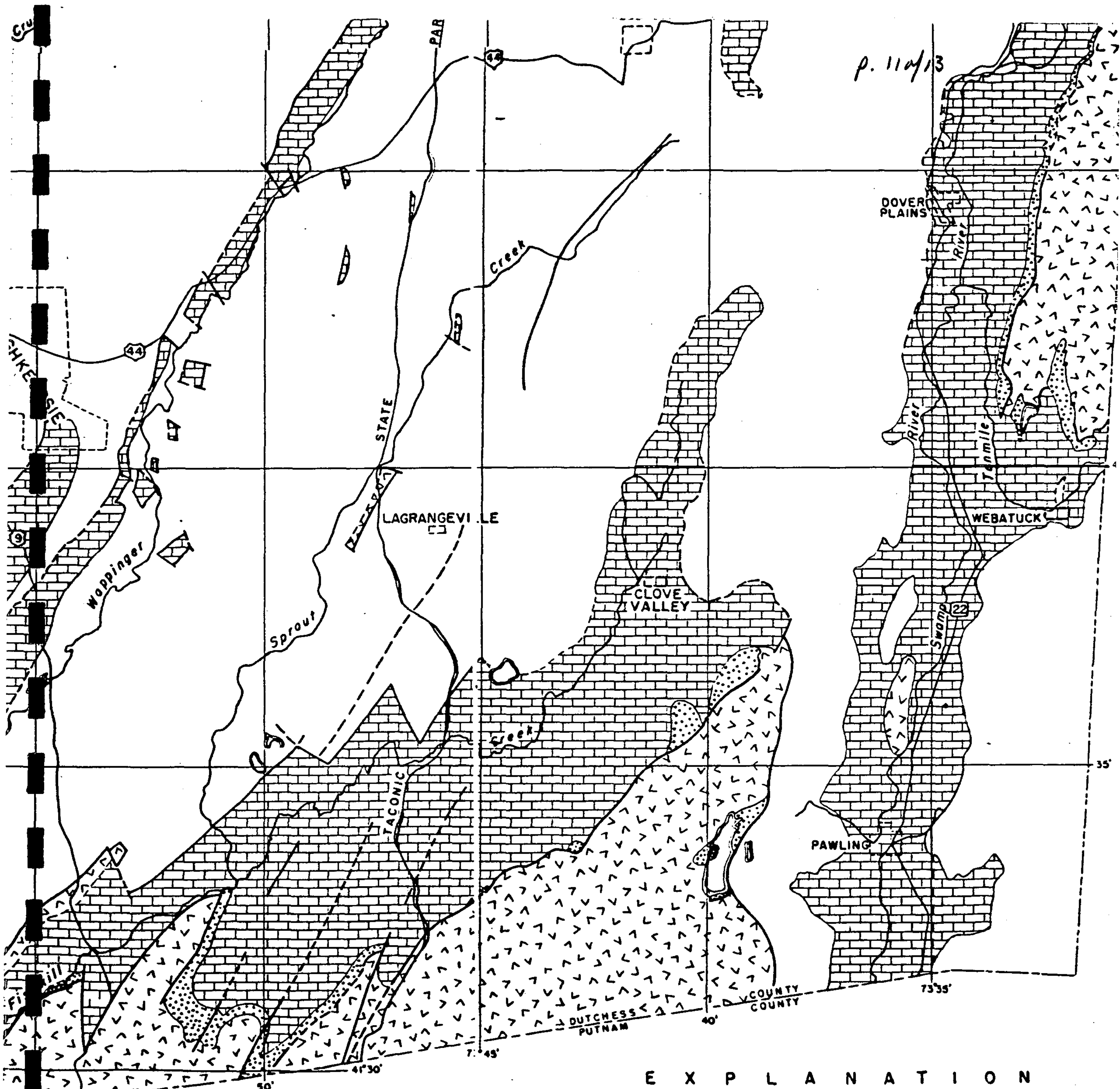
Glacial till is not a productive water-bearing deposit because of its poor sorting and high clay content. Water in usable quantities can generally be obtained from till only from large-diameter wells, which provide a large area for the infiltration of water and a large volume for the storage of water between periods of use. The average yield of the six wells for which



site
HUDSON
POUGHKEEPSIE
Wappinger
Creek
STATE
TACONIC
Sprout
Creek
Fishkill
BEACON
River
Tenmile
WEBATUCK
Swamp
22
PAWLING
DUTCHESS COUNTY
PUTNAM COUNTY
40'
41° 35'
55'
50'
73°45'
41° 30'
40'
73°35'
N
SCALE
1 1/2 0 1 2 3 4 Miles
EXPLANATION
Sand and gravel
Principally stratified deposits laid down in lowland areas by glacial melt waters. Y ds moderate to large supplies of water.
Lacustrine deposits
Fine-grained stratified deposits laid down in glacial lakes. Yields little or no wa
Generally acts as a confining bed where underlain by permeable deposits.
Till
Chiefly unstratified mixture of clay, sand, gravel, and boulders. Widespread on ste
slopes and hilltops. Yields small supplies of water to large-diameter dug well
p. 97/13


N
74°00'
35'
40'
41°45'
50'
HUDSON RIVER
Fishkill
POUGHKEEPSIE
Site
9
Wappinger
Crum Elbow Creek
44
Sprout
Little
STATE
TACONIC
PARKWAY
LAGRANGEVILLE
Creek
Creek
Creek
CLOVE VALLEY
MILLBROOK
DUTCHESS
PUTNAM
COUNTY
COUNTY

p. 110/13



Adapted from maps by R. Balk, C. P. Berkey and M Rice, C. Gordon, E. Knopf, R. Ruedemann, A. S. Warthin, Jr., and J. Weaver.

SCALE

1 0 1 2 3 4 Miles

EXPLANATION

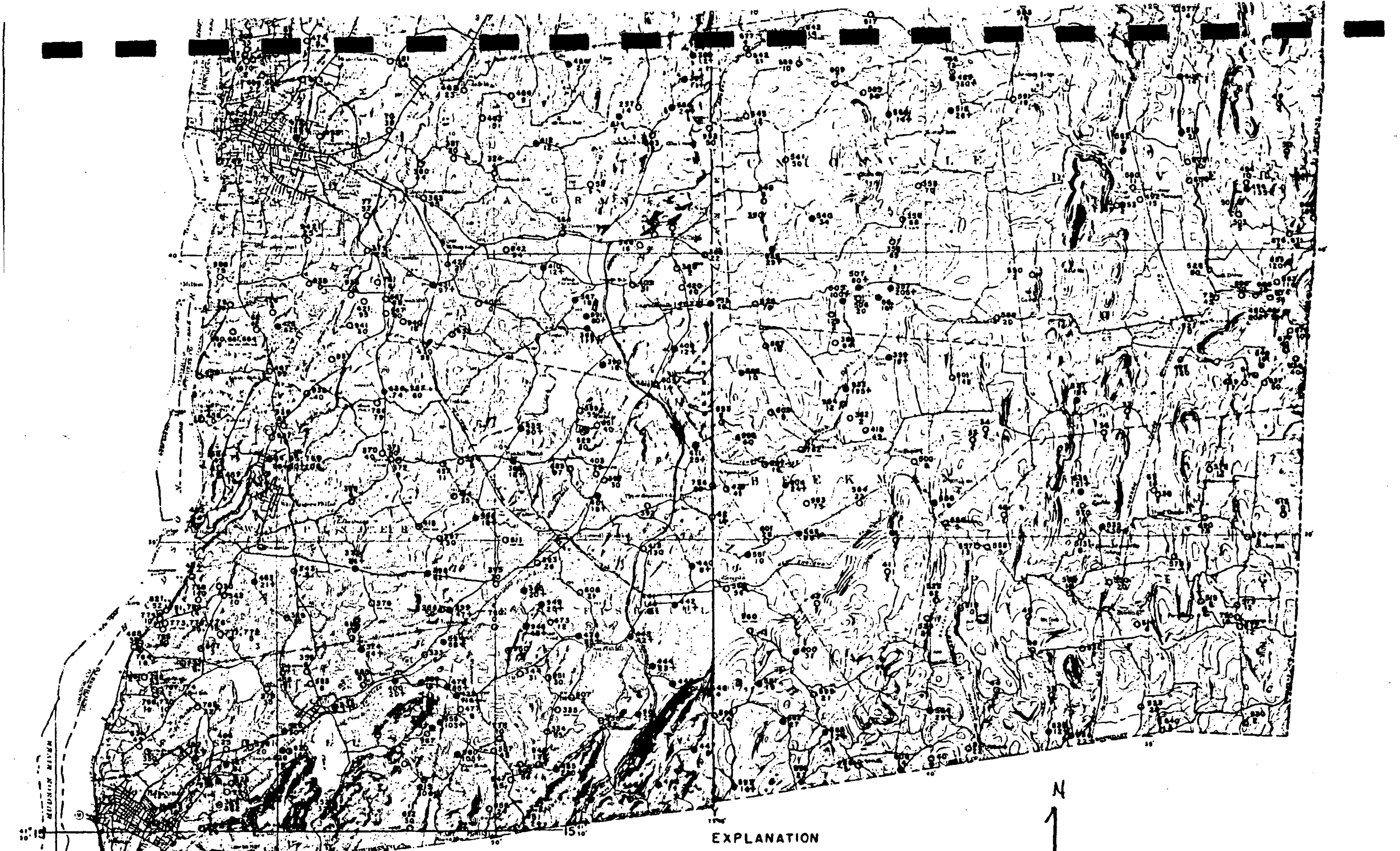
Cheshire quartzite
(Early Cambrian)
Unimportant as a water-bearing formation because of small areal extent.

Hudson River formation
(Ordovician)
Chiefly slate and phyllite in west and schist in e[ast]. Yields small supplies of water.

Undifferentiated granite and gneiss
(Precambrian)
Medium- to coarse-grained igneous and metamorphic rocks. Yields small supplies of water.

Stockbridge limestone
(Ordovician and Cambrian)
Limestone, dolomite and marble. Most productive bedrock aquifer.

Fault
Known Inferred



EXPLANATION

SPRINGS	WELLS	WATER-BEARING MATERIAL
♀	○	Bedrock
♀	●	Unconsolidated deposits
♀	◍	Bedrock and unconsolidated deposits
♀	◎	Unknown

Symbol indicates type of water-bearing material. Upper figure is well or spring number with prefix "Du" omitted; suffix "Sp" also omitted in spring numbers. Lower figure is thickness, in feet, of unconsolidated deposits. Plus sign (+) following lower figure indicates that thickness of unconsolidated deposits is unknown but is greater than figure given.

SCALE

1 0 1 2 Miles

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

p. 12 7/13

Well number	Location	Owner or occupant	Altitude above sea level (feet)	Type of well	Depth below land surface (feet)	Diameter (inches)	Depth to bedrock (feet)	Water-bearing formation	Water level below land surface (feet)	Method of lift	Yield (gallons per minute)	Use	Remarks
* Du 417	15Y, 14.2N, 9.4W	Nelson House	160	Drl	826	6	30	Hudson River formation	--	--	5	Com	Well supplies water for air conditioning.
Du 418	14Y, 9.4S, 3.1E	John Flanagan	500	Drl	97	6	45	Stockbridge limestone	5	Suction	4	Dom	
Du 419	15Y, 16.5N, 4.4W	William Hawley	200	Drl	50	6	3	do.	13	do.	3	Dom	Bedrock contains large seams of clay. (a).
Du 420	15Y, 11.0N, 0.6W	B. Kirby	380	Drl	64	6	10	Hudson River formation	8	None	20	Dom	
Du 421	15Y, 10.7N, 7.0W	C. L. King	240	Drl	134	6	95	do.	12	do.	7	Dom	Temperature 50°F, April 1949. (b).
Du 422	15Y, 11.4N, 5.3W	E. F. Delaney	220	Drl	88	6	21	do.	14	Suction	7	Dom	Yield 4 gpm when well was 40+ ft deep.
Du 423	14Y, 10.6S, 0.3E	E. Lerby	400	Drl	125	6	45	Stockbridge limestone	--	Force	8	Dom	
Du 424	15Y, 8.8N, 6.6W	Peter Tennis	160	Drl	183	6	74	Hudson River formation	5	Suction	5	Com	(b).
Du 425	15Y, 10.2N, 8.7W	International Business Machines Country Club	100	Drl	62	6	--	Pleistocene sand and gravel	11	Hand	30	Dom	
Du 426	15Y, 10.5N, 8.8W	do.	160	Drl	69	6	6	Hudson River formation	6	do.	15	Dom	Three other wells on property.
Du 429	15Y, 2.7N, 5.2W	T. Tompkins	240	Drl	116	6	--	Pleistocene sand and gravel	2	Hand	50	Dom	(b).
Du 430	15Y, 9.7N, 5.7W	Rodney Plew	210	Drl	117	6	55	Hudson River formation	12	Suction	5	Dom	Water cloudy after heavy rains.
Du 431	15Y, 11.0N, 5.6W	Neil Hall	265	Drl	97	6	--	Pleistocene sand and gravel	9	do.	8	Farm	
Du 432	15Y, 10.0N, 5.2W	B. Larner	300	Drl	185	6	7	Hudson River formation	20	Force	12	Dom	
Du 433	15Y, 12.0N, 1.1W	E. Hunt	360	Drl	152	6	4	do.	6	Suction	8	Dom	
Du 435	15Y, 8.1N, 3.8W	A. Stillman	280	Drl	90	6	--	Pleistocene sand	9	do.	12	Dom	
Du 437	15Y, 7.4N, 5.4W	Bernard Schultz	340	Drl	85	6	11	Hudson River formation	15	do.	6	Dom	
Du 438	15Y, 14.0N, 7.8W	Seitz Terrace	180	Drl	180	6	2.5	do.	8	Force	30	Dom	Drawdown 42 ft after pumping 30 gpm for 2 hrs. Yield 2 gpm when well was 40 ft deep.
* Du 439	15Y, 14.1N, 9.5W	Young Men's Christian Association	180	Drl	1,200	6	30	do.	--	None	4	None	Yield 4 gpm when well was 75 ft deep.
Du 440	15Y, 5.3N, 0.4W	L. Mittko	320	Drv	8	2¼	--	Pleistocene sand and gravel	4	Suction	5	Dom	
Du 441	15Y, 4.4N, 1.3W	L. Rumph	300	Drv	14	1¼	--	do.	7	do.	--	Dom	
Du 442	15Y, 4.5N, 0.8W	Charles Morris	300	Drv	11	1¼	--	do.	7	do.	2	Dom	
Du 443	15Y, 3.9N, 1.7W	J. D. Fowler	300	Dug	42	48	--	do.	30	Force	--	Dom	
Du 444	15Y, 3.3N, 1.2W	Mario Amadel	320	Drv	23	1¼	--	do.	12	Suction	2.5	Com	
Du 445	15Y, 2.9N, 0.9W	Lewis Bailey	320	Drv	18	1¼	--	do.	--	do.	4	Dom	
Du 446	15Y, 2.8N, 0.2W	Henry Feinblatt	500	Drl	101	6	4	Granite and gneiss, undiff.	11	do.	9	Dom	
Du 447	15Y, 1.6N, 0.4W	Ernest Smalley	800	Dug	8	62	8	Pleistocene till	2	do.	--	Dom	
Du 448	15Y, 0.9N, 1.1W	E. S. Ladd	860	Dug	14	48	14	do.	6	Suction	--	Dom	
Du 449	15Y, 0.6N, 1.7W	B. Perthington	800	Drl	88	6	4	Granite and gneiss, undiff.	--	Force	7	Dom	
Du 450	15Y, 0.6N, 2.5W	Frank Robertson	420	Dug	21	65	21	Pleistocene till	16	Suction	--	Dom	

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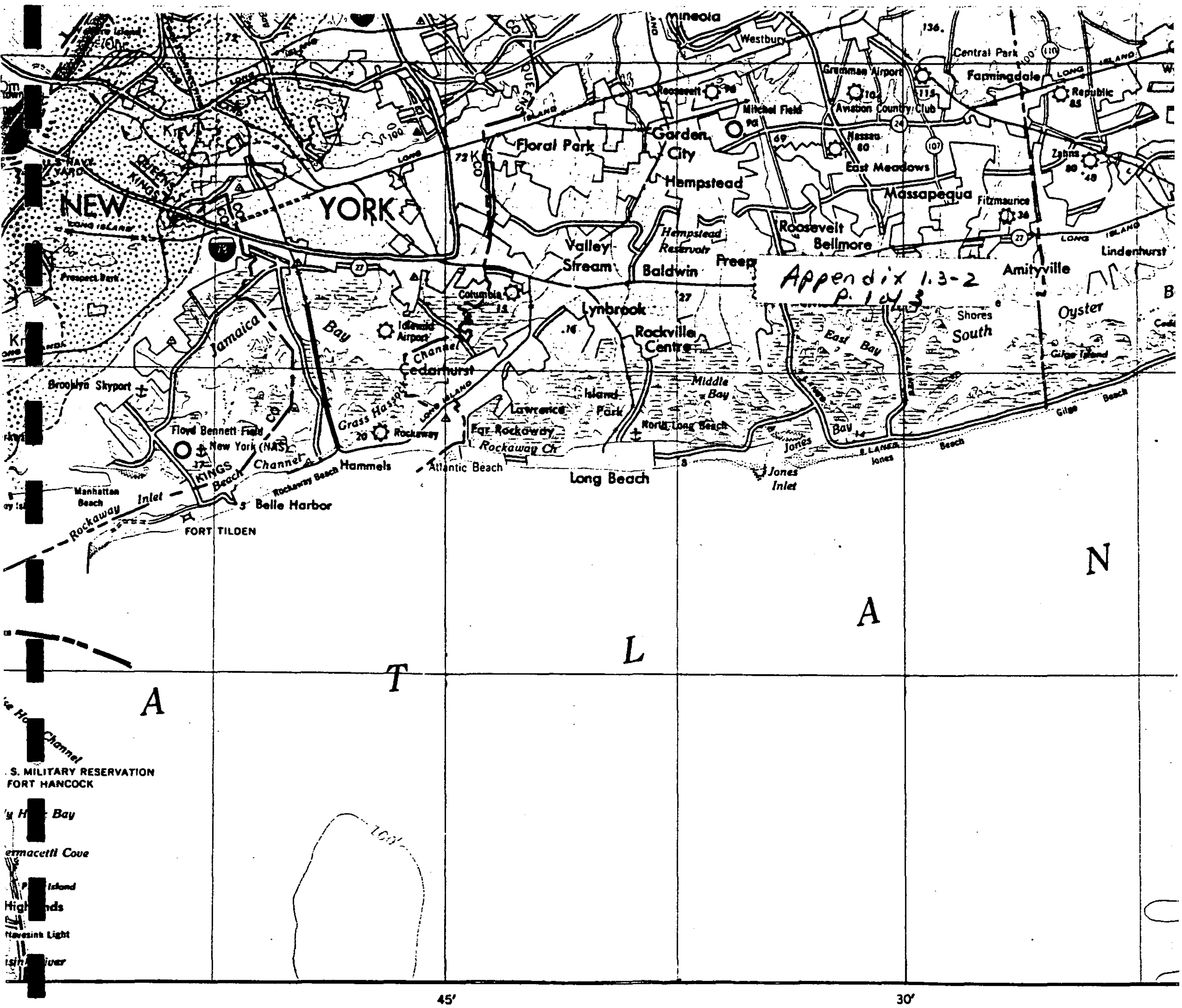

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GEOLOGIC MAP OF NEW YORK

1970

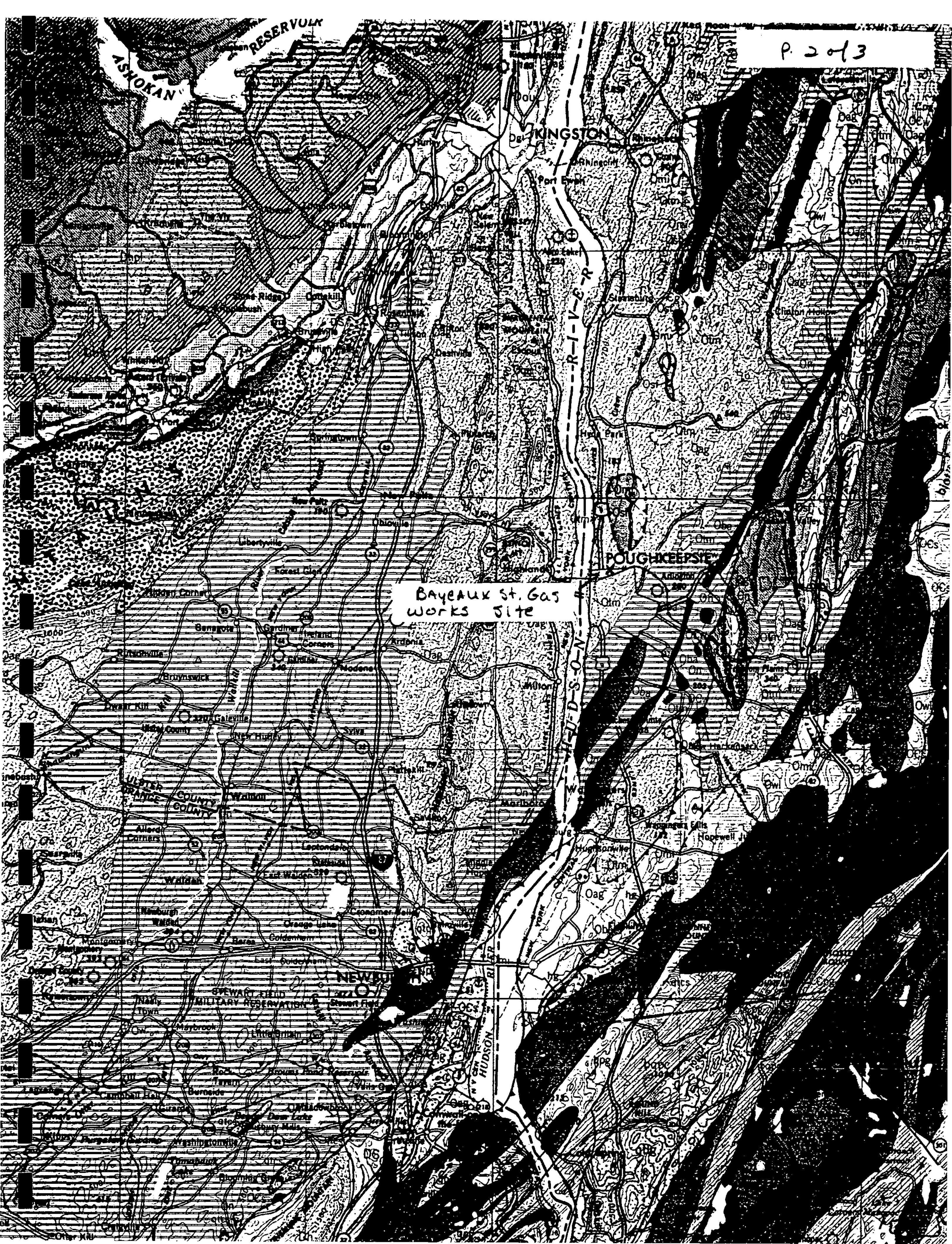
Lower Hudson Sheet

Scale 1:250,000

5 0 5 10 15 Statute Miles 20

5 0 5 10 15 20 25 Kilometers 30

CONTOUR INTERVAL 100 FEET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ASHOKAN
RESERVOIR
KINGSTON
POUGHKEEPSIE
R-I-V-E-R
H-U-D-S-O-N
HUDSON
Bayeaux St. Gas works site
ULSTER COUNTY
ORANGE COUNTY
STEWART FIELD MILITARY RESERVATION
Springtown
New Paltz
Libertyville
Gardiner
Bruynswick
Galeville
Walden
Montgomery
Maybrook
Marlboro
Hyde Park
Stone Ridge
Cottekill
Rosendale
Highland
Modena
Plattekill
Wallkill
Newburgh
Wappingers Falls
Hopewell Jct
Burnside
Washingtonville
Stewart Field
Rifton
Esopus
Port Ewen
Forest Glen
Tuthill
Little Britain
Orange Lake
Chester
Pine Bush
Gardiner
Clinton Hollow

[redacted]Dbg Muscovite-biotite granite gneiss.

[redacted]

WEST FALLS GROUP
1,800 ft. (550 m.)

Dwh Honesdale Formation—sandstone, shale.

[redacted]ws Slide Mountain Formation—sandstone, shale, conglomerate.

[redacted]ww upper Walton Formation—shale, sandstone, conglomerate.

[redacted]

SONYEA GROUP
900 ft. (270 m.)

[redacted]sw lower Walton Formation—shale, sandstone, conglomerate.

[redacted]

GENESEE GROUP
1,500-3,200 ft. (400-980 m.)

Dgo Oneonta Formation—shale, sandstone.

[redacted]

HAMILTON GROUP
2,600-2,800 ft. (790-850 m.)

[redacted]mo Moscow Formation—shale, sandstone.

[redacted]pl Plattekill Formation—shale, sandstone; Ashokan Formation—shale, sandstone.

Dhm Undifferentiated lower Hamilton Group—shale, sandstone.

[redacted] Undifferentiated Hamilton Group—shale, siltstone. in eastern Orange County: Skunnemunk Formation—sandstone, conglomerate; Bellvale Formation—shale, sandstone; Cornwall Shale.

[redacted]

ONONDAGA LIMESTONE AND ULSTER GROUP
450-1,000 ft. (140-300 m.)

[redacted] Onondaga Limestone—Seneca, Morehouse (cherty), and Nedrow Limestone Members, Edgecliff cherty Limestone Member, local bioherms, Buttermilk Falls Limestone Member; Schoharie Formation—shale, limestone; Carlisle Center Siltstone; Esopus Shale.

D[redacted] Glenerie Formation—limestone, chert; Port Jervis Formation (near Port Jervis only)—shale, limestone, chert.

[redacted]

. HELDERBERG GROUP
400-500 ft. (120-150 m.)

D[redacted] Port Ewen, Alsen, Becraft, New Scotland, Kalkberg, Coeymans, and Manlius Limestones.

[redacted]

UNDIFFERENTIATED LOWER DEVONIAN AND SILURIAN ROCKS
400-1,000 ft. (120-300 m.)

DS [redacted] In northern Ulster County: Port Ewen thru Manlius Limestones; Rondout Oolostone; Binnewater Sandstone; High Falls Shale. In Orange County: Kanouse Sandstone; Woodbury Creek Formation—shale, sandstone; Esopus Shale; Connelly Conglomerate; Central Valley Sandstone; New Scotland Limestone thru Rondout Dolostone; Decker Limestone; Poxono Island Formation—shale, dolostone; Longwood Shale; Green Pond Conglomerate.

[redacted]

PALEOZOIC

Upper Silurian

stone; Poxono Island Formation—shale, dolost

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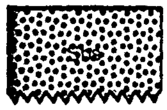
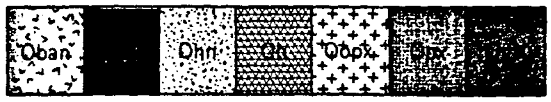
UNDIFFERENTIATED SILURIAN ROCKS II
0-1,800 ft. (0-550 m.)



Sbs Bloomsburg Formation—shale, sandstone; Guym Quartzite; Otisville S —sandstone, conglc

Upper Ordovician

CORTLANDT AND SMALLEI MAFIC COMPLEXES



Oban Biotite augite norite.

Od Diorite with hornblende and/or biotite.

Ohn Hornblende norite; hornblende is poikilitic.

Oh Hornblendite.

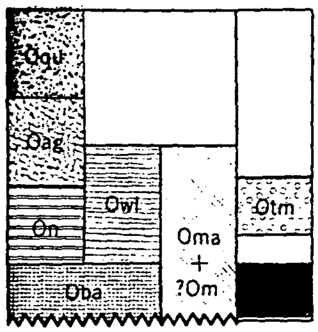
Oopx Olivine pyroxenite, in part with poikilitic hornblende; local peridotite.

Opx Pyroxenite.

Ogb Rock complex ranging in composition from gabbro or norite to hornblende diorite, with minor pyroxenite; Croton Falls and Peach Lake complexes in New York, and Mt. Prospect Complex in Connecticut.

Middle Ordovician

TRENTON GROUP AND METAMORPHIC EQUIVALENTS
up to 8,000 ft. (2400 m.)



Oqu Quassaic Quartzite — quartzite, sandstone, conglomerate.

Oag Austin Glen Formation—graywacke, shale.

On Normanskill Formation—shale, argillite, siltstone.

Owl Walloomsac Formation—phyllite, schist, metagraywacke.

?Om Manhattan Formation, undivided — pelitic schists, amphibolite; Units ?Omb, ?Omc, and ?Omd may be Cambrian eugeosynclinal rocks thrust upon Oma; ?Omd — sillimanite - garnet - muscovite - biotite - plagioclase - quartz gneiss; ?Omc — sillimanite - garnet - muscovite - biotite - quartz - plagioclase schistose gneiss, sillimanite nodules, local quartz - rich layers; ?Omb — discontinuous unit of amphibolite and ?Omc - type schist; Oma — sillimanite - garnet - muscovite - biotite - quartz -plagioclase schists; calcite marble and calcsilicate rock at base.

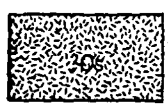
Oba Balmville Limestone.

Otm Taconic Mélange—chaotic mixture of Early Cambrian thru Middle Ordovician pebble—to block-size clasts in a pelitic matrix of Middle Ordovician (Barneveld) age. Rims and floors earlier submarine gravity slides of Taconian Orogeny.

O€s Cambrian thru Middle Ordovician (Barneveld) carbonate rocks occurring as slivers along thrusts of later allochthones, or carbonate blocks in Taconic Mélange.

Lower Ordovician

LOWER ORDOVICIAN INTRUSIVE



?Os Serpentinite.

15' 75°00' 45'

[redacted]

Appendix 1.3-3
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FINAL REPORT

WATER RESOURCES STUDY FOR DUTCHESS COUNTY

for

Dutchess County Department of Planning

by

Robert G. Gerber
Consulting Civil Engineer and Geologist
Ash Point Road
South Harpswell, Maine 04079

June 1982

3.3 Bedrock Aquifers

3.3.1 Aquifers in Bedrock Formations

The bedrock of Dutchess County includes a wide range of sedimentary, metamorphic, and igneous rocks which have, from place to place, experienced markedly different histories of formation, metamorphic alteration and structural deformation. Regional differences in bedrock lithologies and deformational history inherently suggest regional differences in the physical and chemical character of the rocks, in turn signalling the likelihood of regional differences in the quantity and quality of ground water that the rocks can deliver to wells.

We have performed no field investigations in Dutchess County, and have no direct personal knowledge of the rocks, their local lithologic variations, layering fabrics, fracture density, mineralogy or weathering. Our experience with bedrock aquifers in Maine, however, in a number of rock types comparable to Dutchess County rocks, suggests that the regional Dutchess County bedrock distributions (Fisher et. al., 1970a, 1970b; Woodward-Clyde, 1979) may be differentiated into five major bedrock aquifer groups.

These major groups may be used in a general way to categorize regional differences in aquifer yields, depths and, especially inherent water quality. We have further found in Maine that notable variations, particularly in well yields and depths, occur from place to place within the major groups. We have, accordingly, subdivided the major Dutchess County groups into smaller subdivisions, generally delimited by formation contacts or fault boundaries. Each smaller subdivision has been assigned a "geologic unit code" (GUC) for its map and computer identification. The following table defines the major bedrock aquifer groups, and lists the GUC numbers assigned to individual aquifers within those groups. Table 4 describes bedrock formation names and rock types for each GUC number.

MAJOR BEDROCK GROUP	GUC NUMBERS	TOTAL AQUIFERS
Autochthonous* shales	1-10	10
Allochthonous* shales	20-31	12
Carbonate rocks	40-57, 60-81	40
Schists, phyllites	90-107, 110-120	29
Quartzite, crystallines	130-146, 150-168	36

* Autochthonous rocks are those still present where they were formed. Allochthonous rocks are those transported from where they were formed by faulting or gravity sliding.

Notwithstanding the many bedrock aquifer subdivisions that we have devised (127), it is likely that an appreciable number of the aquifers could be further subdivided, were detailed information available from specialized geologic mapping or more closely-spaced water well information. Of our total number of bedrock aquifers, 65 (51%) contain no wells and 96 (75%) contain less than 5 wells. We know of no geologic studies conducted specifically to map those characteristics of bedrock fabric and structure which control aquifer yields and depths. Furthermore, many of our aquifer subdivisions are quite large, with the total averaging over 4100 acres per aquifer; portions of many of the larger ones undoubtedly contain discrete sectors where the bedrock is relatively "open" and high-yielding, or relatively "tight" and low-yielding. Our aquifer subdivisions, therefore, should be viewed only as forming a basic framework, upon which future data collection and evaluation may build a more detailed understanding with which to guide land use decisions for local areas. Based on the available data, Table 5 contains basic statistics and a ranking of bedrock aquifers based upon well depth and yield. Table 6 contains a ranking of aquifers based on intrinsic water quality parameters.

3.3.2 Aquifers in Bedrock Lineaments

It is common practice in portions of midwestern United States to search for bedrock ground water along and at the intersections of "lineaments", the elongate troughs or breaks observed directly in ground-surface topography, or the linear patterns perceived remotely by viewing aerial photographs and satellite images. Topographic lineaments may develop over through-going zones of bedrock fracturing, where the relatively high fracture porosity of the broken rock makes it an attractive site for the collection of readily-recoverable ground water. Some lineaments apparent on remotely-sensed images may reflect bedrock fracture zones, to be revealed by distinctive topographic or vegetation patterns. Proof of the existence of a fracture zone requires on-site geological investigations; proof of the presence there of special bedrock aquifer conditions requires the drilling and testing of the zone by wells.

In our study we have observed numerous lineaments, both long and short, which taken together form a tight, interlocking network over all of Dutchess County. The most common trend of lineaments is toward the north northeast, parallel to the grain of bedrock structure imposed on the region by Paleozoic orogenic deformations. Second in frequency is a lineament trend sector toward the west northwest and west. A relatively weak trend toward the north northwest and northwest is apparent in some areas. A complete plotting of all lineaments perceived in the topography, aerial photographs, satellite images and on raised-relief maps would create a complex interlacing of many hundreds of elements. We have perceived more than 300 linear elements on a NASA Skylab satellite photomap (USGS, 1973), ranging in length from a few hundred feet to more than 6 miles. Wise (1981) has perceived about 145 lineaments in Dutchess County by study of 1:250,000-scale raised relief maps, few of which coincide with the trends or lengths of lineaments seen by us on the Skylab photomap. Woodward-Clyde (1979) reports more than one dozen lineaments of county-wide length that do not coincide with either the Wise or Skylab features.

While the available graphic data and the perception of lineaments are voluminous, the lack of supporting control from field

BEDROCK AQUIFER INDEX - WATER RESOURCES PLANNING, DUTCHESS COUNTY, NY

Autochthonous Shales, etc. (AQUIFER NOS. 1-10)

SYMBOL	BEDROCK FORMATION	ROCK TYPES
Oag	Austin Glen	Graywacke, Shale
On	Normanskill	Shale, Argillite, Siltstone
Otm	Taconic Melange	Sedimentary clasts in Pelitic Matrix

BEDROCK AQUIFER NUMBERS and ASSOCIATED ROCK TYPE SYMBOLS

1 Predominantly Oag; minor On; local patches of Otm
2 Predomonantly Oag; minor On to south; patches of Otm
3 About equal Oag and On; small patch of Otm near Lafayetteville
4 Predominantly On; local patches of Oag and Otm
5 Predominantly On; local patches of Otm
6 On between faults
7 Entirely On
8 Oag in the south; On in the north; patches of Otm
9 About half-and-half On and Oag; patches of Otm
10 On; patches of Otm

(Geology from:

Fisher, D.W., Y.W. Isachsen, L.V. Rickard (1970) Geologic Map of New York, Lower Hudson & Hudson-Mohawk Sheets. Scale 1:250,000; March 1970

Violet Ave Sch
The Childrens Home
FULTON STREET
Inwood Lake
Radio Tower (WEOK)
Fairview
Playground
BM 220
Morgan Lake
COLLEGE HILL PARK
College Ecc.
Highland Landing
Oil and Gas
Penn
Coes
Water Works
BM 23
Oil & Gas
Substation
Bridge
RIVER
SITE
Cornell
North Base
Oil and Gasoline
MID-HUDSON BRIDGE
South Base
POUGHKEEPSIE
URBAN AREA BOUNDARY IS
DEFINED AS FOLLOWING
THE SHORELINE
Morse Sch
Mansion Square Park
Courthouse
Armory
Library
Eastman Park
Vassar Brothers
POUGHKEEPSIE
High Sch
Smith Sch
Holy Trinity Sch
Arlington
Raymond Ave Sch
Vassar Temple
COLLEGE
GLENWOOD
AVENUE
Oil and Gasoline
Yellow
Vassar Lake
Krieger Sch
POUGHKEEPSIE
RURAL
CEMETERY
Mine Pt
Blue Pt
Got

P. 6 of 6
SITE
Highland Landing
Oil and Gas
Oil & Gas
Substation
Cornell
Oil and Gasoline
MID-HUDSON BRIDGE
RIVER
POUGHKEEPSIE URBAN AREA BOUNDARY IS DEFINED AS FOLLOWING THE SHORELINE
Oil and Gasoline
Water Works
Marist College
Fairview
St Francis Hospital
Pulaski Park
Morgan Lake
Reservoir
COLLEGE HILL PARK
College
Trailer Park
Arlington
Eastman Park
Library
Armory
Courthouse
POUGHKEEPSIE
Vassar Brothers
Vassar Temple
Vassar Lake
VASSAR COLLEGE
Calvary Cemetery
Sunset Lake
POUGHKEEPSIE RURAL CEMETERY
Mine Pt
Blue Pt
Yellow
Krieger Sch
High Sch
Raymond Ave Sch
Radio Tower (WEOK)
ST PETERS CEMETERY
UNDERHILL
NORTH GRAND
Fulton
106
St Josephs Cem

Appendix 2

(47-15-11 (10/83)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

DIVISION OF SOLID AND HAZARDOUS WASTE

INACTIVE HAZARDOUS WASTE DISPOSAL SITE REPORT

PRIORITY CODE: ______ SITE CODE: ______

NAME OF SITE: Bayeaux Street Gas Plant REGION: III

STREET ADDRESS: North Perry Street

TOWN/CITY: Poughkeepsie COUNTY: Dutchess

NAME OF CURRENT OWNER OF SITE: Admiral Halsey Senior Village, Inc. *

ADDRESS OF CURRENT OWNER OF SITE: 515 Rockaway Blvd., Spring Valley, New York 10977

TYPE OF SITE: OPEN DUMP ☐ STRUCTURE ☐ LAGOON ☐ LANDFILL ☐ TREATMENT POND ☐

ESTIMATED SIZE: 1.2 ACRES

SITE DESCRIPTION:

The site is situated at the corner of North Perry (formerly Bayeaux Street) and Main Street. Currently the site is the location of the Admiral Halsey Senior Village, a 13-story apartment complex. The area is generally flat, 0-3 percent slope to the west. The property is open, park-like, and well maintained. An asphalt parking lot is located on the southeast side of the building. The remaining land surface is predominately grass covered. The land use is predominant land use in the vicinity is residential woth some commercial use.

* Two other owners:

Mr. John Bahrenburg
35 Manchester Circle
Poughkeepsie, NY 12601

Mr. Charles Effron
Unknown Address

HAZARDOUS WASTE DISPOSED: CONFIRMED ☐ SUSPECTED ☐

TYPE AND QUANTITY OF HAZARDOUS WASTES DISPOSED:

TYPE	QUANTITY (POUNDS, DRUMS, TONS, GALLONS)
Undocumented	Unknown

TIME PERIOD SITE WAS USED FOR HAZARDOUS WASTE DISPOSAL:

Sometime in 1850, 19___ TO about, 1911

OWNER(S) DURING PERIOD OF USE: Poughkeepsie Gas Light Co., and Central Hudson Gas & Electric Corp

SITE OPERATOR DURING PERIOD OF USE: Same

ADDRESS OF SITE OPERATOR: Unknown

ANALYTICAL DATA AVAILABLE: AIR [ ] SURFACE WATER [ ] GROUNDWATER [ ]
SOIL [ ] SEDIMENT [ ] NONE [X]

CONTRAVENTION OF STANDARDS: GROUNDWATER [ ] DRINKING WATER [ ]
SURFACE WATER [ ] AIR [ ]

SOIL TYPE: Glacial till

DEPTH TO GROUNDWATER TABLE: Less than 75 ft

LEGAL ACTION: TYPE: None STATE [ ] FEDERAL [ ]
STATUS: IN PROGRESS [ ] COMPLETED [ ]

REMEDIAL ACTION: PROPOSED [ ] UNDER DESIGN [ ]
IN PROGRESS [ ] COMPLETED [ ]

NATURE OF ACTION:

ASSESSMENT OF ENVIRONMENTAL PROBLEMS:

None known.

ASSESSMENT OF HEALTH PROBLEMS:

None known.

PERSON(S) COMPLETING THIS FORM:

FOR NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION	NEW YORK STATE DEPARTMENT OF HEALTH
NAME EA Science and Technology	NAME
TITLE	TITLE
NAME	NAME
TITLE	TITLE
DATE: 2 December 1986	DATE: