Further, the adjacent communities are well served by mass transit facilities. One trolley, Girard, travels along Delaware-Richmond Streets within one block of the site.

Traffic patterns in the immediate and secondary areas of the site tends to reflect the established land use and road pattern of the area.

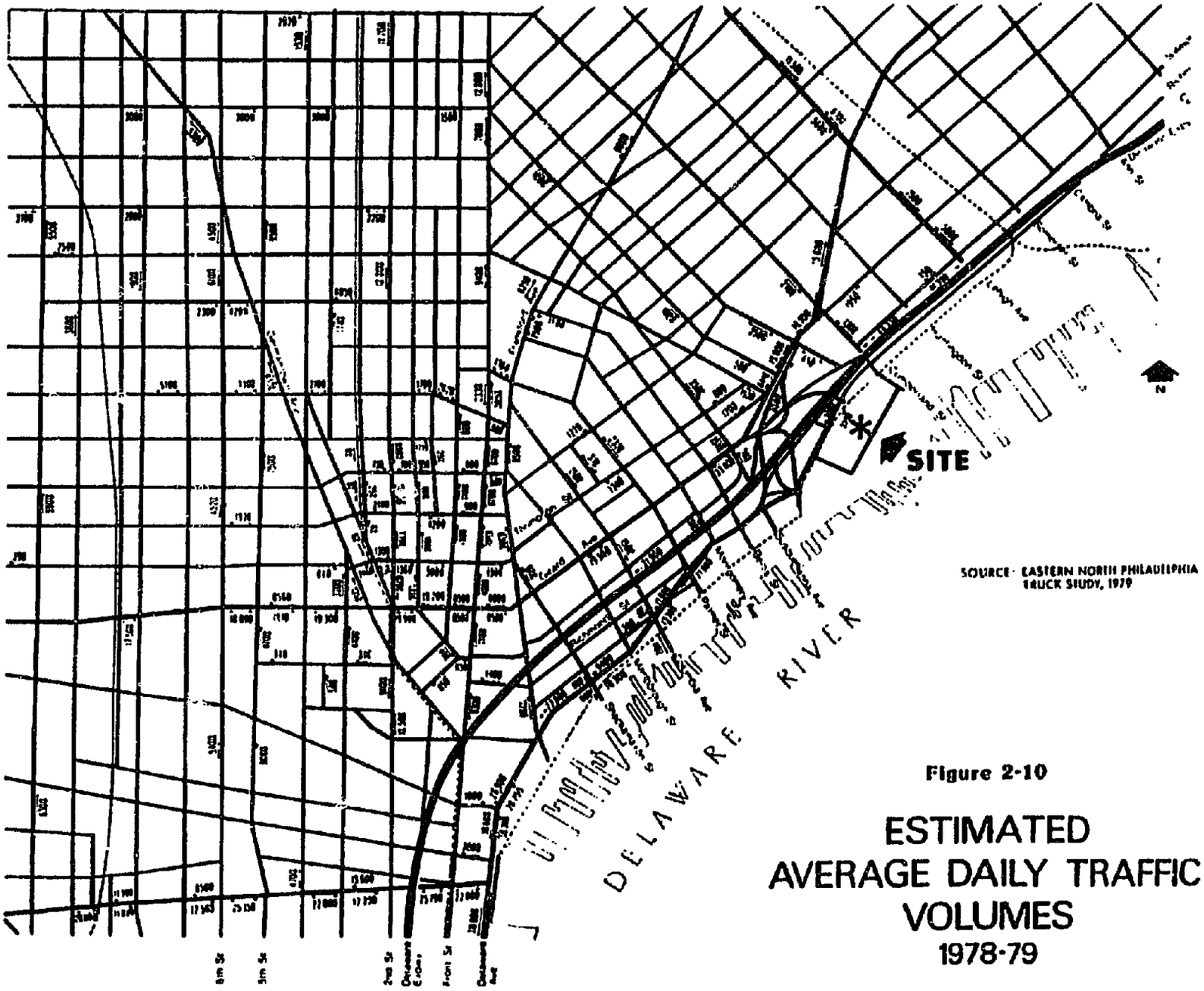
The most immediate is the Delaware Expressway with access and exit near the site. The estimated average daily traffic volume shows traffic on the Delaware Expressway was place at over 90,000 vehicles in 1978-1979. See Figure 2-10.

Traffic in the adjacent residential area reflects a road pattern of combined diagonal and grade streets established many years ago. Among the heaviest traffic carriers are Lehigh, Aramingo, and Frankford Avenues. The railroad tracks north of and parallel to Lehigh Avenue also affect the patterns as there are few under passes.

2.3.4 Community Description

The residential communities closest to the site are Fishtown and Kensington, two of the older communities in the city. Because of their historic development, the land uses tend to be mixed with industrial, commercial, and residential development. The communities are relatively stable, with most housing units occupied and maintained.

Community Characteristics - Social and Economic Activities: The land use development reflected the close relationship of home to factory and to shopping. Mixed land use became prevalent and its effects continue to this day.



SOURCE: EASTERN NORTH PHILADELPHIA TRUCK STUDY, 1979

Figure 2-10

ESTIMATED AVERAGE DAILY TRAFFIC VOLUMES 1978-79

The coming of the automobile and the truck left its mark on the community in two ways. One was the increase in vehicular traffic on narrow, inappropriately arranged streets and, secondly, in leaving little room for parking. Traffic is one of the main problems of the community and will be discussed further.

Historic Sites, Landmarks, Schools, and Hospitals: The local community representatives are actively seeking to have Penn Treaty Park, located a number of blocks to the south of the site, declared a National Landmark. If successful, it would be the first in this area to be listed on the National Register.

These communities are served by a number of institutions within or nearby. There are three nearby hospitals, which are listed as follows:

a. St. Mary's - Frankford and Palmer Streets (improvements are being made to their existing facilities),
b. St. Christopher's - 5th and Lehigh Streets, and
c. Episcopal - Front and Lehigh Streets.

A number of schools serve the area, which are listed as follows:

a. Alexander Adams,
b. George Chandler (Annex),
c. Penn Treaty Junior High,
d. Edison or Frankford High,
e. Chandler School,
f. Kensington Girls High School, and
g. Holy Name Church and School.

Recreation is provided by the following:

a. Fishtown Recreation Center - Palmer and Flora Streets,

b. Hetzell Playground - Thompson and Montgomery Streets,
c. Kensington Recreation Center - Norris and Blair Streets,
d. Penn Treaty Park - Delaware River and Columbia,
e. Palmer Park - Frankford and Palmer Streets, and
f. Aramingo Square.

In addition, there are efforts being made to improve the land under the Delaware Expressway near Cumberland Street and to turn it into recreational use.

One item that cannot be overlooked in dealing with the history of the area is the Palmer Burial Ground located at Palmer and Memphis Streets. An early settler bequeathed the land for free burial in 1732 and it has been so maintained by a local committee ever since.

Community Concerns: In late 1978, because of a proposed improvement in "American Street" a sample study was performed of residents in the area to determine their major concerns. The major concern dealt with traffic, its volume and type. The study(39) culminated in a ranking of problem issues. As Table 2-11 shows, truck vibrations and truck air pollution were ranked 1st and 3rd in order of concern. Delaware Valley industrial air pollution ranked 4th, although local industrial pollution and industrial noise was again noted but were of lesser concern.

In another comparison with a city-wide sample of concerns, the Eastern North Philadelphia residents mentioned commerce and industry as but one of many problems in the area, others being more important, see Table 2-11.

Parks and Recreation Sites: While there are a number of civic associates in the area, two tend to act as "umbrella" organizations for their communities. They are the Fishtown Civic Association, located at 330 E. Girard Avenue, and the New Kensington Neighborhood Advisory Committee, located at 2514 Frankford Avenue.

TABLE 2-11

RANKING OF PRIMARY PROBLEM ISSUES

Primary Issues	Average Evaluation*
Truck Vibrations	3.8
Property Values	3.7
Truck Air Pollution	3.5
Delaware Valley Ind. Air Pollution	3.4
Truck Noise Source	3.3
Auto Air Pollution	3.3
Repair Streets	3.1
Street Noise	2.8
Auto Noise	2.7
Crime	2.6
Air Pollution - Local Industry	2.4
Abandoned Buildings	2.2
Deteriorating Housing	2.1
Outdoor	2.0
Noise-Pedestrian	1.9
Sleep	1.9
Indoor	1.8
Noise Source-Industry	1.8
Noise-Trolley	1.7
Noise-Neighbor	1.6
-Motorcycle	1.4
-Bus	1.4
-El	1.1

*Based on scale of 1 (no problem) to 7 (severe problem).

Overall opinion of neighborhood: 1-Excellent; 2-Good; 3-Fair; and 4-Poor; Average-2.6.

Source: Reference 39

These two organizations are in the forefront in matters and issues that they feel affect their community, such as the movement to have Penn Treaty Park listed on the National Register. These organizations also work closely with the Philadelphia Office of Housing and Community Development which has established these areas as "Neighborhood Strategy Areas." Under this program, funds are channeled into the area for new housing, previously through rehabilitation, as well as in street and other neighborhood improvements.

Noise Levels: The existing acoustical environment in the vicinity of the proposed site is dominated by typical industrial and highway noise. The environment may be characterized as urban industrial with the added presence of the Delaware Expressway (Interstate Route 95).(40) Residential areas are confined to the west of I-95, where normal average sound levels, A-weighted, are such that the area maybe described as noisy urban close to I-95.(41)

2.3.5 Other Socioeconomic Characteristics

A number of socioeconomic features of the study area have been noted in previous sections, especially in Table 2-10. Additional information is presented in the following discussions.

Industrial Background - Industrial Organization and Operations: The site, formerly used as a World War II shipyard, is located in the east-central waterfront area of Philadelphia. It is adjacent to the Port Richmond Coal Yard and the Conrail marshalling yard. The City of Philadelphia Industrial Development Commission recently cleared and filled the site to make it more suitable for industrial development, and sold it to a private trust.

Employment: Employment patterns in the city and selected census tracts are presented in Tables 2-12 and 2-13. The 1970 census

showed that about 40 percent of the employed residents were employed in manufacturing with four percent in construction. The citywide comparison was 25 percent in manufacturing and five percent in construction.

TABLE 2-12

MAJOR EMPLOYMENT CATEGORIES BY CENSUS TRACT, 1970

Census Tract	Total Employed	Construction	Manufacturing
143	1,214	75	537
157	2,964	76	1,201
159	995	43	346
160	3,447	125	1,320
161	2,871	172	1,171
City-wide	763,520	35,499	214,965

Source: Reference 36

The five 1970 census tracts studied showed a somewhat higher unemployment rate than the city-wide average, see Table 2-13. The city-wide average was 4.6 percent in 1970; the unemployment rate in the subject census tracts averaged from a low of 5.2 percent in census tract 159 to 8.0 percent in census tract 145.

TABLE 2-13

UNEMPLOYMENT BY CENSUS TRACT, 1970

Census Tract	Unemployment
143	8.0
158	6.0
159	5.2
160	7.7
161	6.2
City-wide	4.6

Source: References 36 and 37

Education and Income: The educational level of the residents in the area is slightly below that of the city average (1970 data) of 10.9 years of school completed (Table 2-14). Median family income in the above census tracts also reflected this relative position city-wide. The median incomes ranged from $7,992 to one tract units with a median income of $9,506. The city-wide median family income in 1970 was $9,366. The proportion of families rated as poor was more mixed. The percentages of families rated as being below the poverty level were from 7.4 percent to 18.6 percent of these respective census tract populations. The 1970 city-wide percentage of families below poverty was placed at 11.2 percent.

TABLE 2-14

MEDIAN YEARS OF SCHOOL COMPLETED, 1970

Census Tract	Years Completed
143	8.6
158	9.7
159	9.4
160	9.7
161	9.0
City-wide	10.9

Source: Reference 37

2.4 REFERENCES

1. U.S. Environmental Protection Agency, Office of Federal Activities, October 1975. Environmental Impact Assessment Guidelines for Selected New Source Industries, Washington, D.C.

2. U.S. Department of Energy, CFR, Vol. 45, No. 62, March 28, 1980. Compliance With the National Environmental Policy Act. Washington, D.C.

3. Philadelphia Gas Works, February 1981. Low/Medium Btu Coal Gasification Assessment of Central Plant for the City of Philadelphia, Pa.

4. Pennsylvania Dept. of Environmental Resources, Topographic and Geologic Survey, 1978. Physiographic Provinces of Pennsylvania, Map No. 13.

5. Greenman, D.W., D.R. Rima, W.N. Lockwood, and H. Meisler, 1961. Groundwater Resources of the Coastal Plain Area of Southeastern Pennsylvania. Pennsylvania Topographic and Geologic Survey Bulletin W-13.

6. U.S. Geological Survey, 1967. Engineering Geology of the Northeast Corridor, Washington, D.C. to Boston, Massachusetts: Bedrock Geology, U.S.G.S. Map I-514-A.

7. Bischke, R.E., 1980. The Abington-Cheltenham, Pennsylvania Earthquake Sequence of March-May 1980. Pennsylvania Geology Vol. 11/5, p. 10-13.

8. Algermissen, S. T., 1969. Seismic Risk Studies in the United States, ESSA. U.S. Government Printing Office, p. 20.

9. U.S. Geological Survey, 1967. Engineering Geology of the Northwest Corridor, Washington, D.C. to Boston, Massachusetts: Earthquake Epicenters, Geothermal Gradients and Excavations and Borings. U.S.G.S. Map I-514-C.

10. Jordan, R.R., T.E. Pickett, and K.D. Woodruff, 1972. Preliminary Report on Seismic Events in Northern Delaware. Delaware Geological Survey Open File Report, April 1972.

11. U.S. Department of Agriculture, Soil Conservation Service, 1975. Soil Survey of Bucks and Philadelphia Counties, Pennsylvania.

12. Miller, E.G. Observations of Tidal Flow in the Delaware River. Geological Survey Water-Supply Paper 1586-C. United States Government Printing Office, Washington, D.C., 1962.

13. National Oceanic and Atmospheric Administration, Environmental Data Service. "Climates of the States. Vol. I - Eastern States." Published by the Water Information Center, Inc. 1974.

14. National Oceanic and Atmospheric Administration, National Climatic Center. "Local Climatological Data - Annual Summary with Comparative Data - Philadelphia, Pa." 1979.

15. Headquarters, Quartermaster Research & Engineering Command, U.S. Army, Technical Report EP-83. "Hail Size and Distribution." Natick, Massachusetts. 1958.

16. Thom. H.C.S. "Tornado Probabilities." Monthly Weather Review. October - December 1963.

17. National Oceanic and Atmospheric Administration, National Climatic Center. STAR for Philadelphia IAP, Pennsylvania. 1960-64.

18. U.S. Environmental Protection Agency. "Meteorological Episodes of Short Dilution in Contiguous United States." EPA-650/4-74-002, February 1974.

19. Air Force Surveys in Geophysics No. 277, Air Force Cambridge Research Laboratories. "Estimated Glaze Ice and Wind Loads at the Earth's Surface for the Contiguous United States." October 1973.

20. Air Force Manual 88-29, U.S. Army Technical Manual 5-785, U.S. Navy Facilities P-89. "Engineering Weather Data." July 1978.

21. Title 40 CFR 81. Air Quality Control Regions, Criteria, and Control Techniques. Section 107 - Attainment Status Designations.

22. Title 40 CFR 50. National Primary and Secondary Ambient Air Quality Standards.

23. Tyrawski, 1979. Shallows of the Delaware River, Trenton, New Jersey to Reedy Point, Delaware. For Environmental Resources Branch Philadelphia District, Corps of Engineers. Contract No. DA CW61-79-M-0445, 519 pp.

24. U.S. EPA, 1976. Quality Criteria for Water. EPA-440/9-76-023. 501 pp.

25. Pennsylvania Department of Environmental Resources, 1979. Water Quality Standards. PA Bulletin 9 (36): 3051-3183.

26. American Public Health Association, American Water Works Association, and Water Pollution Control Federation, 1976. Standard Methods for the Examination of Water and Wastewater, Fourteenth Edition, 1193 pp.

27. Brezina, E.R., K.K. Sheaffer, and J.T. Ulanocki, 1976. Delaware River Basin Water Quality 1974. BWQM Pub. No. 44, 195 pp.

28. Brezina, E.R., K.K. Sheaffer, and J.T. Ulanocki, 1976. Delaware River Basin Water Quality 1974. BWQM Pub. No. 44, 195 pp.

29. Potter, W.A., and P.L. Harmon, 1973. An Ecological Study of the Delaware River in the Vicinity of Chester Generating Station. Monthly Report for April. Ichthyological Associates, Inc.

30. Friedersdorf, J.W. 1976. Population Estimates and Relative Abundance Work on Adult American Shad Stocks in the Delaware River 1969-1976. In Proceedings of a Workshop on American Shad. Dec. 14-16, Amherst, Mass.

31. U.S. Department of the Interior. 1980. Republication of Lists of Endangered and Threatened Species and Correction of Technical Errors in Final Rules. Federal Register, 45(99):33768-33781.

32. Lee, D.S., C.R. Gilbert, C.H. Hocutt, R.E. Jenkins, D.E. McAllister, and J.R. Stauffer, Jr. 1980. Atlas of North American Freshwater Fishes. North Carolina State Museum of Natural History. Publication No. 1980-12, North Carolina Biological Survey.

33. Pennsylvania Fish Commission. 1979. Pennsylvania's Endangered Fishes, Reptiles and Amphibians. Revised.

34. Pennsylvania Fish Commission. 1978. List of Pennsylvania Fishing Waters.

35. II-2-24 - Commonwealth of Pennsylvania Coastal Zone Management Program Final Environmental Impact Statement.

36. U.S. Census, 1970.

37. Philadelphia City Planning Commission, 1979. Housing and Socio-Economic Inventory.

38. Elyse Pivnick - Neighborhood Program Coordinator, Office of Housing and Community Development.

39. Eastern North Philadelphia Truck Study Prepared for the Philadelphia City Planning Commission, 1979.

40. U.S. Environmental Protection Agency, "Community Noise" NTID 300.3 December 31, 1971, Figure 14.

41. U.S. Environmental Protection Agency, "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety", Report No. 550/9-74-004. March 1974, Figure 1.

3.0 ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT

In this section environmental impacts are analyzed from two perspectives. The first associates environmental impacts with the particular elements of the project from which they originate. The second associates the impacts with the particular elements of the environment upon which they will impinge, converge, or interact.

Areas that were reviewed for the purpose of evaluating potential impacts of the project include the site, the primary study area, and other selected areas.

The general approach employed to assess potential impacts of the project was derived from U.S. EPA's Environmental Impact Assessment Guidelines for Selected New Source Industries.(1)

3.1 SUMMARY OF ANTICIPATED ENVIRONMENTAL IMPACTS

Limitations on emissions, which have been established by standards, directly impact the definitive design of the coal gasification facility.

In Table 3-1 the anticipated air, water and solid waste emissions have been listed along with the design features which will be used to limit these emissions to levels which comply with the applicable regulations.

Permits which must be procurred from various city, state, and federal departments and agencies shall be sought when the project demonstrates that it will comply with applicable rules and regulations, including environmental regulations. Major permits which must be obtained before the facility becomes operational are listed in Table 3-2. A schedule indicating the time frame in which permits will be obtained is shown on Figure 3-1.

TABLE 3-1

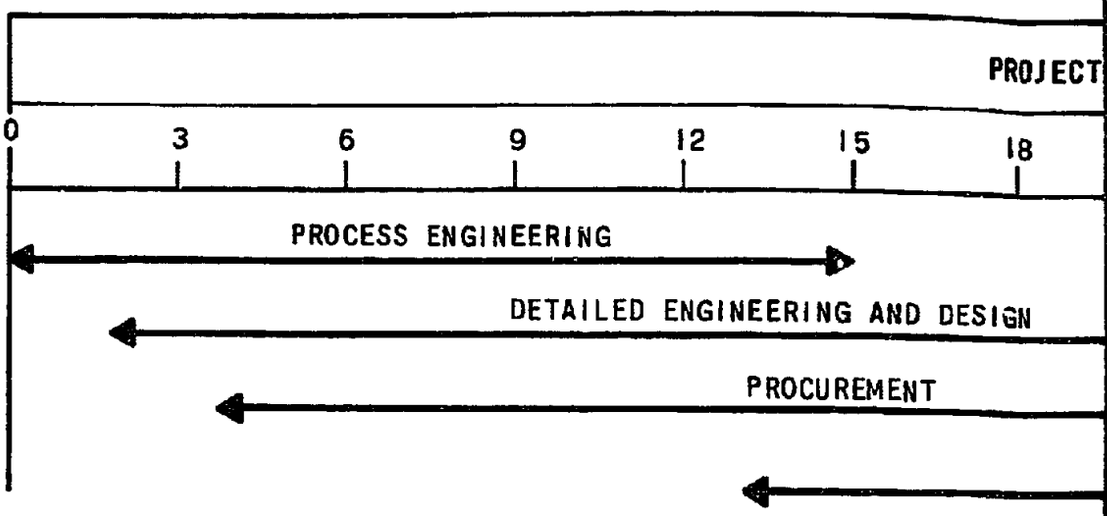
SITE SPECIFIC COMPLIANCE WITH WATER, AIR AND SOLID WASTE ENVIRONMENTAL REGULATIONS
FOR A COAL GASIFICATION FACILITY IN PHILADELPHIA

MEDIUM IMPACTED	APPLICABLE REGULATORY AGENCY	LIMITATION	METHOD OF COMPLIANCE
. EMISSIONS FROM COMBUSTION OF PRODUCT GASES			
Particulates	Philadelphia Air Management	Particulate emission limits set 0.10 pounds per million Btu gross heat input (2000 lbs/day based on 20×10^9 Btu/day med-Btu gas heat input)	Particulate emissions will not exceed allowable emissions. Scrubbers will clean gas of particulates prior to combustion so that expected particulate emissions (350 lbs/day) are projected to be less than 20% of maximum permitted.
SO_2	Philadelphia Air Management	SO_2 emission limit set at 500 ppm by volume (approximately 0.86 lbs/10^6 Btu heat input)	SO_2 emissions will not exceed allowable emissions. Stretford unit will reduce sulfur levels in product gas to approximately that in natural gas. 11,865 lbs/day of SO_2 are projected to be released due to burning med-Btu gas. This is 69% of the 17,200 lbs/day which is the maximum permitted.
NO_x	Philadelphia Air Management	NO_x emission limits set at 0.30 lbs/10^6 Btu heat input, maximum 2 hour average.	NO_x emissions will not exceed allowable emissions. NO_x emissions are projected to be 4600 lbs/day. This is only 77% of the 6000 lbs/day allowed.
WATER			
Discharges	Pennsylvania Dept. of Environmental Resources and Delaware River Basin Commission	Controls discharges to Delaware River through NPDES program. Sets limits on TSS, pH, Total Cl, ammonia, cyanide, sulphide, oil and grease, phenol, priority pollutants.	1. A lining shall be provided under the coal hauling and storage area to prevent leachate seepage to the groundwater. 2. "Dead storage" of the coal pile shall be compacted and sprayed with an organic polymer crusting agent to minimize both dusting problems and rain erosion.
	City of Philadelphia	Controls discharges to Philadelphia sanitary sewage system.	3. Coal pile runoff shall be directed to a lined collection pond designed to handle a once-in-ten-year, 24-hour design storm and subsequently treated prior to discharge to the river. 4. Large trash and debris from the river intake water bar screens shall be dewatered and disposed of as trash. Traveling screen and filter backwash and water pretreatment sludges shall be dewatered with gasification process water clarification slag/ash. 5. A separate batch equilization/neutralization facility shall be provided for demineralizer waste treatment. Treated effluent shall be to the river. 6. All blowdown required from the gasifier waste heat boiler, auxiliary boiler and gasifier jacket shall be suitably cooled and used for makeup in the process quench/cooling system. 7. All blowdown from the air separation plant cooling system shall be used for makeup in the process quench/cooling system. 8. After successful plant startup and operation, concentration in the process cooling loop may be increased by decreasing blowdown flow with the goal of obtaining minimum of zero blowdown without concentrating to a point where scaling problems result in heat exchange or process equipment. 9. Air separation plant air compressor aftercooler condensate shall be sent to the plant cooling system as makeup. 10. A Pollution Incident Prevention Plan (PIPP) shall be developed for the plant to contain local spills and prevent accidental discharges. Rainfall runoff from the plant site shall be drained to a separate holding pond for monitoring prior to discharge to the river. Uncontaminated rainwater may alternately be used as makeup to the process cooling system. 11. All sanitary wastes shall be directed to the City of Philadelphia sanitary system.
SOLID WASTE			
Slag from gasifier and ash from scrubber and ESP	Pennsylvania Dept. of Environmental Resources	All solid waste now considered as non-hazardous. Requires industrial generator of solid waste to assure that hauler of waste and disposal sites are adequately permitted.	PA DER excludes ash as a hazardous waste. Ash and slag will be picked up at the plant gate by a licensed hauler and transported to a DER approved landfill.

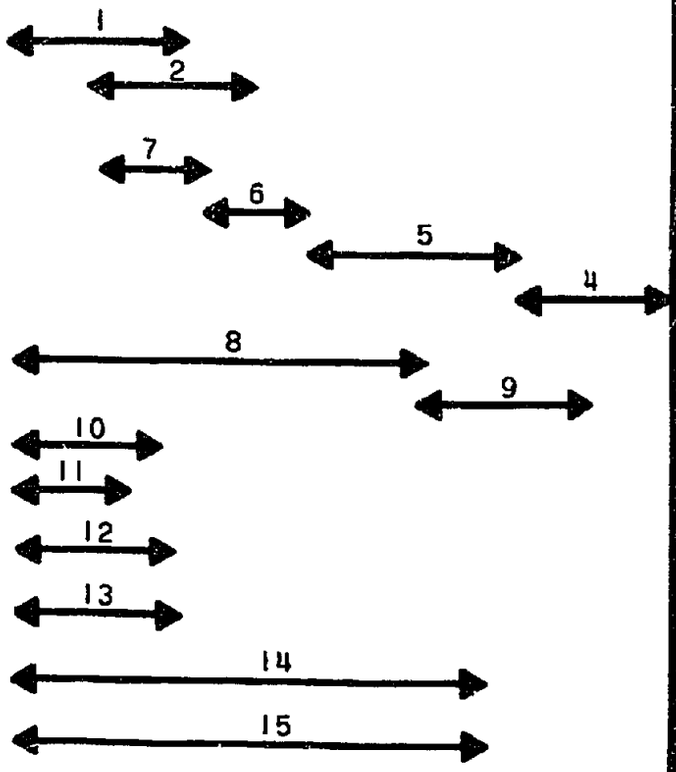
TABLE 3-2

PERMITS REQUIRED FOR PCW COAL GASIFICATION PLANT

No.	Permit	Permitting Time	Permit Needed During: Design	Construc.	Operation	Other Related Permits Which Must Proceed It	Agency/Contact
1	Construction Permit Phil. Dept. of Licenses and Inspection	3 wks.	X				Henry Herling/686-1776
	Air Pollution						
2	Installation Permit Phila. Dept. of Licenses and Inspections	8 wks.	X				Henry Herling/686-1776
3	Operating License Phila. Air Management Services	8 wks.			X		Tom Elliot/686-7894
	Water						
	- Encroachment						
4	PA DER	6-9 wks.	X			7	Dan Lengo/717-787-6826
5	U.S. Corps	11 wks.	X			7,6	John Olsen/215-597-4722
6	DRBC	4 wks.	X			4,5,7	Dave Everett/609-883-9500
7	Phil. Dept. of Commerce	4 wks.	X			Before 4,5,6	
	- Wastewater Discharge -- To Delaware River						
8	PA DER	17-26 wks.	X			Before 9	George Kohut/215-631-7411
9	DRBC	4 wks.	X			8	Dave Everett/609-883-9500
	-- To Municple System						
10	Phil. Industrial Sewage Permit	8 wks.	X				Thomas Kulesza/686-1776
	- Water Consumed -- From Delaware River						
11	DRBC Water Consumption Permit	4 wks.	X				Dave Everett/609-883-9500
12	-- From Phil. Water System Phil. Water Permit	8 wks.	X				George Bay/686-3891
	Solid Waste						
13	PA Solid Waste Module Permit PA DER	8 wks.	X				Wayne Lynn/631-2420
14	Environmental Assessment DOE	6 mos.	X				
15	Storage of Hazardous Chemicals Phila. Dept. of Licenses and Inspections	6 mos.			X		Henry Herling/686-1776



No.	Permit
1	Construction Permit Phil. Dept. of Licenses and Inspection
	Air Pollution
2	Installation Permit Phila. Dept. of Licenses and Inspections
3	Operating License Phila. Air Management Services
	Water
	- Encroachment
4	PA DER
5	U.S. Corps
6	DRBC
7	Phil. Dept. of Commerce
	- Wastewater Discharge -- To Delaware River
8	PA DER
9	DRBC
	-- To Municple System
10	Phil. Industrial Sewage Permit
	- Water Consumed -- From Delaware River
11	DRBC Water Consumption Permit
12	-- From Phil. Water System Phil. Water Permit
	Solid Waste
13	PA Solid Waste Module Permit PA DER
14	Environmental Assessment DOE
15	Storage of Hazardous Chemicals Phila. Dept. of Licenses and Inspections



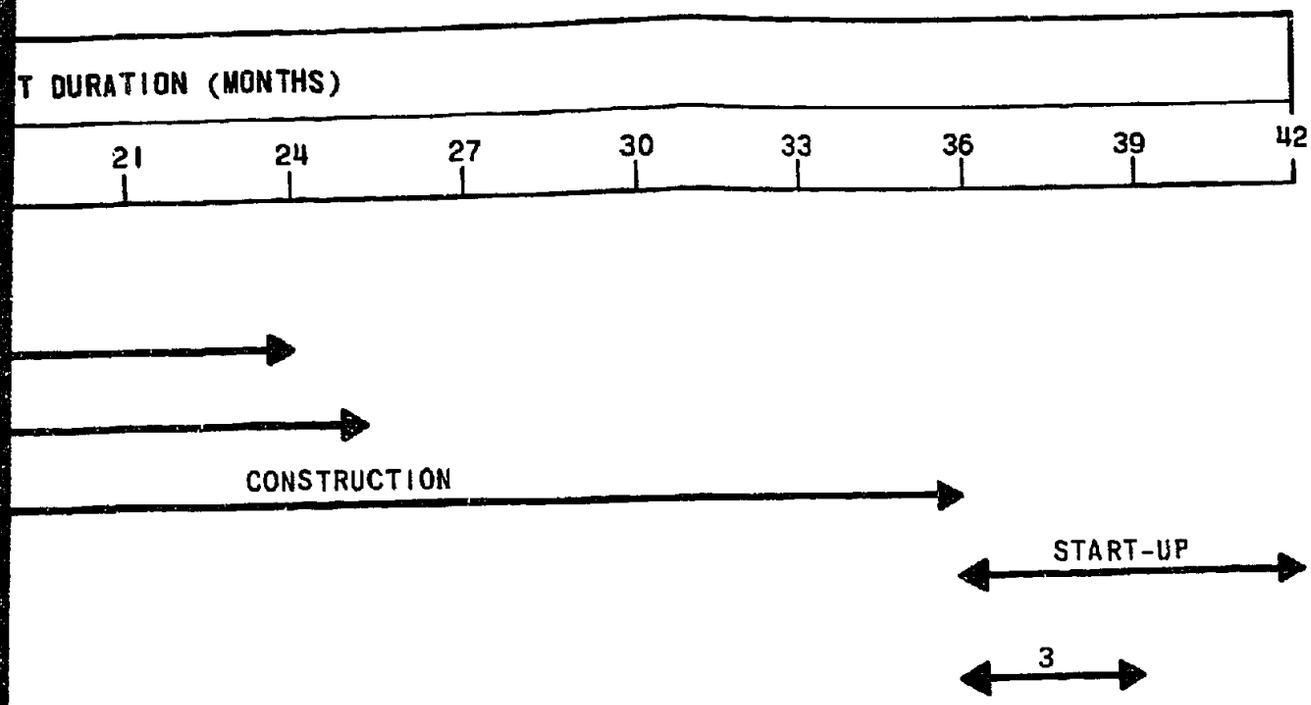


FIGURE 3-1
PERMIT AND LICENSING
SCHEDULE

Despite the mitigative measures which will be used in the project and the complying with environmental regulations it is no surprise that there still will be some environmental impacts, some positive and others negative.

Conclusions reached in the present investigation concerning major positive and adverse impacts which are expected to result from operation of the project are outlined in Table 3-3, along with corresponding mitigating measures.

Environmental Impacts Due to Construction

Major construction impacts and further explanation of operational impacts are addressed below and in the subsections which follow.

Because the site is located in an accessible, industrialized area within a large city, but is separated from residential areas by a heavily travelled interstate highway, positive impacts of construction are expected to be small but locally significant, and adverse impacts of construction are anticipated to be negligible. All construction impacts will be of relatively short duration.

The positive impacts will be the effect of 715 construction jobs on the Philadelphia economy and the construction workers' families for several calendar quarters. For the families involved, these jobs will be significant. For the city these jobs are a clear economic benefit, but a small one representing less than 1.5 percent of the city construction labor force.

Adverse impacts of construction will include the following:

a) Noise from excavation, pile driving, and public address systems. This will be insignificant because of the overriding influence of existing noise from Route I-95.

TABLE 3-3
SUMMARY OF OPERATIONAL IMPACTS

Project System	Environmental Impacts: Potential	Expected	Mitigating Measures	1	2	3	4	5	6*
I. Coal Receiving									
o Coal Trains	Noise	Minimal (1/40 total area train traffic)	Existing rail lines used	L	L	L	P	L	N
o Unloading hoppers, thawing shed, car dumper	Noise	Slight increase	Acoustically insulated enclosures	L	L	L	P	L	N
	Dust	Slight increase	Controlled with monitored dust filters and water spray	L	L	L	P	L	N
	Fire	Increased risk	Ambient monitors (no flame). Monitoring equipment	L	L	L	P	L	N
	Acid water	Minimal	Water pumped to treatment system	L	L	L	P	L	N
o Unloading conveyors	Noise	Slight increase	Acoustically insulated enclosures	L	L	L	P	L	N
	Dust	Slight increase	Controlled with monitored dust filters and water spray	L	L	L	P	L	N
	Acid water	Minimal	Water pumped to treatment system	L	L	L	P	L	N
o Coal storage									
Live pile (10,000 tons)	Noise	Slight increase	Acoustical enclosure on conveyor	L	L	L	P	L	N
	Dust	Slight increase	Partially underground. Dust filter on conveyor and hopper						
	Acid water	Minimal	Runoff pumped to treatment system	L	L	L	P	L	N
Dead pile (56,000 tons)	Dust	Slight increase	Pile compacted with water and crusting agent like/wind activated spray	L	L	L	P	L	N
	Acid water	Minimal	Pile diked and lined with clay base. Runoff pumped to treatment system.	L	L	L	P	L	N
	Fire	Minimal	Fire monitoring and control equipment	L	L	L	P	L	N
	Noise from bulldozer	Minimal	Standard muffler equipment	L	L	L	P	L	N
II. Coal Preparation									
o Pulverizer and storage bin	Dust	Slight increase	Monitored dust filter	L	L	L	P	L	N
	Noise	Slight increase	Acoustically insulated enclosure	L	L	L	P	L	N
	Fire/Explosion	Increased risk	Monitoring equipment. Explosion door with vessel, low oxygen atmosphere	L	L	L	P	L	N
o Pneumatic conveyor	Dust	Slight increase	Monitored dust filters	L	L	L	P	L	N
	Noise	Slight increase	Acoustically insulated enclosure	L	L	L	P	L	N
	Fire/Explosion	Increased risk	Monitoring equipment. N_2 blanket.	L	L	L	P	L	N
III. CRT Gasification System									
	Noise	Slight increase	Acoustically insulated enclosures	L	L	L	P	L	N
	Odors and gases	Slight odors in immediate areas of vents (vents at steam blowdown vessel, wash coolers, vacuum pumps for rotary filter, and slag water treatment system)	Odors restricted to immediate area of vents. Levels not toxic.	L	L	L	P	L	N
		Increased discharges of SO_2, NO_x, H_2S and particulates from flare during start-up and malfunctions	Flare stack system Flare 50 ft. above ground to prevent worker exposure to heat and gases.						
	Water Used	1,396,000 GPD withdrawn from Delaware River 1,051,200 GPD consumed 11,000 GPD taken from City water	Water Available. Water recycled when possible. River intake designed to minimize impingement	L	L	L	P	L	N
	Discharged	345,800 GPD returned to River after treatment 176,800 GPD from gasifier discharged to Philadelphia sanitary system	Erosion and sedimentation control plan used. Water recycled when possible. 25% of water taken from River returned. City has capacity to treat sanitary and gasifier wastewater at Southeast STP	L	L	L	P	L	N
	Chemical Spills	Slight risk	Site drainage to on-site treatment plant. Spill prevention plan employed.	L	L	L	P	L	N
	Fires/Explosion	Increased risk	Gas monitoring and alarm system. Nitrogen purge and instantaneous shutdown system. Fire prevention and control plan. Hydrants and river water available for fire control	L	L	L	P	L	N
	Health/Safety	Slight risk to workers	Protective clothing. Monitors	L	L	L	P	L	N

			[illegible] and river water available for fire control						
	Health/Safety	Slight risk to workers	Protective clothing. Monitors and alarms for toxic gases. Health/safety program	L	L	L	P	L	R
	Coal consumption	301,000 TPY bituminous coal	Sufficient supplies of PA coal available for delivery on existing rail lines	N	L	L	F	L	R
	Solid waste	450 TPD slag and flyash landfilled. Occupies 347 yd³ of landfill space	Flyash recycle minimizes volume. Other methods for flyash recycle sought. Enclave and landfills available	N	M	M	P	L	I
		Noise due to hauling trucks	13 trucks/day, 5 days per week Access to I 95 near plant	L	L	L	P	L	R
	Spray from cooling tower	Slight increase in local humidity	Spray localized. Consists of water and some chlorine and non-chromate corrosion inhibitor	L	L	L	P	S	R
IV. Sulfur Removal and Recovery System	Odors and gases	Odor of recovered sulfur Vent from oxidizer contains traces of H_2S	Sulfur stored underground as molten elemental sulfur Odor restricted to area of vent	L	L	L	P	S	R
	Chemical Spills	Increased risk to workers due to Stretford chemicals	PLPP developed Workers Protected from exposure	L	L	L	P	S	R
	Byproduct recovery	28 tpd molten elemental sulfur recovered	Elemental sulfur saleable at approx. $125.00 per ton	N	M	L	P	L	I
	Noise	Minimal	Acoustically insulated enclosure	L	L	L	P	S	R
	Purge liquors	Hazardous wastes	Zero discharge. Incinerated in Nitrox incinerator	L	L	L	P	S	R
V. Air Separation System	Noise	Minimal	Acoustically insulated housing	L	L	L	P	S	R
	Fires/Explosions	Increased risk	Isolation location of air separation plant away from gasifier. Molecular sieve to remove impurities from product oxygen. Maintenance of clean working conditions and monitoring.	L	L	L	P	S	R
	Air emissions	Minimal, vented gas contains components of air other than O_2	Most N_2 used in purge systems	L	L	L	P	S	R
VI. Gas Compression and Dehydration System	Noise	Minimal	Compressors - acoustically insulated	L	L	L	P	S	R
	Water	Minimal	Wastewater from condensate to Philadelphia Wastewater System	L	L	L	P	S	R
	Air	Minimal	Vented gas is water. Flash gas from glycol flash tank to Nitrox burner	L	L	L	P	S	R
VII. Wastewater Treatment System for Water not Originating from Gasifier	Water discharged to Delaware River	316,300 GPD discharged	Water treated to meet EPA, PA, Phil and DRBC standards. Wastes from floor sumps, filter backwash, demineralizer, coal and ash pile runoff streams to equalization/ neutralization holding tanks. Effluent treated by oxidation/ flocculation and settling prior to discharge to River. Cooling tower blowdown discharged directly to river	L	L	L	P	S	R
	Sludge	Small quantity of sludge produced in settling tanks	Thickened sludge is landfilled with ash/slag solid wastes	L	L	N	S	L	I
VIII. Gas Delivery and Utilization Systems	Explosion or CO poisoning as result of leak	Slight increase in safety risk in pipeline vicinity	Design pipeline to minimize risk. Will meet all construction and safety standards	L	O	O	S	L	R
	Air emissions from burning med-Btu gas	Major reduction in NO_x and particulate emissions	Positive impact	L	L	L	S	S	R
	Fuel source	Increases reliability of economical fuel supply will decrease risk of industrial relocation or temporary shutdown	Positive impact	L	L	L	S	L	R
IX. Employment	Creation of jobs	101 full time workers 713 construction workers	Positive impact	L	L	L	P	L	R

Key to Terms

1. Significance - measurable by some weighting factor or relative measure that describes the importance of an impact (for example, toxicity of a substance). 0 = none, L = low, M = medium, H = high.
2. Magnitude - measurable by some physical property indicating size or quantity of the impact (for example, parts per million discharged). O = none, L = low, M = medium, H = high.
3. Cumulative Effects - additive or synergistic effects of all project actions and environmental conditions considered together. O = none, L = low, M = medium, H = high.
4. Directness - P = primary impact - attributable directly to the station, S = secondary impact - attributable indirectly to the action.
5. Duration of Effects - L = long-term or persistant, S = short-term.
6. Reversibility - R = reversible, i.e., baseline conditions would be restored, I = irreversible, i.e., impact cannot be nullified.

b) Some increased local highway traffic from truck deliveries, 500 construction workers travelling to and from work, and congestion from construction of approximately five miles of pipeline. This should be insignificant because some workers can be expected to use public transportation. Those who drive to the site will be able to park on the site, and pipeline construction will not tie-up heavily travelled routes for extended periods of time.

c) Some increase in dust at the site and along the pipeline route. This will be controlled to acceptable levels by sprinkling, paving, and placement of crushed stone on heavily travelled areas.

d) Displacement or disturbance of habitat will be negligible. Vegetation at the site is characteristic of a disturbed area and has little intrinsic value. The pipeline will be constructed in roadways where there is no vegetation. Sedimentation, which could effect aquatic systems, will be controlled at all points of construction to avoid such impacts.

e) Construction is not expected to adversely affect groundwater quantity or quality in the vicinity of the site.

f) Construction wastes and refuse will be controlled by the contractor to prevent fires or other hazards, and trucked to licensed landfills for disposal.

g) Sanitary facilities will discharge to the city's sewerage treatment system.

h) No historical or archeological materials will be adversely affected by construction.

i) Visual intrusion will be insignificant during construction because of the visual barrier provided by Route I-95, existing tall structures in areas surrounding the site, and the localized nature of pipeline construction.

Environmental Impacts Due To Operation

The major positive impacts of operation of the project include (a) 105 jobs at the proposed facility, (b) a decreased risk that the four users will have to shut down during periods of natural gas shortage or that they will relocate, and (c) a decrease in NO_x and particulate emissions of the four users. The 105 jobs are less than 0.1 percent of city employment. The decreased risk of shutdown or relocation of the users is difficult to quantify but is potentially significant. The percent decreases in NO_x and particulate emissions resulting from burning of the product gas compared to burning of No. 6 fuel oil by industries are projected to be 57 percent and 82 percent, respectively.

It is expected that the project will have no major adverse operational impacts. Worker and public safety are important considerations because of the high carbon monoxide content of the product gas and the explosive potential of the gas and numerous parts of the gasification process. These concerns will be mitigated by extensive engineering safeguards and elaborate monitoring and control instrumentation and procedures.

Solid waste will be transferred to a licensed hauler at the plant gate and transported to a DER approved landfill for disposal. Because the landfill will be monitored and controlled no adverse impacts are anticipated to result from this method of disposal for the non-hazardous material.

The increased rail and vehicular traffic is not considered a major impact because it constitutes a small percentage of that which

exists in the area now and which is planned in conjunction with expanding the adjacent Port Richmond to serve as a major coal exporting terminal.

All major sources of noise will be enclosed and acoustically insulated.

Dust will be controlled through the use of sprays, filters, and enclosed processing equipment, and storage hoppers for ash and slag.

Temporary impacts caused by dumping and flushing of process materials in response to emergency shutdowns are a major consideration. These impacts will be mitigated by the inclusion of facilities to contain all such materials on site. Net impacts of the project on specific elements of the environment are presented in the following subsections.

3.2 EFFECTS ON THE PHYSICAL ENVIRONMENT

In this section net impacts of the project on specific elements of the physical environment are described and evaluated. Impacts which were presented in association with specific project systems and phases in Table 3-3 are rearranged and examined in association with the elements of the physical environment upon which they will ultimately impinge.

3.2.1 Geotechnical Impact

The construction and operation of the proposal plant will not interfere with the production of any natural resources in the area. There will be negligible impact on the water quality of the area's aquifers and on the production of the closest wells.

Because site soils are susceptible to significant settlements, most of the heavier structures will have to be founded on deep, high-capacity piles. Medium and lighter weight structures may be placed on shallower piles, spread footings, and mat foundations depending on actual conditions. Plant structures should be designed to withstand Zone 1 intensity seismic events.

3.2.2 Impacts On Hydrology

As with most site developments, the primary hydrological impact will be the result of a decrease in the percentage of surface area available to hold and absorb rainfall. In general, the effect of such development is to increase the amount of surface water runoff and erosion and decrease the amount of water percolating into ground water storage. The surface water is also more likely to carry pollutants which tend to accumulate on impervious surfaces between rainstorms.

The impact of the increased surface water runoff can be mitigated by the installation of detention ponds if the increase in flow will cause downstream flooding. The detention pond will also remove much of the sediment load from the runoff before it leaves the site.

The PGW site is so small in relation to the receiving waters of the Delaware River that none of the above effects are likely to have any measurable impact.

3.2.3 Impacts on Air Quality

Since 1965 the City of Philadelphia has made remarkable progress in improving air quality. In early 1973, the city-wide average of sulfur dioxide was reduced below the annual standard of 0.03 ppm. In late 1977 the four-quarter, moving, geometric average of total suspended particulate (TSP) dropped below the annual standard of 75 $\mu g/m^3$. This dynamic change is the result of the dramatic reduction

in city-wide emissions of these pollutants during the same period. In 1966 there were 262,000 tons per year of sulfur dioxide emitted into the atmosphere. Of this total, 44 percent was from power generation, 33 percent from space heating, and 21 percent from industrial processes. In 1979 the sulfur dioxide emissions had dropped to 46,000 tons per year. Power generation was responsible for 13 percent (6,000 tons); space heating, 19 percent (9,000 tons); industrial processes, 57 percent (6,000 tons); and other, 11 percent (9,000 tons). It should be noted that the percentage increase in industrial processes from 21 percent to 57 percent reflects a statistical change only because of the large decreases in emissions in the power generation and space heating categories. In tonnages the emissions from industrial processes was reduced from 56,000 tons in 1966 to 26,000 tons in 1979.(2)

The total emissions for TSP in 1966 amounted to 80,000 tons per year. The distribution among types of emitters includes: refuse incineration, 6,000 tons (8 percent); transportation, 16,000 tons (20 percent); power generation, 15,000 tons (19 percent); industrial processes, 21,000 tons (25 percent); and space heating, 22,000 tons (28 percent). (Transportation includes re-entrained street dust.) In 1979 the total emissions for particulates had been reduced to 24,000 tons per year with a distribution as follows: refuse incineration, 1,000 tons (4 percent); transportation, 16,000 tons (65 percent); power generation, <500 tons (<1 percent); industrial process, 4,000 tons (17 percent; and space heating, 3,000 tons (13 percent).(2)

The most significant impact from the proposed project to produce medium Btu gas from coal is the plan to sell it to several major industrial process plants in this section of Philadelphia. This arrangement will result in appreciable decreases in total suspended particulate and nitrogen dioxide emissions in the area from those companies that have indicated an interest in converting from their present fuels to gas.

Table 3-4 compares the sulfur dioxide, suspended particulates, and nitrogen dioxide emissions which are estimated to result from burning 20 billion Btu per day of medium-Btu coal gas and No. 6 fuel oil (0.5 percent S). Also included in the table are actual emissions of sulfur dioxide and particulates from the four industries as provided by Air Management Services Data.

As shown in the table, conversion to medium-Btu gas will result in a decrease in both nitrogen dioxide and particulate emissions. Nitrogen dioxide emissions will decrease from 10,667 lbs per day to 4,600 lbs per day and particulate emissions will decrease from 3,067 lbs per day to 360 lbs per day.

The projected 1,395 lbs per day increase in SO_2 emissions which would result from burning medium-Btu gas is not considered to be significantly different than from that resulting from the burning of 0.5 percent fuel oil. Philadelphia Air Management Services' regulations sets the limit for SO_2 emissions from the burning of this quantity of gas at 17,200 lbs per day. The estimated sulfur dioxide emissions are only 69 percent of this limit. Since none of the proposed industrial users of the gas are in non-attainment areas for sulfur dioxide, this increase should be acceptable.

The process gas can be flared to the atmosphere during start-up and shut-down procedures. In the event of a failure of the flare an alarm will be sounded and the procedure discontinued until corrective action can be taken.

Vented emissions to the atmosphere from various process units are not projected to constitute adverse environmental impacts. These emissions will be, to a large extent, the normal products of combustion. Vented gases other than H_2O and air are projected to be in the part-per-million, or part-per-billion, levels which will be organoleptically detectable except in the immediate area of the vents. Below are listed the vents which have been identified from

the process flow diagrams and emissions which could be found in the vented gases.

Vent		Possible Emissions
1.	Settling pond from slag water treatment system	H_2O + trace of hydrocarbon and organic sulfur compounds
2.	Dehydration unit for product gas	H_2O
3.	Pulverizer dust filter	Coal dust passing through filter (smaller than 0.04 microns)
4.	Steam blowdown vessel	H_2O + traces of proprietary water treatment chemicals
5.	Cooling tower	H_2O + traces of proprietary water treatment chemicals
6.	Dust filter from service bunker No. 1 containing coal dust	Coal dust passing through filter (smaller than 0.04 microns)
7.	Purge gases from oxygen plant	Components of air other than O_2
8.	GKT gas wash coolers	Traces of raw cool gas including H_2S, CO, hydrocarbons, and other gases shown in Table 3-5
9.	Vacuum pumps from moisture trap from rotary filter for ash	H_2O + traces of hydrocarbon and organic sulfur compounds
10.	Oxidizer at Stretford Plant	H_2O, air, traces of H_2S
11.	Flare	H_2O + traces of NO_x and SO_2, CO_2, hydrocarbons

TABLE 3-4

ESTIMATED EMISSIONS RESULTING FROM INDUSTRIAL BURNING OF 20 BILLION BTU PER DAY MEDIUM-BTU GAS COMPARED WITH BURNING NO. 6 FUEL OIL

Combustion Product	Medium-Btu Gas	No. 6 Fuel Oil (0.5%)
SO_2	11,863 lbs/day[2]	10,467[3](10,176)[4] lbs/day
NO_x	4,600 lbs/day[1]	10,667[3] lbs/day
Particulates	360 lbs/day[1]	3,057[3](1,715)[4] lbs/day

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1. Derived from Table 1-6 of Environmental Protection Agency, Compilation of Air Pollutant Emission Factors (AP-42) Office of Air Programs, April 1973.

2. Based on a 0.10 volume percent COS composition in product gas after the Stretford Unit.

3. Derived from Table 1-5 of AP-42 (See footnote 1, above).

4. Actual emissions from four industries (Rohm and Haas, Allied Chemical, Neuman Paper, and National Sugar) based on Philadelphia Air Management Services Data.

Fugitive emissions from the coal piles can cause a potential impact on the air quality of the immediate environment. However, control measures will keep the impact to a minimum. For instance the dead coal pile will be coated and sprayed, particularly at times of high winds, in order to control dust emissions from affecting the immediate area.

Dust from coal and ash handling is controlled and monitored to prevent fugitive dust from leaving the plant environs. The coal unloading structure is enclosed and water sprays there and in the hoppers and vibratory conveyors suppress dust. Fabric filters in the crusher house and 72 hour bunkers control dust emissions larger than 0.04 microns in size. At all discharge ducts from filter fans, air capacity is monitored to detect breakage in filters. An alarm would be sounded in the event of a filter breakage, the fans would be stopped, and the broken filter replaced. All conveyors are shrouded. Dust collected on filters is recycled for burning in the gasifier.

Ash and slag which is stored in covered bins has the consistency of mud. Any potential for fugitive dust emissions during ash and slag transfer is eliminated through the use of enclosed storage bins and a spray system used when ash and slag is transferred to trucks or trains via telescoping chutes from the storage bins. Trucks or rail cars will be covered during hauling of the material to the final disposal site.

Pure molten sulfur cake is produced in the sulfur removal process. Molten sulfur will be stored in underground tanks until it is vacuum piped to trucks. There will be no emissions of elemental sulfur to the atmosphere from the storage and piping system. Trace metals in the raw product gas are removed with the ash and slag.

In the cooling tower, water from numerous closed heat exchangers in various components of the gasification systems, including the

gasifier and slag quench tank, is cooled and circulated. No pollutants from the gasification systems enter this cooling water. Atmospheric emissions from the cooling tower will consist of water vapor. The computer program, ORFAD, was used to estimate the fogging, drift and icing which would result from the cooling tower in the vicinity of the plant. The computer analysis showed that the operation of these cooling towers at full load on an annual basis would cause no additional fogging in the vicinity of the plant on Route I-95 nor would any icing conditions occur as a result of this source. Basically these cooling towers make a minimal contribution to the water vapor already in the atmosphere. The plumes from these towers will dissipate before they progress very far from their origin.

Odor emissions will cause negligible impact. In accordance with Pennsylvania Department of Environmental Resources regulations, no odors will be detectable beyond the plant boundaries.

3.3 EFFECTS ON THE BIOTIC ENVIRONMENT

In this section, net impacts of the project on specific elements of the biotic environment are described and evaluated. Impacts which were presented in association with specific project systems and phases in Table 3-3 are rearranged and examined in association with the elements of the biotic environment which they will effect.

3.3.1 Impacts on Terrestrial Ecology

Terrestrial ecological impacts of the project are not expected to be significant. The existing terrestrial communities that will be displaced from the site and terrestrial communities near the site do not appear to include or support any species of special interest or economic value. Project atmospheric emissions from the gasification facility are not expected to cause any adverse impacts on biota at the site or in areas remote from the site. Existing patterns of

atmospheric emissions by the users are expected to improve as a result of the project. (See Section 3.2.3).

3.3.2 Impacts on Aquatic Ecology

Project construction effects on the Delaware River biota are expected to be minor, temporary, and confined to a localized area. Construction activities will tend to temporarily increase soil erosion on-site and turbidity of the river at the site. This can be minimized by using proper construction techniques, and by planting vegetation in open areas where the soil is bare after construction has been completed.

The river bank and a very localized portion of the stream bottom will be affected if make-up water intake and discharge structures will be built. Soil erosion along the stream bank is expected to be very minor because the bank is composed primarily of large blocks of concrete and other solid rubble (concrete, brick, etc.) used for fill. If the river bottom must be dredged to install the intake shoreline turbidity would be temporarily increased.

Effects of operation on aquatic biota would be associated with make-up and process water intake from the river and treated wastewater and make-up water discharges.

Impacts of withdrawing make-up water are not expected to be significant, even if the water is withdrawn from the river. Some of this water will be bought from the City of Philadelphia. Water taken directly from the river will be screened and filtered to remove debris and particles. One potential effect of the intake is impingement of fish on the intake screen. The extent of fish impingement can be minimized by designing the intake to have few or no areas where fish can become trapped (such as intake channels) and to have an intake velocity of no more than 0.5 fps.[4]

Species of fish that might be expected to be impinged in the intake are those found on other industrial screens in the site vicinity (see Section 2.2.2).

Organisms likely to be entrained in the make-up water, and therefore subject to filtration and possibly other treatment methods, are small fish and plankton, including ichthyoplankton (fish eggs and larvae). Effects of the intake on riverine populations of fish and plankton are likely to be very small, since the intake volume is only about 0.01 percent of the river's average discharge over ten years,[5] and the site is not located in an ecologically sensitive region of the river.

Direct discharge of untreated wastewater to the river will not occur. Treated discharges will be released according to requirements of the NPDES permit which will be obtained before operation begins. A summary of the treated wastes is diagramed in Section 1.0, that will be discharged to the river, is as follows. Runoff from the coal storage piles will be directed to a settling basin. It will undergo neutralization, precipitation, flocculation, and clarification before being discharged. Runoff from the plant process area will be collected in a separate system, held for monitoring to ensure that it contains no substances that should not be discharged, and either released to the river or recycled in the quench/cooling system. A Pollution Incident Prevention Plan (PIPP) will be developed that will provide for spill containment and prevention of accidental discharges.

The process quench/scrubbing and cooling system has the potential for zero discharge of blowdown. Initially, it will be treated for discharge to the river. Zero discharge may be achieved after some operational experience.

Blowdown from the boiler and gasifier jacket and from the air separation plant cooling tower will be used as make-up to the

process quench/scrubbing and cooling system. Consequently, there are not expected to be any thermal effects of the project.

With the molten sulfur process, a blowdown of 116 gallons per hour will occur that contains sodium thiosulfate, sodium cyanide, sodium bicarbonate, ADA, and other compounds. To eliminate discharge of these compounds the blowdown will be reductively incinerated on-site.

Sanitary wastes will be discharged to the city's sewage system.

In addition to the treated solids storage pile runoff, the only other wastewater to be discharged to the river will be the raw water treatment wastes. Backwash and regeneration wastes from the demineralizers will be neutralized to a pH of 6 to 9 and discharged to the river. This waste will have a relatively high dissolved solids content.

Treated discharges will be within both state and federal discharge limits. The amounts discharged will be 25 percent of the volume of water withdrawn from the river, and will represent a correspondingly smaller percentage of the river's flow. Thermal discharge will not be a consideration. The effect of the project's discharge on aquatic biota is expected to be minimal and very localized.

3.4 EFFECTS ON HUMAN ENVIRONMENT

In this section, net impacts of the project on specific elements of the human environment are described and evaluated. Impacts of specific project systems and phases presented in Table 3-3 re examined in association with the elements of the human environment which they will effect.

3.4.1 Safety and Health Factors

Although hazardous conditions will be controlled or eliminated insofar as practical, the potential for any significant effects of the project must be considered. The following sections describe the designed and programmed precautionary preventative measures that were considered and will be implemented to minimize any potential deleterious effects.

Site Safety: The site is in an essentially abandoned industrial area on the river with neither any adjacent residences or fire hazard operations.

There are four existing fire hydrants near the site on Beach Street. Two fire stations are within five blocks of the site. Each station is manned with well trained city firemen and each is equippped with a pumper (1,000 gal./min.) and hook and ladder trucks. There are also two fire boats. Water is pumped from the city hydrants and by the fire boats from the river.

Response time from the fire stations is only two minutes.

Toxicity, Fire and Explosion: Table 3-5 gives pertinent toxicity, flammability, and explosive data for the gas leaving the battery limits.

As indicated in the table, carbon monoxide and hydrogen are the major constituents of the product gas. Carbon monoxide and hydrogen are both highly flammable gases. Hydrogen will ignite when only four percent by volume is present in air and can result in explosions at higher volumes of gas in air. However, only 50 parts per million (ppm), five-thousandths of one percent, of carbon monoxide in air is the permissible average exposure for an eight hour day, and exposure to over 1,000 ppm (one-tenth of one percent) may be fatal in less than an hour. Higher concentrations can be

TABLE 3-5

PRODUCT GAS FLAMMABILITY AND TOXICITY DATA
GKT GASIFICATION PLANT

	Gas At Outlet GKT Battery Limits (Mole%)	Gas At Plant Battery Limits (Mole%)	Vapor Density[1]	Explosive Limits[2] Percent By Volume	Flash point/ Ignition Temperature[3] °F	Maximum Allowable Concentration In Parts Per Million <10 Minutes	Maximum Allowable Concentration In Parts Per Million <8 Hours
CO	58.61	61.03	1.00	12.5-74.2	1,128	1,000	50
H_2	27.29	24.45	0.10	4.0-75.0	1,060		
CO_2	6.36	7.22	1.53			-	5,000
N_2	0.92	2.45	0.97				
COS	0.09	0.09	1.20	4.0-45.0		200	10
Ar	0.57	0.59	0.60				
CH_4	0.01	0.01	0.60	5.0-15.0	999	-	10,000
H_2O	5.3	0.11	1.00				
HCN	75 PPMV	26 PPMV	0.90	5.6-41.0	1,000		10
H_2S	0.85	0				200	20

1. Vapor density is the weight of a volume of pure vapor or gas compared to the weight of an equal volume of dry air at the same temperature and pressure, calculated as the ratio of the molecular weight of the gas to the average molecular weight of air. A vapor density figure less than 1 indicates the vapor is lighter than air and will tend to rise in a relatively calm atmosphere. A figure greater than 1 indicates that the vapor is heavier than air and may travel at low levels for a considerable distance to a source of ignition and flash back (if the vapor is flammable).

2. The flammable limit figures given in the table are based upon normal atmospheric temperatures and pressures, unless otherwise indicated. The general effect of an increase of temperature or pressure is to lower the lower limit and raise the upper limit. Decrease of temperature or pressure has the opposite effect.

3. Ignition Temperature of a substance, whether solid, liquid, or gaseous, is the minimum temperature required to intitiate or cause self-sustained combusion independently of the heating or heated element. Ignition temperatures observed under one set of conditions may be changed substantially by a change of conditions. For this reason, ignition temperatures should be looked upon only as approximations.

fatal after a few minutes. Hydrogen sulfide is even more dangerous than CO with a safe exposure limit of 200 ppm for ten minutes.

Community Environment: The prevention of any possibility of inadvertently transmitting carbon monoxide into any residence or any building is a matter of primary concern.

The transmission line must be completely sealed-off from any distribution lines and trenches leading to residences and buildings. The piping must be approved for use with hydrogen containing one percent hydrogen sulfide. The distribution system is designed to be isolated from the natural gas system and constructed of welded steel, protected pipe. This will provide assurance that every practical means will be utilized to prevent loss of hydrogen, hydrogen sulfide, carbon monoxide, and other gases into the community environment.

The transmission line will be adequately marked with warnings against any excavations without prior approval from PGW. If the line is too close to residences, schools, or any occupied buildings, consideration will be given to any potential hazard and the advisability of relocating the line and protecting it against damage.

Producer Health and Safety: As noted earlier, H_2S, COS (carbonyl sulfide), and CO are highly toxic constituents of the product gas. CO and H_2 are the major constituents with flammable/explosive ranges of about four to 75 percent by volume in air. PGW will require an adequate health, safety, and fire prevention program to control hazards and prevent any harmful exposures to employees.

The coal gasification processing requires sophisticated health and safety programs that include appropriate monitoring instruments for CO, H_2, H_2S, COS (carbonyl sulfide), HCN, polynuclear aromatic hydrocarbons (PNA's), organic compounds (phenols, etc.), and coal

dust. Personnel monitors with alarms will be required for CO and H_2S as well as area monitors for CO, H_2, etc. Specific safety and health training/education, protective clothing, and written work permits will be required, especially for maintenance workers.

User Health and Safety: Users shall have personnel and area monitoring instruments with alarms to detect CO, H_2, H_2S before the gas is introduced into the user's plant site. The health and safety education data and the findings from the producer's monitoring shall be utilized to develop adequate health, safety, and fire prevention requirements for the users.

Hazard Control System - General Fire Protection: The fire prevention and protection provisions to be incorporated into the design and operation will be founded on basic concepts. These include:

a. The use of noncombustible construction forms and materials wherever possible and the elimination, control, and isolation of hazardous operations, processes, equipment, and materials.

b. Provision of smoke, fire, toxic gases, and over-temperature detection instrumentation, alarms, and a central control room data, alarm, and communications center.

c. Training of personnel in the safe operation of facilities and safe procedures to follow in handling any emergency.

d. Establishment of an adequately manned and properly trained fire brigade, emergency procedures manual, and fire and emergency drills.

e. A management-coordinated emergency procedure to coordinate station procedures with local fire departments.

All provisions concerning fire protection will be designed in accordance with the requirements of the National Fire Protection Association (NFPA), the Occupational Safety and Health Administration (OSHA), and the State of Pennsylvania safety regulations.

Hazard Control System - Coal Fire and Explosion Prevention: The danger of coal pile fires will be eliminated by compacting, temperature monitoring, sealing, and water sprays.

Shrouded coal conveyor fires will be minimized by utilizing positive lubrication grease fittings located at the walkway side of conveyors to ensure ready access for adequate lubrication, and by providing combustion detectors and automatic sprinklers.

Primary explosions in equipment will be minimized and controlled by carefully following the guidelines on design and coordination in selecting, inspecting, and dry-run startup testing of safety controls described in NFPA 60, Pulverized Fuel Systems; in NFPA 85E, Pulverized Coal-Fired Multiple Burner Boiler Furnaces; and in NFPA 69, Explosion Prevention Systems. Secondary coal dust explosions will be avoided by prevention of primary explosions, housekeeping utilizing a central vacuum cleaning system, and an automatic sprinkler system.

Hazard Control System - Oxygen Fire and Explosion Prevention: The air separation unit will produce pure gaseous oxygen. Liquid oxygen (LOX) is present in the cold box during operation. The precautions include absolute prevention of the introduction of any acetylenes or hydrocarbons into the air intake of the air separation unit and the prevention of the use of any hydrocarbons, oils, grease, or reactive materials either in the fabrication, operation, or maintenance of the unit. A clean workroom, clean benches, and clean toolroom will be maintained.

Provision will be made for an adequate inlet filtering system to prevent the intrusion of coal dust and hydrocarbons.

Monitoring to detect acetylenes and hydrocarbons in the air inlets will be provided.

Hazard Control System - Coal Gasification Unit: In an emergency the gasifiers can be shutdown almost instantaneously. "The K-T gasifier has an uninterrupted history of safe operation, no serious or damaging explosion has occured. This is due essentially to the safety controls which have been progressively developed and perfected with plant operation and experience. In addition to a safety shutdown from loss of coal in the feed system, gasifiers automatically shut down should an excessive increase or decrease occur in the oxygen pressure at the gasifier, or in the event that free oxygen is detected in the process gas after the washer coolers. In a shutdown, oxygen is automatically and constantly replaced with nitrogen, and the system completely purged. A solenoid valve which opens to drain the water seal at the washer outlet allows rapid venting of all explosive gases directly to the flare."(6)

Hazard Control System - Construction: The general contractor shall be responsible for the fire prevention, housekeeping, first aid, and accident prevention program for all subcontractors and shall provide a qualified construction safety engineer to assist and advise him in this area of responsibility.

3.4.2 Demographic Impacts

By producing some jobs and reducing the risk of four companies being relocated, the project may be expected to have a positive effect on population trends in the City of Philadelphia, but because of the small size of the project in relation to the city this effect will be imperceptably small.

The fact that the site is vacant would facilitate its development because it lacks any cultural amenities, such as historic sites, schools, and parks, that might be expected to be encountered in clearing land for industrial usage in such a highly urbanized setting. Nor would there be any disruption or relocation of persons or existing land use activities.

While recent trends in the city have been towards declining employment levels in heavy industry, some eight companies have constructed new industrial facilities within this corridor between 1967 and 1973, the largest being the Rohm and Haas plant.

3.4.3 Land Use Impacts

Impacts of Facility on Land Use

The proposed project will not change the existing land use pattern or land value of the site or surrounding areas.

Land values in the area have been increasing in recent years according to the Office of Housing and Community Development. Between 1967 and 1973 12 major warehouse, storage, and industrial structures were constructed along the waterfront further establishing the industrial character and value of the area. Based on the data reported in the feasibility study for this project, the asking price for industrial waterfront property, of a size suitable for a coal gasification plant, ranges from $75,000 to $77,000 per acre.

Existing values and floodplain design considerations essentially limit site usage to industrial, commercial, or high density housing, although the environmental setting for housing is marginal.

The proposed coal gasification site is to be developed in an industrial area. The uses immediately adjacent, are to be either

industrial in nature or, if vacant, industrially zoned. Route I-95 or the Delaware Expressway further separates the site from the predominantly residential area to the west.

Impacts of Solid Waste Disposal on Land Use

The scenario which has been developed for solid waste disposal is one in which a licensed hauler picks up slag and ash at the plant gate and transports it to a DER approval landfill.

The landfilling of 250 tpd (347 yd^3/d) of combined ash and slag will require a landfill or landfills of sufficient capacity to accommodate this volume of solid waste. As a result of the only RECRA leaching experiments which have been performed on slag and ash from a GKT gasifier, Oak Ridge National Laboratory has determined this material is not hazardous under current RCRA regulations (U.S. DOE. Final Environmental Impact Statement - Solvent Refined Coal - 1 Demonstration Project Newman Daviess, County Kentucky, July 1981 - DOE/EIS-0073). The environmental impact of this disposal option rests largely in consuming landfill space that otherwise be available for other municipal or industrial solid wastes.

Other potential methods for disposing of the slag and ash which would have a more positive environmental impact than strict landfill disposal will continue to be sought to determine if there is a more economical or more efficient method to dispose of the solid waste. One option which is currently being explored with the potential coal suppliers is to haul the slag and ash back to the mines from which the coal came. Other potential uses of the solid waste include the following:

Material	Potential Use
Flyash and Slag	Road and construction fill
Flyash	Binding agent for chemicals

Material	Potential Use
Slag	Aggregate for road building material or cinder blocks
Slag	Manufacturing Abrasives
Slag	Anti-skid material for roads

3.4.4 Impacts On Transportation

The proposed project is not expected to disrupt any transportation systems, except in the immediate vicinity of the pipeline, and, therefore, only a few days at any particular location during construction.

Coal will come in by railroad cars on an existing track system to the Port Richmond area. Only a short spur will be required. A portion of Port Richmond has recently been leased by Cibro, a New York petroleum company, for use as a major coal-loading terminal which will eventually be able to load 15 million tons of coal per year. One hundred twenty acres of the site will be used to stockpile more than a million tons of coal at any one time. The rail traffic required to supply this quantity of coal is 40 times as great as that which will be required for the gasification facility. The project will therefore have an insignificant impact because of increased rail traffic.

The gas product will be transported by a new pipeline along Richmond Avenue. Once installed, the Richmond pipeline will be just as inconspicuous as other gas lines that now criss-cross Philadelphia streets. It will carry CO and H_2 but it will meet the latest construction and safety standards for these gases from the onset.

Ash and slag shall be truck hauled off from the site to a DER approved landfill. Thirteen 23-ton truck loads per day, five days per week will be required to remove the solid waste produced.

Trucks will travel on Interstate Route 95 near the site and will have direct access to the site via other existing secondary roads.

3.4.5 Local Community Impacts

The most significant impact that will likely occur because of development of the coal gasification plant will probably be the construction phase. This is the period when the greatest number of employees will be assembled, pipelaying work will be undertaken, and truck traffic will increase bringing construction materials to the site.

In terms of construction activities, trucks should be routed so as to mitigate their impact on the neighborhood either by making greater use of the Delaware Expressway or in routing traffic that cannot use the expressway. There should be ample space on the site for material storage and off-street employee car parking.

Pipeline construction, with the possible exception of Delaware Avenue, is to take place on less heavily traveled streets. In any case, it will probably not be necessary to close an entire street for pipeline construction.

Some 500 construction workers will be needed plus those for pipeline construction. This can have a positive effect on the community by providing another employment source for those in the construction trades who are local residents.

3.4.6 Employment and Economic Impacts

"The Philadelphia Econometric Model and its associated ten-year forecast to the year 1990 were used by the Philadelphia Model staff at Wharton Econometric Forecasting Associates, Inc. to evaluate the impact on the Philadelphia economy of the construction and operation of the coal gasification plant which the Philadelphia Gas Works

currently proposes to build. Three direct economic effects of the proposed plant were input to the Philadelphia Model so that the model could calculate the total impacts, including the so-called "ripple," or secondary, effects:

1. Direct impacts from plant construction

2. Direct impacts from operation of the plant after construction

3. Direct impacts from continued economic activity of firms which decide not to relocate from the city because of the lower prices and greater availability of gas made possible by the coal gas plant

"The direct impacts of plant construction and plant operation were developed from data supplied by Philadelphia Gas Works (PGW) personnel on construction schedules, construction expenditures, the distribution of construction expenditures inside and outside the city and SMSA, expected gas plant employment, and relevant plant operating expenditures exclusive of employment. Since the Philadelphia Model currently possesses no mechanism to evaluate the general impact of gas availability and gas prices on relocation decisions, these primary impacts were developed from data supplied by PGW. This data indicated that a total of 1,500 jobs in the food, paper, and chemicals industries would be lost due to relocation if the plant is not built.

"The total impacts (primary plus ripple effects) for the City of Philadelphia and the eight-county region Philadelphia Standard Metropolitan Statistical Area (SMSA) are presented in Table 3-6. These results indicate that plant construction will boost total city employment by a high of 715 jobs in 1984, but that this will drop to about 300 in 1985 and 200 in 1986 after the plant is completed. The primary impacts are limited to the increase of 105 jobs due to plant operation. However, the major economic effects begin to occur in

1987, as the result of the retention of the 1,500 manufacturing jobs (in the base comparison case, these jobs were all assumed to disappear early in 1987). Thus, after accounting for ripple effects, city employment is higher by 2,262 in 1987 and by 2,695 in 1990 if the gas plant is built. By 1990, gross city product is up by $110.85 million annually,* personal income is up by $47 million, and the city wage and earnings tax is up by $2.3 million. The effects are proportionately somewhat larger for the total SMSA, though the increase in 1990 Philadelphia employment of 2,695 is nearly twice the 1,407 employment increase in the suburbs. This is the result of the fact that a large percentage of Philadelphia employment is supplied by commuters; therefore, a large proportion of the wages paid in the city (approximately 30 percent after accounting for commutation in both directions) is spent in the surrounding communities, where these wages stimulate local economic activity. The stimulus provided by income is especially strong in the nonmanufacturing industries such as retail trade and services. These facts combine to produce an employment multiplier for the city of about 1.7 (on the direct employment impact of 1,595 from 1987 to 1989), while the SMSA multiplier is about 2.6 because it captures the impacts of the personal income increase that "leaks" out of the city. The total economic impacts for the city and region (SMSA) are summarized year by year below."[8]

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*All dollar figures are quoted in constant 1981 $.

TABLE 3-6(8)

SUMMARY OF GAS PLANT TOTAL ECONOMIC IMPACTS
(Income, taxes, and product in million 1981 $)

	PHILADELPHIA CITY				PHILADELPHIA SMSA		
	Total Emplmnt	Personal Income	Gross Product	Wage Taxes	Total Emplmnt	Personal Income	Gross Product
1982	210	3.5	7.2	0.2	314	6.6	11.5
1983	614	10.2	22.3	0.5	950	19.9	37.4
1984	715	11.9	28.6	0.3	1180	24.7	50.4
1985	315	5.3	17.3	0.2	585	12.4	30.1
1986	202	3.8	9.9	1.8	344	7.9	15.6
1987	2262	36.5	85.7	2.1	3052	66.3	128.2
1988	2517	41.9	98.3	2.2	3661	80.7	156.8
1989	2641	45.0	106.2	2.2	3956	88.8	173.2
1990	2695	47.1	110.9	2.3	4102	93.9	182.7

EMPLOYMENT MULTIPLIERS*

Philadelphia City	1.7
Philadelphia SMSA	2.6

*Multipliers computed as ratio of total employment change to primary employment change in 1990.

After plant completion, it is expected that some 105 employees will be required for plant operation and maintenance. It is PGW's policy to hire qualified persons from within the city, and to hire from outside only in extreme cases. It is probable that a significant number of plant employees will be hired from the local community. In view of the total number of hirings, the impact on employment would be small.

3.4.7 Impacts on Wage Rates

Because of the moderate number of persons to be employed in the coal gasification operation, relative to the Philadelphia labor pool, it is expected that the project will not have a significant effect on the prevailing wages in the Philadelphia area.

3.4.8 Institutional Effects (Growth and Tax Base)

The major purpose of the coal gasification program is to provide back up "synthetic" gas for industry which is an "interruptable" user in a natural gas shortage or crisis. That is, industrial users of natural gas have a lower priority than residential users should a critical shortage occur.

Industry in such a case must either close down or find an alternate source. Unreliability of energy supply can lead industry to relocate out of the city. If this were to happen, a loss of jobs as well as of taxes could result.

Assurance of a dependable supply of energy which the coal gasification plant would provide should contribute to the maintenance of taxpaying industry and of employment in the city.

Again, because of the location of the proposed coal gasification plant in an existing non-residential environment and separate from the adjacent community, little or no effect should be felt in the community dynamics.

The Fishtown and Kensington Communities have long existed side by side with industry and commerce and, as the "truck" study has indicated, have lived with the effects of that relationship in traffic, on street parking, noise, and vibration.

The proposed coal gasification plant would have an insignificant impact on that pattern. Whatever changes are likely to occur in property values, school enrollments, and employment are likely to take place because of internal reasons or outside programs such as the city's neighborhood strategies effort, and not because of the coal gasification operation nearby.

The effect of the project on the tax base cannot be assessed in detail at this time because project financing and ownership scenarios are still under review. However, because of the small size of the project in relation to the City of Philadelphia, it is expected that this effect would be small.

3.4.9 Noise Impacts

Based upon the calculated noise levels from Interstate Route 95,[7] verified by on-site surveys, and the highway, industrial, and residential background noise, estimated from on-site surveys, the normal continuous noise from the proposed facility will not be audible in any adjacent residential area. Conrail's increasingly active rail yard is next to the project site. Noises there should exceed those which will be generated at the gasification facility.

The greatest potential for noise is from the coal unloading and crushing activities. To minimize noise during coal unloading and crushing, the buildings where this activity occurs will be enclosed and acoustical insulation will be used to dampen excessive noise outside of the buildings.

The possibility of ash disposal by truck would require additional truck traffic on residential streets for access to and from Interstate Route 95.

The expected venture, which would require approximately thirteen truck trips per day, however, is not expected to be high enough to affect the mean ambient noise level significantly, or to constitute an increase in ambient noise category.

The noise from construction activity at the site is much the same as for normal operation, in the sense that continuous noise is inaudible at residences and the impact noises (pile driving in this case) will be only barely noticeable and probably not high enough to constitute an annoyance.

A short-time noise impact will result from the installation of the distribution pipeline through a short section of residential housing. Such construction noises should be indistinguishable from currently common water or sewer work on city streets.

3.5 REFERENCES

1. U. S. Environmental Protection Agency, Office of Federal Activities, October 1975. Environmental Impact Assessment Guidelines for Selected New Source Industries, Washington, D. C.

2. Air Management Services, Philadelphia Department of Public Health. "The APC Monitor." November 1980.

3. Personal Communication. Air Management Services, Philadelphia Department of Public Health. February 1981.

4. U. S. Environmental Protection Agency, 1976. Development Document for Best Technology Available for the Location, Design, Construction and Capacity of Cooling Water Intake Structures for Minimizing Adverse Environmental Impact. EPA 440/1-76/015a.

5. U. S. Geological Survey, 1979. Water Resources for Pennsylvania. Vol. 1, Delaware River Basin. Water-Data Report PA-79-1. 297 pp.

6. Farnsworth, J.; H. Leonard; D. Mitsak; and R. Wintrell. "K-T Koppers Commercially Proven Coal and Multiple-Fuel Gasifiers." Pesented to the Association of Iron and Steel Engineers' 1974 Annual Convention, Philadelphia, Pennsylvania. April 22-24, 1974.

7. National Cooperative High Research Program Report No. 117, "Highway Noise, A Design Guide for Highway Engineers".

8. Bryant, G.; A. Doud; and R. Mroz. "The Impact on the Philadelphia Economy of the Proposed Philadelphia Gas Works Coal Gasification Plant." Proposed by Wharton Econometric Forecasting Associates, Inc. for the Philadelphia Gas Works. September 22, 1981.

4.0 ALTERNATIVES TO THE PROPOSED ACTION AND THEIR IMPACTS

Major alternatives which have been considered as the project progressed have concerned the product fuel, the site for the project, the sulfur removal system, and the gasification process. A fifth alternative that of taking no action was also considered. Each is discussed below with an explanation of which alternatives were selected and the rationale including the environmental consideration for the alternative selected.

Alternative Sites

The number of candidate sites for the project was limited because of the scarcity of sufficiently sized parcels near potential users of the gas within the City of Philadelphia. Of the more than 16 sites which were initially examined, three were identified as being most suitable for the project. A site owned by the Philadelphia Gas Works was rejected because of the potential adverse publicity which might result from locating a coal gasification plant next to PGW's liquified natural gas storage tanks. Conrail's site at Port Richmond was opposed by the U.S. Army Corps of Engineers because of the adverse effects that intra-pier filling would have on the ecological conditions in the Delaware River in the vicinity of the piers. The Corps predicted that there would be considerable delays in receiving environmental permits for the site, particularly in light of the fact that the project would not be dependent on barge delivery of coal. The Riverside site which was selected for the project is a cleared site adjacent to the Delaware River which has been prepared for industrial development by the Philadelphia Industrial Development Commission and which has access to the rail lines and utilities required for the project. Preliminary approval to use the site for the project has been received by the Philadelphia Port Corporation, PIDC, U.S. Army Corps of Engineers, Philadelphia Air Management Service, and the Pennsylvania Department of Environmental Resources.

4.1 FUEL ALTERNATIVES

Alternative energy production systems which were considered during the feasibility study included converting existing industrial boilers to coal, constructing new coal fixed boilers, and producing either low- or medium-Btu gas from a centrally located facility and piping the gas to industrial users. The study was performed to explore fuels other than natural gas and fuel oil.

A number of published sources as well as sources in industry confirm that conversion of existing boilers to coal is impractical unless the boiler had been designed to burn coal originally. Reconversion of boilers originally designed to burn coal is the least expensive alternative. However, if the boilers had originally been designed for both coal and oil, conversion back to coal would now create extreme derating problems as well as additional problems associated with ash slagging, ash collection, and boiler erosion. Furthermore, Philadelphia Air Management Services would require a petition from the industry showing that such a conversion would include sulfur and particulate emission controls acceptable to the department.

The alternative of constructing new coal fired boilers in the City of Philadelphia has been all but eliminated by City Air Management regulations which, after October 1972, prohibit the burning of coal with a sulfur content exceeding 0.3 percent by weight. Such a low sulfur coal is unavailable in sufficient quantities to satisfy industrial boilers.

Two alternative coal gas fuels were considered: low-Btu gas (approximately 150 Btu per cubic feet) and medium-Btu gas (approximately 300 Btu per cubic foot). Low Btu gas, because of its higher nitrogen content, cannot be economically piped over significant distances and therefore must be produced on or nearby the industrial site. Environmental problems associated with a

single plant would be multiplied if the scenarios included several smaller plants producing gas for individual industries. Low-Btu gas also creates a lower flame temperature which substantially derates existing gas or oil fired boilers unless preheating of the air and fuel is used. Although the cost of low-Btu gas is less than medium-Btu gas, low-Btu gas generation was determined to be impractical for a central plant serving several industries.

Medium-Btu gas was selected as the coal-derived fuel of choice because it can be transported to designated industrial users from a central plant in Philadelphia at a price which is projected to be lower than the price of No. 6 fuel oil in 1985. Minimal retrofit expense is required by industrial users of the gas and environmental considerations are restricted to a single facility.

4.2 ALTERNATIVE GASIFIER

Gasifiers considered were restricted to those capable of producing 20×10^9 Btu per day of medium-Btu gas (HHV = 300 Btu per cubic foot) and which are commercially proven and are guaranteed by the process supplier. The three gasifiers fitting the designated criteria were Koppers Totzek entrained bed, oxygen blown; Lurgi stirred bed, oxygen blown; and Winkler fluidized bed, oxygen blown. The Winkler gasifier was rejected because of its higher operating cost compared to the KT and Lurgi gasifiers. The Lurgi gasifier, which is comparable to the KT gasifier in regard to operating costs, generates tars, phenols, and ammonia, creating environmental problems not caused by the KT gasifier. These substances in the filter cake could be designated hazardous. Effective removal of these by-products adds to the complexity and operating inconvenience of the overall process. The KT gasifier was selected because its unique ability to gasify many coals and because of the fact that it does not necessitate disposal of tars, phenols, and ammonia and, is, therefore, an environmentally cleaner plant.

4.3 SULFUR REMOVAL ALTERNATIVES

A Stretford desulfurization unit was selected to remove sulfur from the product gas. It was selected because of its low capital cost for small capacity plants. The unit could produce sulfur in two alternative forms: as a filter cake of contaminated sulfur, or as molten elemental sulfur. The first alternative of producing a filter cake was rejected for two reasons, one economic, the other environmental. The filter cake consists of sulfur and other process chemicals including sodium thiosulfate, sodium thiocyanate, sodium metavanadate, ADA, and sodium carbonate-bicarbonate. The filter cake option has the advantage of low capital costs but high operating costs because of loss of chemicals and high tonnage disposal of sulfur cake (containing about 50 percent moisture). There would be no by-product recovery with the filter cake option. Environmental problems could result because the filter cake would probably be designated as a hazardous material and would require the expense of disposing it in a licensed hazardous waste disposal area.

The molten sulfur alternative was selected because it produces saleable molten sulfur which can be sold for at least $125.00 per ton in the Philadelphia area where there is a demand for this product. Although the capital cost for this option is greater, the overall operating cost is the least if sulfur credit is allowed. The molten sulfur option results in no solid waste and recovered purge solutions from the process are incinerated so that there are no waste effluents.

4.4 NO ACTION ALTERNATIVE

The alternative of taking no action was rejected at the start of the feasibility study, as the purpose was to explore the use of coal gas as a substitute for fuel oil and natural gas. No action will be taken in the unlikely event that there are sufficient quantities of

fuel oil and/or natural gas available at an economically advantageous cost to satisfy the industrial fuel needs of Philadelphia or if the Environmental Regulations of Philadelphia are changed to permit direct burning of coal by new facilities.

5.0 AGENCIES OR COMPANIES CONTACTED AND LETTERS OF ENDORSEMENT

Table 5-1 lists the agencies and companies which were contacted in order to establish the environmental constraints which will be placed on the coal gasification facility.

These constraints have been identified during the planning phase of the project so that the facility will be designed and constructed to comply with all required environmental permits.

Appendix A includes the letters of endorsement for the project received from the Delaware River Basin Commission, the Pennsylvania Department of Environmental Resources, Philadelphia Air Management Services, and private companies offering to dispose of the solid waste and to purchase the recovered sulfur.

TABLE 5-1

AGENCIES OR COMPANIES CONTACTED CONCERNING ENVIRONMENTAL ASPECTS OF PROJECT

AGENCY OR COMPANY	ADDRESS	PERSON	SUBJECT
City of Philadelphia			
Water Department	1180 Municipal Services Building Philadelphia, PA 19107 (215) HO6-3870	Thomas J. Kuleaza Chief, Industrial Waste Unit	Ability of city sewage system system to receive waste water from gasification facility.
Air Management Services	801 Arch Street - 6th Floor Philadelphia, PA 19107	William Reilly Assistant Health Commissioner for Air Management Services	Air permits required for gasification facility.
Philadelphia Port Corporation	940 Public Ledger Building Philadelphia, PA 19106 (215) 925-9301	Joh Malone Executive Director	Availability of site.
Philadelphia Industrial Development Corporation	Suite 1800 One East Penn Square Philadelphia, PA 19107 (215) LO8-8370	Vincent J. Nero Director - Project Development	Availability of site.
Philadelphia Department of Licenses and Inspection	720 Municipal Services Building Philadelphia, PA 19107 (215) 686-2404	Henry Herling	Construction permit required for project.
Philadelphia Planning Commission	144 City Hall Annex Juniper and Filbert Streets Philadelphia, PA 19107 (215) 686-4628	Ed Duffy	Availability of site.
State of Pennsylvania			
Pennsylvania Department of Environmental Resources	1875 New Hope Street Norristown, PA 19401	Leon T. Gonshor Director, Norristown Office of DER	Permitting requirements for project.

TABLE 5-1 (Cont'd)

AGENCY OR COMPANY	ADDRESS	PERSON	SUBJECT
U.S. Government			
Delaware River Basin Commission	P.O. Box 7360 West Trenton, NJ 08628 (609) 883-9500	Gerald H. Hansler, Executive Director	Withdrawing and discharging water from and into the Delaware River.
United States Army Corps of Engineers	Custom House 2nd and Chestnut Sts. Philadelphia, PA 19106 (215) 597-4722	Roy E. Denmark, Jr. Chief Permits Branch	Water encroachment permits required from Corps. for project.
Federal Energy Management Agency	6th and Walnut Streets Philadelphia, PA 19107 (215) 597-9581	Etta Sims Insurance and Mitigation Office	Location of site in relation to flood plain.
United States Environmental Protection Agency	2nd and Walnut Streets Philadelphia, PA 19107 (215) 597-8991	Dave Arnold	EPA's role in permitting.
Conrail	150 Allendale Road King of Prussia, PA 19406 (215) 596-3991	D.J. Butler, Assistant Manager, Real Estate	Availability of track for coal transportation.
Danella Bros., Inc.	2280 Butler Pike Plymouth Meeting, PA 19462 (215) 825-9000	Renato P. Mariani	Disposal of ash and slag.
Lanchester Corporation	Honey Brook, PA 19344 (717) 354-4351	Dwight D. Worley Vice President, Environmental Management	Disposal of ash and slag.
Arco Chemical Company	1500 Market Street P.O. Box 7258 Philadelphia, PA 19101 (215) 557-2273	Robert J. Herman	Purchase of elemental sulfur.
Essex Chemical Corporation	1401 Broad Street Clifton, NJ 07015 (201) 773-6300	William G. Devine Director of Materials	Purchase of elemental sulfur.

APPENDIX A

LETTERS OF ENDORSEMENT

Source	Subject
Delaware River Basin Commission Gerald M. Hansler (Executive Director)	Water Use
City of Philadelphia Air Management Services William Reilly	City Air Permits
City of Philadelphia Water Department Thomas J. Kulesza (Chief Industrial Waste Unit)	Sewage Treatment
Pennsylvania Department of Environmental Resources Leon T. Gonshor (Regional Director)	State Environmental Permits
Department of Army Corps of Engineers Roy E. Denmark, Jr. (Chief, Permit Branch)	Delaware River Encroachment Permits
Arco Chemical Company R. J. Herman	Sulfur market
Essex Chemical Corporation William G. Devine (Director of Materials)	Sulfur market
Darella Bros., Inc. Renato P. Mariane	Slag and Ash Disposal
Lanchester Corporation Dwight D. Worley	Slag and Ash Disposal

DELAWARE RIVER BASIN COMMISSION
P. O. BOX 7360
WEST TRENTON, NEW JERSEY 08628
(609) 883-9500

GERALD M. HANSLER
EXECUTIVE DIRECTOR

HEADQUARTERS LOCATION
25 STATE POLICE DRIVE
WEST TRENTON, N. J.

June 19, 1981

Dr. Richard P. Stringer
Gilbert Associates, Inc.
Post Office Box 1498
Reading, Pennsylvania 19603

Dear Dr. Stringer:

SUBJECT: Water Use at Proposed Coal Gasification Plant, Philadelphia, Pennsylvania

This is in response to your letter of June 10, requesting confirmation that you have discussed the water-related aspects of the project with staff of the Delaware River Basin Commission and that there is currently sufficient water available in the Delaware River at Philadelphia to supply an estimated 1.6 mgd for the subject facility.

We acknowledge that you have discussed the project with Dave Everett, of our project review section and, as Mr. Everett explained, formal application and approval by the Commission would be required prior to the start of construction for this project. However, at this time, if the application were before the Commission and all required state permits had been obtained, staff would recommend approval of the use of Delaware River water for this project. The return discharge of waters treated to meet all applicable regulations could be included in the recommended approval.

All water used would be subject to water use charges in accordance with the enclosed Resolution No. 74-6. Water used and returned in satisfactory condition has a very minimal charge while water withdrawn and not returned is at a higher rate.

We trust this letter serves your immediate need and look forward to working with you as your project plans move ahead.

Sincerely,

G. M. Hansler

Gerald M. Hansler

Enc.

cc: Commissioner R. Timothy Weston
Commissioner William J. Marrazzo

CITY OF PHILADELPHIA

DEPARTMENT OF PUBLIC HEALTH
Stuart H. Shapiro, M.D.
Health Commissioner

AIR MANAGEMENT SERVICES
801 Arch Street — 6th Floor
Philadelphia, Pa. 19107

WILLIAM REILLY
Assistant
Health Commissioner
for Air Management Services

March 4, 1981

Mr. Charles Cannon
Manager, Planning & Analysis
Philadelphia Gas Works
1800 North 9th Street
Philadelphia, PA 19122

Dear Mr. Cannon:

With regard to Philadelphia Gas Works' plan for a coal gasification project, Air Management Services would consider this more acceptable than coal utilization at individual plants. From the limited information presently available, the Koppers-Totzek process appears to be, from an environmental standpoint, the most acceptable coal gasification process, if the expectations presented by PGW and its consultants are realized and the unit is properly operated and maintained.

Air Management Services is concerned, as are other air pollution control agencies throughout the country, about the environmental impacts that could accompany a return to coal as a major energy source. However, we also recognize that there have been improvements in the method of coal energy utilization, and that there is a national need to become less dependent on natural gas and oil.

In view of this, over the past several years, Air Management Services has considered, after full public review, the limited use of coal in environmentally sound projects, especially where the facilities are constructed and operated by companies with adequate technical and financial capabilities. This allows AMS to observe the actual operation of selective processes under real life conditions without jeopardizing the environment in a significant manner, even if the project proves unacceptable. This approach provides for demonstration projects which is essential since most coal utilization systems have not been tried and tested in urban areas under current environmental rules and regulations.

Sincerely,

William Reilly

WR:glm

Cc: H. Cl...
R. Stringer
F. Hiett
J. Escott
CPF-154

CITY OF PHILADELPHIA

WATER DEPARTMENT
1120 MUNICIPAL SERVICES BUILDING
PHILADELPHIA, PENNSYLVANIA 19107

WILLIAM J. MARRAZZO
WATER COMMISSIONER

July 20, 1981

Mr. Jonathan J. Escott
Gibert/Commonwealth, Inc.
P. O. Box 1498
Reading, PA 19603

Re: PGW - Riverside Coal Gasification Plant

Gentlemen:

Pursuant to your July 2, 1981 requesting information and approval concerning the proposed Coal Gasification plant to be located on Beach Street between Dyott and Cumberland Streets, the following is provided:

1) There exists sufficient capacity to hydraulically handle the proposed discharges into the City sewer system for sanitary and industrial wastes. All non-contaminated storm water should be discharged to the Delaware River.

2) The waste characteristics of this plant are acceptable for treatment at our Southeast Water Pollution Control Plant. However, the Department reserves the right to require detailed analytical information of all waste streams discharges into the City sewer system during start ups and actual plant operations for determination of compliance with the Department's "Wastewater Control Regulations".

3) There exists sufficient water supply to meet your demands.

Should you have further questions, please do not hesitate to contact the writer.

Very truly yours,

Thomas J. Kulesza

THOMAS J. KULESZA
CHIEF, INDUSTRIAL WASTE UNIT
PHILADELPHIA WATER DEPARTMENT
1140 MSB 686-3869

TK:FH:pd
cc: file

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
1875 New Hope Street
Norristown, PA 19401
215 631-2402

July 13, 1981

Mr. William J. Gallagher
Planning Engineer
Philadelphia Gas Works
1800 North Ninth Street
Philadelphia, PA 19122

Dear Mr. Gallagher:

This is in reference to our meeting of July 7, 1981 concerning Department requirements that would be applicable to a proposed coal gasification project along the Delaware River in the City of Philadelphia.

At our meeting we reviewed in some detail the encroachment, erosion and sedimentation control, water quality and solid waste permits or approvals that would have to be obtained. We also discussed potential involvement by other agencies such as the Delaware River Basin Commission, Corps of Engineers and Philadelphia Air Management Services.

We will be pleased to work with you in processing the necessary Department applications. From the preliminary information you presented it would appear that any issues related to the proposed project could be resolved in order to obtain the necessary approvals. The final decision, however, will be based upon our review of your applications.

We strongly recommend that you work closely with the City and the community in the development of this project.

If you have any questions, please let me know.

Very truly yours,

LEON T. GONSHOR
Regional Director

CC: Mr. Boardman
Mr. Beechwood
Mr. Lynn
Mr. Bender
Re JP528

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO

NAPOP-R

29 JAN 1981

Mr. Richard P. Stringer
Gilbert/Commonwealth
P. O. Box 1498
Reading, PA 19603

Dear Mr. Stringer:

This is in regard to your letter of 26 November 1980 on behalf of the Philadelphia Gas Works and meeting on 11 December 1980 with Mr. Frank J. Cianfrani and Mr. John M. Olson of this office concerning Department of the Army jurisdiction over a proposed coal gasification plant along the Delaware River in the City of Philadelphia, Pennsylvania. Two potential sites for the proposed plant are the Port Richmond Conrail Yard (Piers A-D) at Allegheny Avenue and the Riverside site at Richmond Street (see inclosed location map).

Current Federal regulations state that a Department of the Army permit is required for work or structures in navigable waters of the United States and/or the discharge of dredged or fill material into waters of the United States including adjacent wetlands. Construction of the plant at the Port Richmond site would require the filling of existing aquatic areas and would, therefore, require a Department of the Army permit. The Riverside site is existing upland fronting the Delaware River. Corps jurisdiction at this site would be limited to work below the high tide line.

Please inform this office of the site selected for construction of the coal gasification plant and submit plans of the proposed project, when available, in order that we can determine the exact jurisdiction of this office. Inclosed for your information is an application package for a Department of the Army permit.

If you should have any questions regarding this matter, please contact Mr. John M. Olson (215-597-4722).

Sincerely,

Roy E. Denmark, Jr.

ROY E. DENMARK, JR.
Chief, Permits Branch

2 Incls
As stated

ARCO Chemical Company
1500 Market Street
Post Office Box 7258
Philadelphia, Pennsylvania 19101
Telephone 215 557 2273

Robert J. Herman
Sales Manager
Industrial Chemicals
ARCO Intermediates

June 19, 1981

Mr. Richard P. Stinger
Gilbert/Commonwealth Engineers and Consultants
Gilbert Associates, Inc.
P. O. Box 1498
Reading, Pennsylvania 19603

Dear Mr. Stinger:

We have reviewed your letter of June 16, 1981.

ARCO Chemical Company would like to confirm its' interest in purchasing the estimated 22 long tons per day of molten sulfur meeting 99.9% purity as produced at the coal gasification plant planned by the Philadelphia Gas Works. We understand plant operation is expected in 1984.

We will appreciate your keeping us advised of your progress on this project. As you may know, we currently are marketing the molten sulfur produced at our Philadelphia refinery. Thank you for contacting ARCO Chemical Company in this regard.

Cordially yours,

R. J. Herman

R. J. HERMAN

/sdc

ESSEX CHEMICAL CORPORATION

1401 BROAD STREET · CLIFTON, N. J. 07015

EXECUTIVE OFFICES

PHONE 201·773·6300
NEW YORK: 212·962·3042
CABLE ADDRESS: ESSEXCHEM, CLIFTON, N. J.

June 8, 1981

Gilbert/Commonwealth
Gilbert Associates, Inc.
P.O. Box 1498
Reading, Pa. 19603

Att: Mr. Subhash S. Patel

Dear Mr. Patel:

Essex Chemical would be interested in purchasing the approximately 25-30 tons per day of recovered Sulfur, exit the Philadelphia Gas Works plant in Philadelphia, Pa. starting in 1984-85. We understand that this Sulfur would be generated from a coal gasification plant and that final approval for construction is still pending.

As discussed on the telephone, it is difficult to predict price and market conditions for 1984-85. However, if we were to make an offer in today's market it would be on the Tampa, Florida posting for Frasch Sulfur less a discount of 10%, FOB Philadelphia, Pa. loaded into our tank trucks.

We certainly would like to discuss this business opportunity in more detail once the decision is reached to proceed with construction.

Very truly yours,

ESSEX CHEMICAL CORPORATION

William G. Devine

William G. Devine
Director of Materials

WGD/hl

Danella BROS INC.

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July 8, 1981

Richard P. Stringer, ScD
Gilbert Associates, Inc.
P.O. Box 1498
Reading, PA 19603

Dear Mr. Stringer:

In regards to your letter of June 24th, our price is $3.90 per ton. This rate includes transportation to six D.E.R. approved sites and the rehandling by a frontend loader or dozer at the Landfill. In Montgomery County only, Landfill out of Montgomery County, the price is $4.50 per ton. The Landfill in New Jersey is also $4.50 per ton. All sites are D.E.R. approved.

Montgomery County, 1981 - $3.90
1982 - $4.40
1983 - $4.90
1984 - ?

Also, add the 6% fuel surcharge to the above prices.

Sincerely,

Renato P. Mariani
DANELLA BROTHERS, INC.

RPM:dg

Lanchester Corporation
Honey Brook, Pa. 19344 • [redacted] • 717-354-4351

April 17, 1981

Dr. Richard Stringer
Gilbert Associates, Inc.
P. O. Box 1498
Reading, Pa. 19603

RE: Philadelphia Gas Works
Coal Gasification Plant

Dear Dr. Stringer:

This is to confirm our conversation at my office on April 2, 1981.

It would appear, based on the analytical information you provided to me, that we could obtain approval from the state agency to dispose of waste from the proposed Philadelphia Gas Works Coal Gasification Plant. Obviously before a final determination could be made we would have to know the actual source of the coal and generate some data from that source.

With regard to the landfill, the landfill has 20 million cubic yards of capacity, of which we have depleted about 10% to date. We believe that we can double our filling rate and still have adequate capacity for the next 20 to 25 years. Your proposed 250 tons per day would only increase our filling rate by 25% so there is no problem with providing adequate capacity.

With regard to the cost of disposal I would estimate that the 1981 rate would be around $15.00 per ton and the 1985 rate would be approximately $25.00 per ton. Obviously the economic and regulatory climate between now and 1985 will cause this 1985 quote to be quite speculative.

I hope this information will be helpful to you in performing any cost analyses.

If you have any questions do not hesitate to contact me.

Sincerely yours,

Dwight D. Worley
Vice President
Environmental Management

DDW/wm