

CHAPTER VI

SOCIOECONOMIC IMPACT

The construction and operation of an electric generating station may have significant economic, demographic, and social effects upon the community where it is located. These effects may be viewed as beneficial to the community or seen as costly and disruptive. Among the many possible beneficial or positive effects of power plant construction and operation are:

- increased local employment
- a larger tax base
- added personal income
- increased economic diversity

Commonly considered negative impacts of power plant construction and operation include:

- housing shortages
- inadequate public facilities and services, e.g., schools and police protection
- higher labor costs and prices
- changes in cultural composition
- transportation inadequacies and congestion
- increases in municipal expenditures

The socioeconomic effects of power plant construction stem from the rapid increase in population resulting from a sudden increase in the local work force during plant construction. The influx of workers who relocate within the area, as well as those who commute to the plant site can potentially create demands that exceed the capacity of the public and private services, facilities, markets, and institutions -- the local social and economic infrastructure -- which serve a given community, county, or region. Figure VI-I illustrates the potential socioeconomic impacts and their interrelationships.

The magnitude of these social and economic effects are determined by a variety of specific factors, particularly the size of the construction project, the size and diversity of the economic base of the local economy, and the infrastructure of the local community. A jurisdiction with a large and well-developed economic base is generally more able to meet the service, employment, and economic requirements of major construction

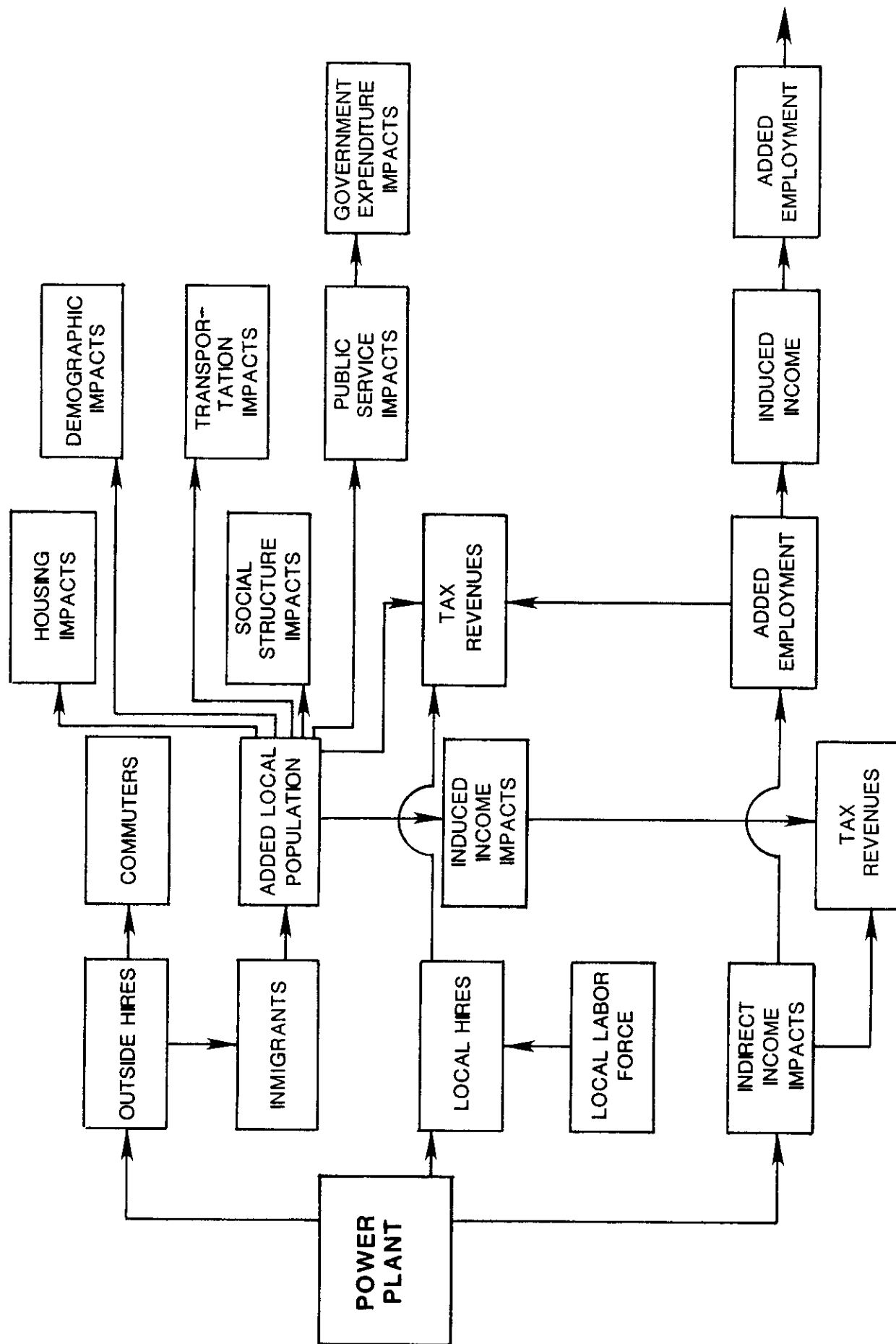


FIGURE VI-1
OVERVIEW OF POWER PLANT SOCIOECONOMIC IMPACTS.

projects more readily than a jurisdiction where a construction project is the dominant new economic force in the area.

A recent major power plant construction project in a rural Maryland community was the Calvert Cliffs nuclear power station (completed in 1975). Descriptions of the socioeconomic effects of the Calvert Cliffs power plant construction project are found in studies by the Maryland Power Plant Siting Program (1) and by the Nuclear Regulatory Commission (NRC) (2). The PPSP study concluded that the major negative impacts associated with the construction of Calvert Cliffs were in the areas of labor force shortages, housing shortages, increased housing costs, and transportation access. Positive impacts identified by PPSP's study were employment gains and increased tax revenues to Calvert County.

The NRC study generally concurred with the results of the PPSP study. In addition, the significance of the economic, population, housing, public service, and social structure effects to the individuals and groups that constitute the social system of the Calvert Cliffs area was assessed by the NRC. Economic effects, including employment, income, and fiscal effects were identified by the NRC as the most important impacts of the project, although the groups studied were differentially affected. Similarly, population, housing, and public service impacts were found to affect certain groups positively, and other negatively. In general, the area surrounding Calvert Cliffs experienced rapid large-scale development as a result of the power plant construction project, and this development caused considerable changes to the social structure and political interrelationships of the area.

The rural agricultural orientation of the area changed to a more contemporary, suburban atmosphere. The business and professional community expanded, diversified, and acquired a dominant role in local public affairs. A large-scale change occurred within the black community during the construction period of the project. Employment and income due to the construction project diversified the economic base of the black community and provided a significant increase in income. Out-migration patterns diminished and housing for the black community improved during the construction period. Following construction, blacks experienced high unemployment and pressure to return to their former jobs, although some beneficial impacts remained in the form of new employment opportunities in the local economy. As a result of the construction and operation of the Calvert Cliffs plant, BG&E became an important element in the local economy. Representatives of BG&E became members of the business community and the company became the county's largest employer. The role of the large-scale farmer as the traditional focus of the business community was substantially reduced and the increased suburban growth strengthened the importance of the business and professional community as a source of income to the local economy. Other functional groups, including construction workers, landowners, watermen and

retirees, were studied and it was concluded that their major characteristics did not change significantly over the study period.

In order to assess the potential impacts on communities adjacent to the proposed sites for future power plants in Maryland, the Power Plant Siting Program supported the development of a socioeconomic impact assessment methodology and model (3). This model was computerized (4) and first applied as part of the Eastern Shore Power Plant Siting Study which evaluated four sites potentially suitable for fossil and nuclear power plant development on the Eastern Shore of Maryland (5). Projections of the socioeconomic impacts that would result if these sites were developed for power plant use were described in the 1978 Cumulative Environmental Impact Report.

The PPSP impact assessment model was also applied to estimate the social and economic effects of the expansion of the existing Vienna generating station by the Delmarva Power and Light Company (DP&L) (6). DP&L was granted a Certificate of Public Convenience and Necessity to construct a 600 MW coal-fired generating unit, Vienna Unit 9. The potential socioeconomic impacts of the Vienna Unit 9 power plant development are presented in the 1982 Cumulative Environmental Impact Report.

Once a power plant comes on line, the local county government receives a significant increase in tax revenue from the utility. The revenues received by local governments once a plant begins to operate provide new flexibility in the options available to the locality, including capital improvements, improvement of the local housing stock, expansion of social service activities, and reductions in tax rates.

Due to very high capital costs of central station generating units, tax receipts from these facilities tend to be substantial. Tax revenues received from a power plant can dwarf other revenues and expenses in the budget of a rural county. It is not uncommon in such cases for the county to reduce tax rates significantly, which has the effect of reducing power plant tax revenues as well. Such rate reductions have occurred in Calvert County as a result of the tax revenues received from the Calvert Cliffs nuclear plant (2).

Table VI-1 displays the revenues received in Fiscal Year 1982 by all Maryland counties from electric utilities and also indicates the size of the revenue increase relative to total county revenues. These tax payments vary substantially, and depend largely on the size, age, and fuel type of the facilities (including transmission facilities) owned by utilities in each county, as well as on local tax rates. The impact of a large facility on the budget of a largely rural county is most evident in Calvert County. The budget impact of an older plant in a rural county may be seen in the cases of Charles County. Even in large counties such as Anne Arundel, Baltimore, Calvert, Montgomery, and Prince George's and in Baltimore City the presence of power plants are evident in the tax receipts.

Table VI-1. Electric Utility Tax Payment to Maryland Counties Fiscal Year 1981-82

County	BG&E	DP&L	APS/PE	PEPCO	Total	% of County Local Tax Revenues	% of Total County Revenues
Allegany	981		274,732		275,713	1.44	.40
Anne Arundel	6,108,898		15		6,108,903	3.64	1.67
Baltimore City	19,157,333		2,685		19,160,018	5.32	1.18
Baltimore County	10,994,212		37		10,994,249	3.23	1.57
Calvert	10,761,888		4		10,761,892	46.13	25.40
Caroline	1,042	231,640			232,682	4.44	1.26
Carroll	725,861		83,920		809,781	2.30	1.06
Cecil (a)	47,844	6,901			54,745	.30	.11
Charles	453			3,836,287	3,836,740	13.41	4.88
Dorchester	1,702	507,261			508,963	5.80	1.78
Frederick	72,374		1,139,852	29,663	1,241,889	2.94	1.19
Garrett	189		328,090		328,279	3.08	1.13
Harford (a)	1,938,274		3		1,938,277	3.67	1.44
Howard	1,772,292		11,970		1,784,262	2.22	1.08
Kent	1,082	161,337	19		162,438	2.97	1.20
Montgomery	115,615		363,469	10,460,732	10,939,816	2.19	1.20
Prince George's	917,426		18	12,186,460	13,103,904	4.25	1.60
Queen Anne's	1,558	202,506		292,372	204,064	2.40	.89
St. Mary's	563				292,935	1.71	.60
Somerset	726	117,094			117,820	3.15	.77
Talbot	3,813	59,241			63,054	.79	.35
Washington	2,827		670,839		673,666	2.08	.88
Wicomico	1,689	373,931	35		375,655	2.11	.68
Worcester	1,049	323,805			324,854	2.09	1.00
TOTAL	52,629,691	1,983,716	2,875,688	26,805,514	84,294,609		

(a) Also receives taxes from Conwingo Power Co., (not included).

Data from Reference 7.

REFERENCES - CHAPTER VI

1. Department of Natural Resources. Review of Socio-Economic Impacts of the Calvert Cliffs Nuclear Power Plant on Calvert County, Maryland and Comparison with Kent County, Maryland. Maryland Power Plant Siting Program. 1975.
 2. Flynn, James. Socioeconomic Impacts of Nuclear Generating Stations, Calvert Cliffs Case Study. Nuclear Regulatory Commission, NUREG/CR-2749 Vol. 2. 1982.
 3. Rogers and Golden. Economic, Fiscal and Social Assessment Handbook, Volume 3, Maryland Major Facilities Study. Department of Natural Resources, Maryland Coastal Zone Management Program. 1977.
 4. Hall, Peter D. Regional Impact of Facility Location on the Economy - Users Guide, Maryland Economic, Fiscal and Social Impact Assessment Model. Department of Natural Resources, Coastal Resources Division. 1983. (This manual is a complete revision of the RIFLE User's Guide written by Peter L. Harms of Rogers and Golden and released in 1980.)
 5. Rogers and Golden. Eastern Shore Power Plant Siting Study. 1977. Department of Natural Resources, Maryland Power Plant Siting Program, PPSA-4. 1977.
 6. Blinder, Calvin L. Prediction of Socio-Economic Impacts by the Proposed Unit No. 9 at Vienna and Alternative Sites. Department of Natural Resources, Maryland Power Plant Siting Program, PPSE 8-7. 1981.
 7. Data for this Table were provided by the following sources:
 - Hinkle, M. F. (Baltimore Gas and Electric Company). Letter to Suzanne Bachur Watkins (PPSP). April 27, 1983.
 - Kingston, L. D. (Potomac Electric Power Company). Letter to Suzanne Bachur Watkins (PPSP). May 17, 1983.
 - Mason, Edric R. (Delmarva Power and Light Company). Letter to Suzanne Bachur Watkins (PPSP). April 28, 1983.
 - Nicol, James W. (Potomac Edison Company). Letter to Suzanne Bachur Watkins (PPSP). April 26, 1983.
- Local Government Finances In Maryland, Fiscal Year Ended June 30, 1982, Thirty-fourth Report to the Governor and the General Assembly of Maryland by the Department of Fiscal Services, April 1983.

CHAPTER VII

COAL ASH MANAGEMENT

An end product of the combustion of coal is ash. Fly ash is the very fine, light ash which is carried in the stack gasses; it is removed by precipitators or filters before the stack gasses are passed into the atmosphere. Bottom ash is heavy ash which falls to the bottom of the furnace where it is collected. In general about 8 to 14 percent of the weight of the coal burned is collected as ash, and 75 to 85 percent of this is fly ash. Fly ash looks and feels like gray talcum powder, bottom ash is almost black, cinder-like material.¹

Since 1950, approximately 21 million wet² tons of coal ash were collected at power plants in and adjacent to the State of Maryland (1). Some of this ash was sold but most was disposed of as waste in landfills or placed in managed storage for future use. About 700 acres of land in the state contain ash emplaced either separately or in combination with commercial, industrial, or domestic wastes. An additional 500 acres are currently devoted to ash landfilling operations. About one million tons of ash per year are now generated by power plants within Maryland. Expectations are that this amount will double by 1990.

Maryland attempts to protect the integrity of ground and surface water resources at ash storage sites through a regulatory program of permits and certificates.³ The State also attempts to develop economically profitable uses for existing ash sites and encourages the use of ash as a resource, thus reducing the demand for landfill space.

PPSP has initiated several studies to aid the state in regulating ash disposal operations. Results of studies completed over the last two years are reported here. They pertain to:

¹Coal-fired plants equipped with scrubbers to remove gaseous sulfur oxides from the stack gases produce scrubber sludge in addition to ash. No sulfur dioxide scrubbers are presently operating in Maryland, and none are planned until at least 1990.

²Ash is generally collected dry and then conditioned by adding 15 to 20 percent water to prevent dust problems during transportation. "Wet tons" represents weight after conditioning.

³The state currently regulates discharges to ground and surface water at operating ash sites via NPDES and State Discharge Permits, Industrial Waste Management (217) Permits, and/or the Public Service Commissions Certificate for Public Convenience and Necessity.

- sources and quantities of ash collected in Maryland and identification of all ash disposal sites.
- potential environmental impacts and evaluation of some specific ash sites.
- the economics of ash disposal and use within the state; and the institutional constraints to further development of ash utilization.

A. Sources, Quantities, and Disposition of Ash in Maryland

Ash Collection, 1950-1980

From 1950 to 1980, the cumulative total of ash collected by the major power plants in and adjacent to Maryland was approximately 21 million wet tons. This total includes approximately 16.5 million wet tons of fly ash and approximately 4.5 million wet tons of bottom ash, including boiler slag.¹ The periods over which the various plants produced ash are listed in Table VII-1.

Figure VII-1 is a profile of ash collection at these plants during the 30-year period. The top half of the figure represents annual collection and distinguishes between fly ash and bottom ash, including slag. The bottom half of the figure is a pictorial presentation of Table VII-1. For any particular plant, the horizontal bars depict the intervals of time over which at least one unit of that plant was generating ash.

The quantity of ash collected rose slightly between the 1950's and early 1960's, but remained fairly stable. Most of the ash was generated by the numerous but small baseload power plants located near or within the city limits of Washington and Baltimore. These stations included PEPCO's plants at Potomac River, Buzzard Point, and Benning Road as well as BG&E's Riverside, Westport, and Gould Street plants.

During the last half of the 1960s and the 1970s, the amount of power generated in Maryland rose rapidly as did the amount of ash collected. The increase in ash collection was attributed mainly to PEPCO, whose Dickerson, Chalk Point, and Morgantown plants reached full operation at various times during this period (See Figure VII-1). At the same time BG&E, and to a

¹Boiler slag is formed in wet bottom cyclone boilers. BG&E's Crane Station is the only plant in Maryland equipped with these boilers, and it produced all of the boiler slag collected in Maryland. The total amount of boiler slag represents only about ten percent of all bottom ash collected.

Table VII-1. Sources of Coal Ash Disposed of in Maryland and Vicinity, 1950-1980(a).

Allegheny Power System (APS)

Cumberland(b)	1950-1970
R. P. Smith	1950-1980 (present)
Security(b)	1950-1958

Baltimore Gas and Electric (BG&E)

Crane	1961-1971, 1980
Gould Street	1950-1971
Riverside	1950-1970
Wagner	1956-1980 (present)
Westport	1950-1970

Delmarva Power and Light (DELMARVA)

Vienna	1950-1972
--------	-----------

Potomac Electric Power Company (PEPCO)

Benning Road	1950-1975
Buzzard Point	1950-1971
Chalk Point	1964-1980 (present)
Dickerson	1959-1980 (present)
Morgantown	1970-1980 (present)
Potomac River	1950-1980 (present)

Other

Hagerstown Municipal(b)	1950-1971
-------------------------	-----------

(a) Sources: 1950-1968 - FPC Form 1
1969-1980 - FPC Form 67

(b) The Cumberland, Security, and Hagerstown Municipal plants produced very small quantities of ash during their lifetimes. This ash has not been included in the of ash quantities used in Figures VII-1 and VII-2.

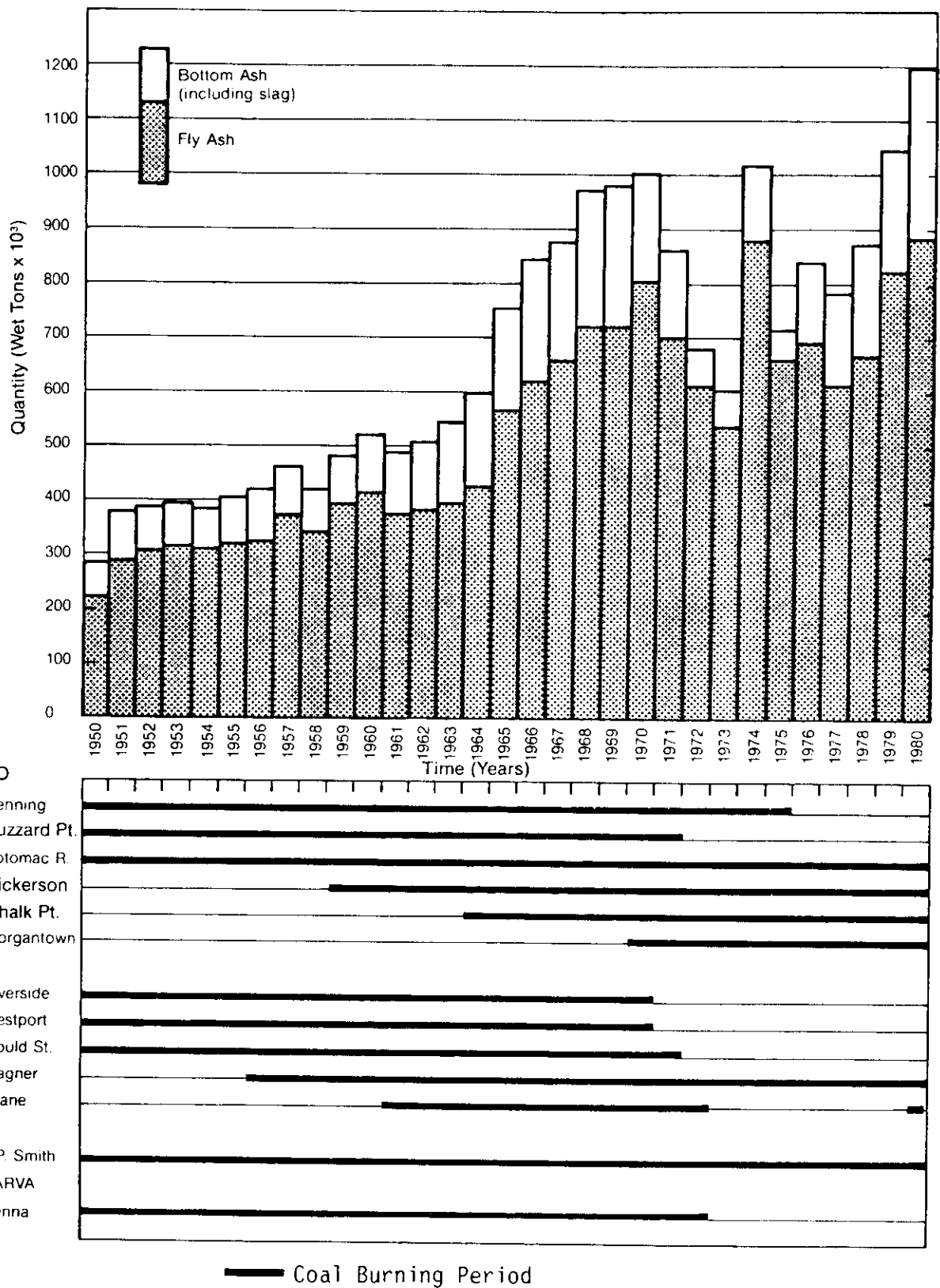


FIGURE VII-1. Annual Ash Collection Quantities and Operation Schedules For Coal-Fired Power Plants In Maryland and Vicinity, 1950-1980 (From Ref. 1).

lesser extent PEPCO, switched from coal-fired generation to oil-fired generation at their older plants to comply with new regulations.

Ash Disposition¹, 1950-1980

Ash collected at power plants in Maryland from 1950 through the 1970s was generally landfilled or placed in managed storage areas. Very little fly ash or bottom ash was sold (Figure VII-2).

During this 30-year period, ash was landfilled or placed in managed storage at over 40 locations throughout the state (Figure VII-3). These sites vary considerably in terms of size, environmental setting, structural integrity and present land use condition, as well as in their potential to impact on the environment or be put to beneficial use. In the 1950s and 1960s, when ash disposal was generally unregulated, many private landowners welcomed ash for use as fill in low-lying areas or in areas of uneven terrain.²

In the 1970s, BG&E, which had been the largest ash producer in the state during earlier years, had only one plant (Wagner) producing ash. Ash from Wagner that was not sold was generally landfilled at state, county, or privately-owned facilities. PEPCO with three large coal-burning plants (Chalk Point, Dickerson, and Morgantown) established large "pozzolan storage areas"³ at their Brandywine, Westland, and Faulkner sites to handle ash disposal.⁴ The original concept, design, and

¹The term "disposition" is used here to include all of the various avenues by which utilities have rid themselves of ash. This includes a spectrum of activities from selling the ash to putting in landfills for final disposal or storing it in managed storage areas for later sales. The word landfilling refers only to final disposal.

²This was primarily the case for relatively small areas (less than 30 acres), such as the Ritchie Road, Dyson Road, and Piscataway sites in Prince Georges County, the Battle Grove Park, Charlesmont, and Coffin Point sites in Baltimore County, and the Lombardee Beach and Riviera Beach areas in Anne Arundel County. However, ash was also welcomed as fill in larger areas such as the Woods Corner and Kenilworth Avenue sites.

³Ash has pozzolanic properties. A pozzolan is a siliceous or alumino-siliceous material which in the presence of moisture reacts with alkali to produce a cementitious product.

⁴Transportation cost for ash increases rapidly with distance from the plant. It is therefore desirable to store the ash as close to the plant as possible.

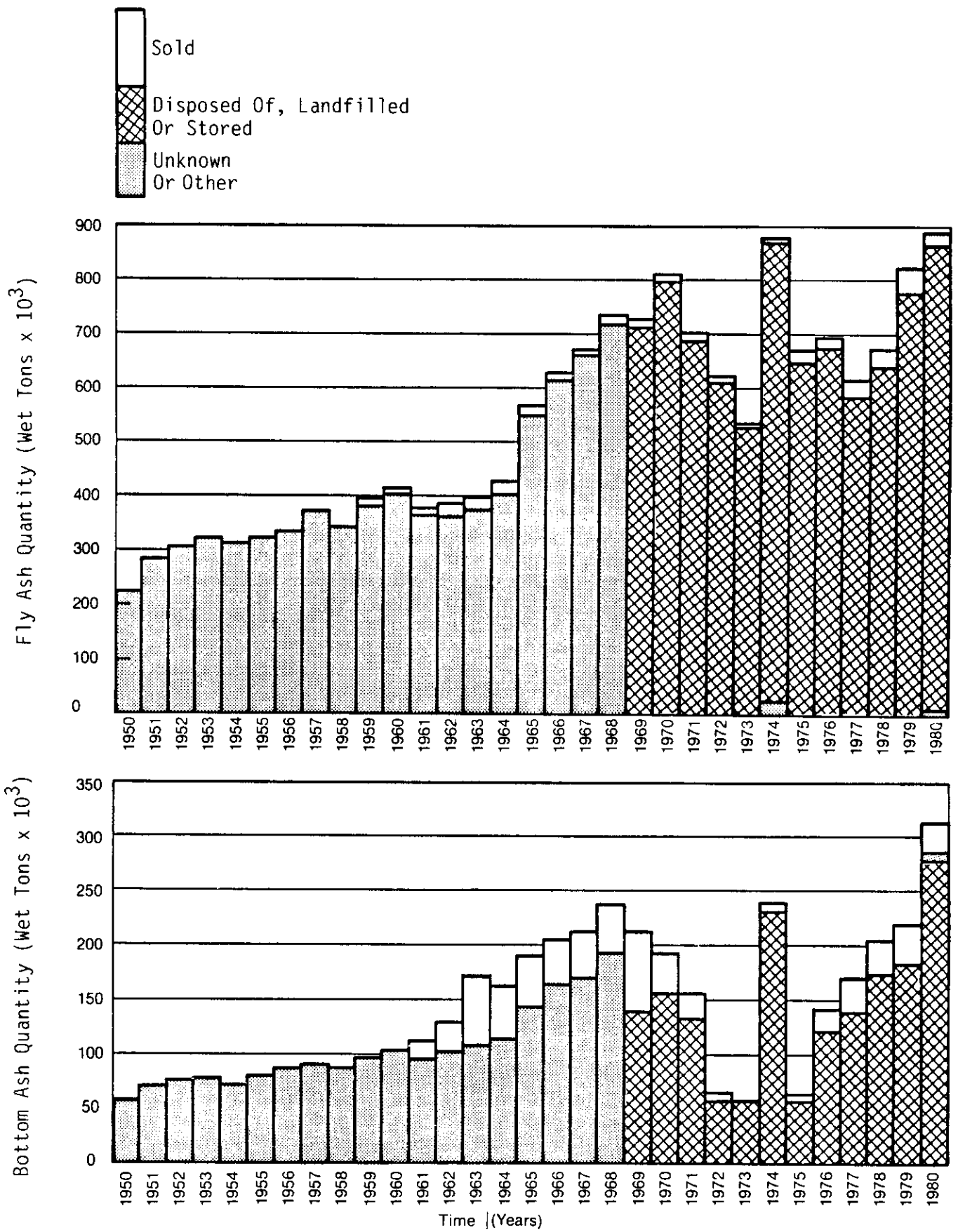


FIGURE VII-2. Annual Disposition of Fly Ash and Bottom Ash Collected In Maryland and Vicinity, 1950-1980 (From Ref. 1).

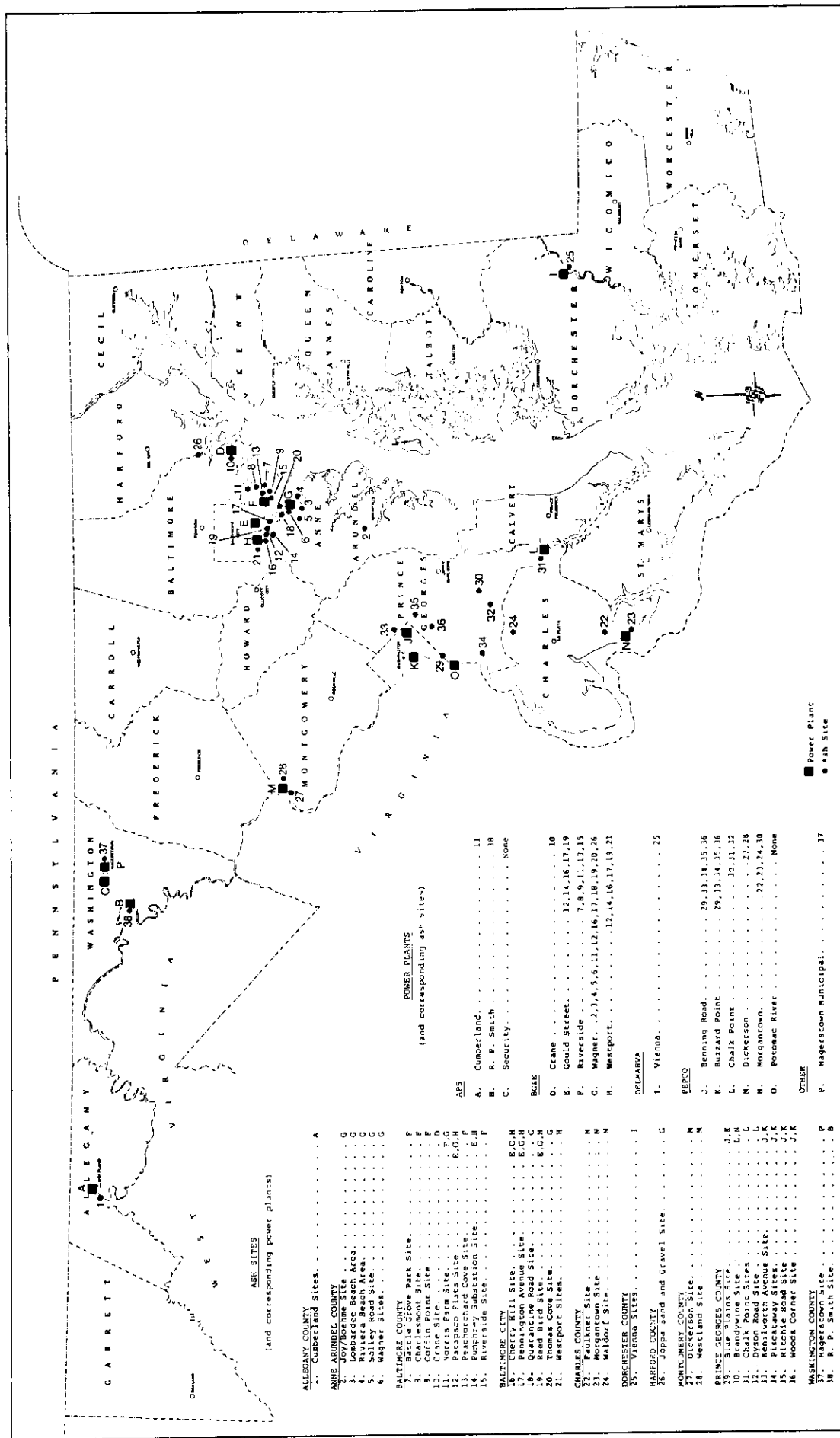


FIGURE VII-3. Ash Sites in Maryland (From Ref. 1).

maintenance of these sites was tied closely to the 1974 version of Natural Resources Subtitle 7A of the Annotated Code of Maryland which stipulates that "any person who uses pozzolan for landfill shall do so in a manner which complies with sound engineering practices and permits subsequent recovery of the pozzolan".¹ Hence, ash or pozzolan was technically placed in storage at these sites for future sale.

Current Ash Management Practices

BG&E, PEPCO, and the Allegheny Power System (through its subsidiary the Potomac Edison Company) currently operate coal-fired plants in Maryland. These utilities have developed ash management programs for each plant. A summary of current practices is presented below:

Baltimore Gas and Electric Company

Fly ash from Wagner is being placed as structural fill at the Brandon Woods Business Park, which is owned by Resource and Property Management, Inc. (RPM), a BG&E's real estate development subsidiary. Bottom ash from Wagner is being used on this and other properties primarily as a drainage blanket. No ash from Wagner is presently sold.

Fly ash from Crane is being placed as structural fill to develop a section of the Rossville Industrial Park, which is also owned by RPM. No fly ash is presently sold. All boiler slag from Crane is sold to Genstar Stone Products Company for processing as blasting grit.

Potomac Electric Power Company (4)

Fly ash and bottom ash from Chalk Point, Dickerson and Morgantown are hauled to PEPCO's Brandywine, Westland, and Faulkner ash sites, respectively. These sites are owned, engineered, and operated by PEPCO as pozzolan storage areas. Ash is placed at these sites in engineered embankments, which could support light structures if alternative uses for the pozzolan are not found. When filled areas reach desired grades the ash is covered with soil and seeded. PEPCO presently sells some fly ash and bottom ash from all three of its plants.

¹The wording of this act was changed slightly in 1983. The phrase "...and permits subsequent recovery of the pozzolan" was deleted, effectively allowing economic development on ash structural fills.

Allegheny Power System

Fly ash and bottom ash from R. P. Smith are sluiced together across the Potomac River to storage ponds (in West Virginia). Ash is hauled from filled ponds to a nearby company-owned upland site (in West Virginia) where it is compacted, covered, and seeded. No ash is presently sold.

B. Potential Effects of Ash on the Environment

Coal ash is composed of the non-combustible mineral matter present in coal and any unburned carbon (typically less than eight percent of ash weight) remaining as a result of incomplete combustion. Most of the naturally occurring elements can be found in ash, but its exact composition depends on the types of coal and combustion processes being used. Ash from eastern coals consists primarily of aluminum silicate with lesser proportions of lime, iron, magnesium, sulfur trioxide, sodium and potassium oxides, and carbon. Fly ash and bottom ash have similar chemical compositions, but bottom ash tends to have a lower carbon content. Coal ash may also contain trace amounts of arsenic, barium, cadmium, lead, mercury, chromium, and selenium.

When ash is landfilled, it may come in contact with water (surface or ground water) and ash leachate may be formed; that is, some ash constituents are dissolved in the water. Ash leachate is of concern because it has the potential to degrade nearby surface or ground water systems. The potential ecosystem and human health impacts associated with ash leachate are discussed in References 2 through 6.

The concentration of toxic substances in the leachate can be determined through EPA's Extraction Procedure Toxicity test (40 CFR 261). Leachate test results for some Maryland power plant ashes are presented in Table VII-2 and compared to EPA's drinking water standards. Note that for some of the constituents of the leachates the concentration exceeded that allowed by the drinking water standards. However, none of these ashes would be considered hazardous material because one or more of the constituents in the test extract has to exceed EPA's test standards, which are 100 times higher than the drinking water standards to be considered hazardous. Since coal ash rarely exceeds these test standards, it is presently classified by EPA as a non-hazardous material.

It should, however, be noted that laboratory determination of concentrations and the subsequent classification as hazardous or non-hazardous does not determine final environmental or health impacts. Site-specific factors may either slow or hasten the flow of any substance through environmental pathways. Physical-chemical parameters such as temperature,

Table VII-2. Metals Concentrations in Leachate Extracted from Fly Ash from Some Maryland Power Plants (Range of 3 Samples Except EPA DWS)

Constituent (ppm)	Wagner (a)	Morgantown (b)	Chalk Point (b)	EPA Drinking
				Water Standards
Arsenic	<0.001-0.004	0.072-0.14	0.56-0.71	0.05
Barium	<0.2-1.0	2.43-2.77	2.98-3.05	1.0
Cadmium	<0.02	0.004-0.0076	<0.0027-0.0076	0.01
Hexavalent Chromium	<0.05	<0.01	<0.01	0.05
Fluoride	0.77-0.94	20.0-28.0	14.2-30.0	1.4-2.4
Lead	<0.1	<0.0014	<0.014	0.05
Mercury	<0.0005	<0.000094	<0.000094	0.002
Nitrate-N	0.01-0.45	0.3-2.8	0.4-5.8	10.0
Selenium	<0.003-0.003	0.019-0.024	0.096-0.18	0.01
Silver	<0.03	<0.0046	<0.0046	0.05
Chloride	2.1-10.4	<0.08-0.11	<0.08	250
Copper	0.19-0.21	0.034-0.096	0.028-0.10	1.0
Iron	0.05-0.1	0.017-0.28	<0.0085	0.3
Manganese	0.09-0.10	0.16-0.19	0.14-0.16	0.05
Sulfate	385-420	182-211	252-261	250
Zinc	0.24-0.27	0.28-0.35	0.11-0.33	5.0

(a) From Reference (7).

(b) From Reference (8).

pH, redox potential, salinity, hardness, hydration, and chelation may alter the environmental importance of certain elements.

C. Impact Evaluations at Ash Sites in Maryland

Studies have been initiated by the PPSP to make preliminary assessments of the adverse environmental impact potential of existing ash storage sites (1). It was recognized that the most critical environmental concern is related to ash leachate movement into the ground water or adjacent surface water bodies. A secondary concern is ash erosion into marshes or surface water bodies. For these reasons, the potential for ground water and surface water impacts, was assessed.¹

Certain important ground water and surface water properties were chosen for the statewide evaluation. The ground water properties were: (a) the nature of the underlying aquifer, (b) the potential rate of leachate spreading, and (c) the proximity to ground water use. Surface water properties were: (a) the proximity of the leachate/ground water discharge to the surface water body, (b) the potential for ash transport by erosion, and (c) the volume of the surface water body available for dilution.

Information was obtained from site visits, county well records, United States Geological Survey maps, and State Highway Administration maps. The results of the evaluations are presented in Tables VII-3 and VII-4. No site-specific investigations were conducted for this preliminary evaluation of the State's ash sites.

Two specific site investigations were completed.

Vienna Site Investigations

From 1950 to 1972, Delmarva Power and Light Company (DP&L) operated a series of coal-fired generating units at their Vienna Power Station, located adjacent to the Nanticoke River in Wicomico County. From 1966 to 1972, fly ash from these units was sluiced under the Nanticoke River to a diked disposal area of about 100 acres of wetland habitat adjacent to the river on the opposite bank. In conformance with standard industry practice at the time, this disposal site was neither lined nor covered. The fly ash slurry covered about 80 percent of the disposal area when use of the site was discontinued in 1972.

¹Other factors, such as on-site metals uptake by resident biota, structural integrity of the site or structures on the site, engineering practices during site construction and maintenance, materials co-disposed of on-site, and general local uses of the surrounding resources are also important and will be considered in future site specific studies.

TABLE VII-3. Ash Site Evaluations - Ground Water Criteria
(From Ref. 1).

	Nature of Aquifer	Potential Rate of Spreading (based on earth material and probable rate of spreading)			Proximity to Ground-water Use		
		Shallow unconfined only	Slow	Medium	Fast	Wells not present	Wells near the area
<u>ALLEGANY COUNTY</u>							
1. Cumberland Sites	X			X		X	
<u>ANNE ARUNDEL COUNTY</u>							
2. Joy/Boehme Site	X		X				X
3. Lombardee Beach Area		X	X			X	
4. Riviera Beach Area		X	X			X	
5. Solley Road Site		X	X			X	
6. Wagner Sites		X	X			X	
<u>BALTIMORE COUNTY</u>							
7. Battle Grove Park Site	X		X			X	
8. Charlesmont Site	X		X			X	
9. Coffin Point Site	X		X			X	
10. Crane Site	X		X				X
11. Norris Farm Site	X		X			X	
12. Patapsco Flats Site	X		X			X	
13. Peachorchard Cove Site	X		X			X	
14. Pumphrey Substa. Site	X		X			X	
15. Riverside Site	X		X			X	
<u>BALTIMORE CITY</u>							
16. Cherry Hill Site	X		X			X	
17. Pennington Avenue Site		X	X			X	
18. Quarantine Road Site		X	X			X	
19. Reed Bird Site	X		X			X	
20. Thomas Cove Site		X	X			X	
21. Westport Sites	X		X			X	
<u>CHARLES COUNTY</u>							
22. Faulkner Site	X		X			X*	
23. Morgantown Site	X		X			X*	
24. Waldorf Site	X			X		X*	
<u>DORCHESTER COUNTY</u>							
25. Vienna Sites	X		X			X	
<u>HARFORD COUNTY</u>							
26. Joppa Sand and Gravel	X		X				X
<u>MONTGOMERY COUNTY</u>							
27. Dickerson Site	X			X		X	
28. Westland Site	X			X			X
<u>PRINCE GEORGES COUNTY</u>							
29. Blue Plains Site	X		X			X	
30. Brandywine Site		X		X			X
31. Chalk Point Sites		X		X		X	
32. Dyson Road Site	X			X			X
33. Kenilworth Avenue Site	X		X			X	
34. Piscataway Sites		X		X		X	
35. Ritchie Road Site		X		X		X	
36. Woods Corner Site		X		X		X	
<u>WASHINGTON COUNTY</u>							
37. Hagerstown Site		X		X		X	
38. R. P. Smith Site		X		X		X	

*Only deep (300 to 600 feet) wells present

TABLE VII-4. Ash Site Evaluations - Surface Water Criteria
(From Ref. 1).

	<u>Proximity of Leachate/Ground Water Discharge to Surface Water Body</u>			<u>Potential for Transport by Erosion</u>			<u>Assimilative Capacity of Surface Water Body</u>		
	• Much dilution before discharge	• Some dilution before discharge	• No dilution before discharge	• Some distance from streams	• Ash disposition on stream banks	• Surface stream drainage on-site	• Large adjacent surface water body (large capacity)	• Small adjacent surface water body (moderate capacity)	• Wetland environment (small capacity)
<u>ALLEGANY COUNTY</u>									
1. Cumberland Sites		X		X			X		
<u>ANNE ARUNDEL COUNTY</u>									
2. Joy/Boehme Site			X	X			X		
3. Lombardee Beach Area		X			X		X		
4. Riviera Beach Area		X			X		X		
5. Solley Road Site		X		X				X	
6. Wagner Sites	X				X			X	
<u>BALTIMORE COUNTY</u>									
7. Battle Grove Park Site			X		X		X		
8. Charlesmont Site			X		X		X		
9. Coffin Point Site			X		X		X		
10. Crane Site			X		X		X		
11. Norris Farm Site			X		X		X		
12. Patapsco Flats Site			X		X			X	
13. Peachorchard Cove Site			X		X		X		
14. Pumphrey Substa. Site			X		X			X	
15. Riverside Site			X		X		X		
<u>BALTIMORE CITY</u>									
16. Cherry Hill Site		X		X			X		
17. Pennington Avenue Site			X		X			X	
18. Quarantine Road Site		X		X			X		
19. Reed Bird Site			X		X		X		
20. Thomas Cove Site		X		X			X		
21. Westport Sites			X		X		X		
<u>CHARLES COUNTY</u>									
22. Faulkner Site			X		X			X	
23. Morgantown Site			X		X		X		
24. Waldorf Site	X			X			X		
<u>DORCHESTER COUNTY</u>									
25. Vienna Sites			X			X			X
<u>HARFORD COUNTY</u>									
26. Joppa Sand and Gravel			X		X			X	
<u>MONTGOMERY COUNTY</u>									
27. Dickerson Site			X		X			X	
28. Westland Site			X		X			X	
<u>PRINCE GEORGES COUNTY</u>									
29. Blue Plains Site			X		X		X		
30. Brandywine Site	X			X				X	
31. Chalk Point Sites		X		X			X		
32. Dyson Road Site	X			X			X		
33. Kenilworth Avenue Site			X	X				X	
34. Piscataway Sites			X		X			X	
35. Ritchie Road Site			X		X			X	
36. Woods Corner Site	X				X			X	
<u>WASHINGTON COUNTY</u>									
37. Hagerstown Site			X			X		X	
38. R. P. Smith Site			X		X		X		

The Vienna site was investigated to assess the potential for impacts on ground water and on aquatic and terrestrial biota (10). This investigation was partially motivated by an earlier riverwide study of the aquatic biota in the Nanticoke River which indicated possible arsenic and selenium contamination problems (9). Present studies of metal levels in muskrat tissue samples indicated slight enhancement of selenium in edible tissues from animals collected on the site as opposed to control animals. The elevated selenium levels were found to be well below levels producing acute or even chronic toxicity from ingestion of seleniferous foods. Correlation with age of the specimens indicated a slight trend of increased arsenic body burden with age (11).

Studies conducted on omnivorous resident fish in the vicinity of the Vienna site (12) revealed no significant elevations in metals levels with regard to station, sex, or size variables. No significant distribution correlations for metals in sediments, interstitial water, and surface water between the ash site and control stations were detected. It is therefore concluded that the ash site no longer contributes significant metal loading to the ecosystem.

Faulkner Site Investigations

PEPCO has owned and operated the Faulkner ash storage facility in southern Charles County, Maryland since 1974. This facility was designed, and is operated, specifically to handle coal ash from the nearby Morgantown Station in an environmentally sound manner. The Faulkner facility reflects current engineering practices which address stabilization of the ash embankments as well as containment of the ash and any ash leachate. There is no surface water discharge from the site.

Both the Maryland Department of Health and Mental Hygiene (DHMH) and PEPCO have been monitoring surface and ground water quality on and adjacent to the site since the early 1970s. Additional sampling was done by PPSP during 1982 to determine whether the facility is affecting ground water or surface water quality (13).

Analysis of all available information indicate that water quality in the shallow ground water system beneath the facility is affected locally by ash leachate, but very little, if any, water appears to leak from this shallow system into the deeper aquifers which are used for drinking water supplies. Affected ground water in the shallow flow system does discharge to the surface waters of the small, intermittent streams adjacent to and downstream (east) from the site and appears to have migrated to the Zekiah Swamp area. However, the water quality of Zekiah Swamp Run is not being altered by the ash facility, and the site, therefore, does not affect the

aquatic communities of this and downstream water bodies. It was concluded that the Faulkner facility has no significant impact on the local environment.

Follow-up investigations are underway at the Faulkner site to address (1) metal uptake and accumulation by trees which overlie areas where ground water is affected by ash leachate, (2) whether metals dissolved in the waters in streams near the site are coming out of solution and accumulating in sediments, and (3) whether invertebrate communities in swamp areas near the site are being affected by metal loading.

Other Site Studies

In addition, a comprehensive environmental assessment of the PEPCO owned Brandywine Ash Site is being conducted to describe the features of the site and its surroundings, and to characterize the sites interactions with the local environment. To assist the State in future ash site management and evaluation protocol, an investigation is underway to evaluate the potential for soil interaction of coal pile and fly ash leachates that run off to contaminate surface or ground waters. This study is designed to identify the most mobile contaminant species and to establish their probable migration rates. Structural engineering measurements are also being made at two ash sites in Maryland to determine whether certain old sites can be put to economically beneficial use through structural development.

D. Ash Utilization and Institutional Barriers

Two studies have recently been completed which evaluate the present constraints to increased ash utilization; one investigating the institutional barriers to increased ash utilization and the other evaluating the economic incentives for using ash.

Economic Evaluation of Ash Use and Disposal

Based on a general set of assumptions regarding price and marginal disposal cost, the cost of marketing (sales, overhead, testing, additional equipment, etc.), and transportation cost, this study (15) concluded that ash can be marketed at terms favorable to the utilities. Revenues would not be large, representing only a very small fraction of overall revenues for the utility. However, under optimistic demand scenarios, almost half of the ash generated could be sold.

It is important to understand, however, that this economic analysis did not consider utility-specific financial considerations such as tax, accounting, and regulatory factors for individual plants. A number of intangible factors would also

enter into each utility's decision on ash marketing, such as the utility's attitude toward pursuing a marketing effort outside of traditional product lines.

Institutional Barriers to Increased Ash Utilization

Institutional barriers refers to legal, regulatory, and administrative activities of government agencies which impede ash utilization efforts. Such barriers may delay the development of a new use or make certain uses impractical or expensive even if they are otherwise feasible from technical, environmental, and aesthetic points of view.

The results of the study effort in this area are summarized in Table VII-5, which shows various phases in the ash utilization process, identified barriers (if any), and potential remedies (14). Two of the suggested remedies, changes to the Pozzolan Act which will allow ash use in structural fills (See p. VII-66), and changes in the State Highway Specifications which encourage ash use in concrete, have been accomplished.

Table VII-5. Summary of phases, barriers, and remedies related to ash utilization^(a).

Phases	Barriers	Remedies
Storage	No significant barriers.	Not applicable.
Transportation	Local opposition - dust and traffic. No significant barriers.	Not applicable.
Marketing	Utility liability concern. Quality control.	None identified.
Disposal and long-term storage	Uncertainty of regulations.	Clarify Pozzolan Act; develop regulations.
Coordination of regulation and use	Contradictory decisions by regulatory agencies and state agency users.	Involvement of users in regulation development (uncommon in other states).
Utilization of Ash		
Roads and transportation facilities	Lack of specifications and experience with some uses.	Pozzolan Utilization Act; reevaluate state specifications; testing of new uses.
Buildings, private	No significant barriers.	Not applicable.
Buildings, public	Lack of specifications.	Pozzolan Utilization Act and regulations or guidelines from it.
Structural fill	Lack of specified treatment.	Develop Section 217 regulations.
Snow and ice control	No significant barriers.	Not applicable.
Other uses	No significant barriers.	Continue research.

(a) From Reference (17).

REFERENCES - CHAPTER VII

1. Simek, Edward M., Christian P. Demeter, and Peter N. Klose. Coal Ash Disposition in Maryland - 1950 Through 1980. Environmental Resources Management, Inc., West Chester, Pennsylvania. PPSP-MP-41, 2 Volumes. 1982.
2. Environmental Effects of Trace Elements from Pondered Ash and Scrubber Sludge, Electric Power Research Institute, Report No. EPRI 202. 1975.
3. Impacts of Coal-Fired Power Plants on Fish, Wildlife, and Their Habitat, U.S. Fish and Wildlife Service. FWS/OBS-78/29. 1978. 260 p.
4. Wallace, A. and W. Berry. Trace Elements in the Environment - Effects and Potential Toxicity of Those Associated with Coal. In. M. Wali, ed. Ecology and Coal Resources Development. Pergamon Press, New York. Vol. 1. pp. 95-114. 1979.
5. Effects of Coal Ash Leachate on Ground Water Quality, U.S. Environmental Protection Agency. EPA-600/7-80-066. 1980.
6. Trace-Element Geochemistry of Coal Resource Development Related to Environmental Quality and Health, National Research Council, Washington, D.C. 1980. 153 p.
7. 397 Permit Application to Develop the Brandon Woods Property, BG&E.
8. Evaluation of Potential for Leachate Migration From Faulkner and Brandywine Fly Ash Storage Facilities Beyond Facility Boundaries, Dames and Moore, Washington, D.C. 1981.
9. Merhle, P. M., T. Haines, S. Hamilton, L. Ludke, F. L. Mayer, and M. A. Ribick. Relationship Between Contaminants and Bone Development in East Coast Striped Bass. Transactions of the American Fisheries Society. 111:231-241. 1982.
10. Vienna Fly Ash Disposal Site - Problem Definition Study. Environmental Resources Management, Inc., West Chester, Pennsylvania, V-82-1, June 7, 1982. NTIS No. PB82-238411.
11. Petrimoulx, H. J., G. T. Potera, and P. N. Klose. Vienna Fly Ash Disposal Site Mammal Study. Environmental Resources Management, Inc., West Chester, Pennsylvania. PPSP-MP-42. December 1982. NTIS No. PB83-178517.

12. Study of Metals in Fundulus Heteroclitus Near the Abandoned Vienna Fly Ash Disposal Area, Ecological Analysts, Inc., Sparks, Maryland. 1983.
13. Simek, Edward M., Marilyn A. Hewitt, and George T. Potera. Environmental Aspects of the Faulkner Ash Site. Environmental Resources Management, Inc. PPSP-MP-43. January 1983.
14. Hudson, James F., Mark Stoler, Christian P. Demeter, and Susan O. Farrell. Institutional Barriers to Increased Utilization of Power Plant Ash in Maryland. Urban Systems Research and Engineering, Inc., Cambridge, Massachusetts and Environmental Resources Management, Inc., West Chester, Pennsylvania. 1982.
15. Hudson, James F., Mark Hunsberger, Christian P. Demeter, and Peter N. Klose. Economic Evaluation of Power Plant Ash Use and Disposal in Maryland. Urban Systems Research and Engineering, Inc., Cambridge, Massachusetts and Environmental Resources Management, Inc., West Chester, Pennsylvania. PPSP-MP-44. February 1983.