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COASTAL EFFECTS OF COAL TRANSSHIPMENT IN MICHIGAN: AN EVALUATION STRATEGY

Prepared for

The State of Michigan Department of Natural Resources
Division of Land Resource Programs • Coastal Energy Impact Program
by the Staff of the Great Lakes Basin Commission

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The State of Michigan
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Coastal Energy Impact Program

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Division of Land Resource Programs

Chris A. Duncan, Contract Manager
under contract CEIP 80-8

by the Staff of

Great Lakes Basin Commission
Charles A. Job, Project Manager

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ABSTRACT

Coal use will increase steadily in Michigan between 1980 and 2000. The deliberate, undramatic nature of this growth reflects the substantial coal use in Michigan already. Thirteen coastal coal unloading facilities are expecting major increases in deliveries, and five will be physically expanded to handle larger coal shipments during the 1980's.

While Michigan is the single largest user of coal shipped on the Great Lakes, most coal is delivered to Michigan by rail. For coal used in coastal areas, lake vessel delivery can minimize the land area required. For large facilities, lake vessel delivery is dictated not only by the source of the coal but also by the facility's ability to handle rail delivery.

Generally, coal is a safe commodity to transport and deliver. Coal is a relatively inert substance. However, potential negative effects of coal unloading and transshipment include: fugitive coal dust generation, release of toxic substances from sediments, aquatic ecosystem disruption, erosion, noise, and land use conflicts. Although not all these effects will be significant at every facility expansion or development, their possibility must be considered, especially since mitigation measures are available to reduce or avoid them.

Key recommendations for Michigan state policy include: (1) developing a policy on future coal use, (2) developing programs to minimize onshore vessel impacts, (3) examining low-cost solutions to rail interference with community activities, (4) preparing a coordinated, flexible long-range dredging and dredge disposal plan, (5) considering alternatives to channel improvements, (6) evaluating public access in proposals for coal-related development, (7) conducting studies concerning the effects of coal and coal-dust on the aquatic environment, (8) integrating planning and permit processes for coal transshipment facilities with those of other energy facilities and an overall energy facility siting process, (9) using coastal energy impact program funds to mitigate the effects of coal facility expansion, and (10) using permit renewals to enhance existing coal facilities.

COASTAL EFFECTS OF COAL TRANSSHIPMENT IN MICHIGAN: AN EVALUATION STRATEGY

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PREFACE

With large projected increases in coal use, the Department of Natural Resources, Division of Land Resource Programs, Coastal Energy Impact Program was concerned about the ability of Michigan's coastal zone to handle the demands of greatly increased coal shipment. The extent of future coal deliveries, the need for additional coal unloading and handling facilities, the incremental effects of expanding coal use, and the available mitigation measures that should be considered in reviewing proposed facilities were major topics requiring investigation. The intent of this report is to give the Department a planning document for policy development and a handbook for project reviewers.

ACKNOWLEDGEMENTS

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SECTION I

INTRODUCTION

COASTAL EFFECTS OF COAL TRANSSHIPMENT IN MICHIGAN
AN EVALUATION STRATEGY

SECTION I

INTRODUCTION

OVERVIEW

Coal use in Michigan is expected to increase. This increase will be gradual rather than dramatic, partly because the state already uses much coal in both the utility and industrial sectors. The extent of the growth will be influenced by the implementation of coal conversion orders, continued energy conservation, production and use of the electric car, production of synthetic coal gas, and environmental controls on stack emissions. Increased use will in turn magnify demands on transportation, particularly by waterways, ports and railroads in coastal areas.

In most cases, Michigan's coal transportation system can accomodate future demands. In other cases, expanded or new facilities will be needed, and these developments should be evaluated for their effects on communities and the environment. Overall, coal is a safe commodity to transport and handle. However, site-specific circumstances may dictate a more extensive analysis of particular anticipated effects. This report provides a systematic approach to evaluating and mitigating these potential effects.

PURPOSE OF THE STUDY AND THE REPORT

This study (1) indicates the new and expanded facilities needed to accomodate future coal use, (2) provides systematic guidelines to evaluate the potential effects of these new or expanded facilities on communities and the environment, and (3) indicates additional state policy needed to accomodate new or expanded coal transport and unloading facilities.

The focus of this study, responding to the specific needs of the Michigan Department of Natural Resources, is on environmental and community effects of constructing and operating coal unloading and transshipment facilities. The study was not intended to recommend which facilities should be developed or to suggest improvements in the engineering of facilities. Thus, the report describes the full range of effects of coal unloading and transshipment facilities and the principal mitigation measures available. Since not all the effects described will occur at every facility, the magnitude of the effects will vary from facility to facility. This report's evaluation guidelines simply provide a checklist for both a facility's proposer and the state's reviewer.

FINDINGS AND CONCLUSIONS

Future Coal Use

Michigan's coal use will increase steadily rather than with a large near-term demand. Michigan utilities and industries already use coal for a major portion of their energy. Therefore, massive conversions will not take place and no dramatic shift in demand will occur in the near-term. Michigan's coal use will probably increase by 50 to 75 percent over the next twenty years.

The electric utility sector is the largest consumer of coal in Michigan now. This dominance is expected to continue in the future, with major increases in coal use also occurring in electric utilities. Conversion to coal in other industries will be limited.

Projections indicate that the principal factors affecting future coal use will be its delivered price relative to other sources of energy, the cost of installing, operating and maintaining coal combustion and pollution control equipment relative to other energy sources, and the reliability of the coal supply.

Projected Coal Unloading

Most national forecasters are optimistically using figures based on the National Energy Plan (NEP) that are derived by doubling coal use from 1978-9 to the year 2000. If current coal users dominate future use and they double coal use by the year 2000, current unloading facilities in Michigan's coastal areas could handle this doubling and more. Thirteen locations along Michigan's coast are expected to increase coal deliveries during the 1980's. Five will be expanded.

Future Expansion in Coal Unloading Capacity at Existing Large Facilities

A review of expected coal facility construction along Michigan's coast shows that expansion of coal unloading capacity will generally occur at the locations of the larger coal users, predominantly in the southern lower peninsula where waterfront land has high value.

Coal Unloading is Part of Larger Coal-Using Facility

The effect of coal unloading in Michigan is difficult to separate from the effect of the larger coal-using facility, and this limits the analysis of relative coal use effects and socio-economic effects. Future analyses should consider the planning and the effects of the larger coal-using facility -- for boiler fuel or for feedstock for synthetic fuels and products. Each facility has different coal unloading requirements for water or rail access, storage area available, and rate of coal use. Coal unloading is an integral part of the entire coal-using facility and is affected by alternatives for the larger facility.

Not All Impacts at Every Proposed Facility

Not all the impacts described in this report will occur or be important for every coal unloading and transshipment facility. The effects of facility expansion will generally be several orders of magnitude less than the effects of a new facility. In any case, the extensive list of environmental effects should not be presumed to be an indictment of future coal use. This is a checklist to insure that facilities are developed compatibly with the environment.

Major Effects

Generally, experts agree that coal in water does not have any major deleterious effects. Some experts maintain that coal particulates in water can improve quality in already polluted water by adsorbing organic chemicals to them and then settling out in sediments. However, coal dust will have no beneficial effects in unpolluted waters. Because of its inert nature, a substantial volume of coal deposited on submerged lands would smother aquatic habitat and not provide a base for reestablishing the habitat. Major accumulations of coal or coal particulates in the Great Lakes have not been documented.

The principal potential effects of coal unloading are water turbidity and community disruption. Overall, these are minor. However, at specific locations, these effects may be very significant and adverse. Turbidity would be caused by a high concentration of coal particulates in water from runoff, spillage or atmospheric fallout from coal storage, delivery, or on-site management. Community disruption could be caused by transporting coal through populated coastal areas, especially by long unit trains tying up traffic and generating continuing noise at regular intervals.

The main problem prescribed by coal transshipment facilities along the coast is using land which is then not available for other purposes, especially for recreational purposes. Access to shorelands for recreation is an increasing concern of the public, and raises the policy question of placing priorities on competing uses of shorelands.

The other effects described in this report are generally considered minor, but on a site-specific level could be significant.

Effects in Perspective

Coal transportation and delivery is considered by most experts to be far less a problem than burning coal and generating sulfur dioxide which can result in acid rain.

Similarly, comparing the environmental impacts of coal transporting and unloading with the effects of the same activities for other bulk commodities, shows that coal is not an especially noxious substance. With the exception of coal dust generation, unit train disruption of communities, and competition with other shoreland uses, many environmental effects identified in this report could be connected with the transport and handling of many bulk commodities under similar conditions. Specifically vessel effects, noise, dredging effects, and many impacts related to nearshore construction are by-products during delivery, processing, and facility development for many commodities, and are certainly not exclusively related to coal unloading and transshipment. The results of this study remain significant, however, in that coal unloading is one activity which does have these effects, and the mitigation strageties and review guidelines in this study will help prevent and mitigate the impacts of coal transportation, handling, and facility development.

Coal Unloading Guidelines Should be Part of Energy Facility Siting

Evaluation guidelines for coal unloading facilities should be part of overall energy facility siting. If coal is unloaded, it is unloaded with the intent of using it in an adjacent activity. If an evaluation determines that a proposed coal unloading facility is poorly located, most likely the associated coal-using plant is also poorly located. Alternatives to using coal and to the location of the plant should be evaluated under state and federal environmental impact review regulations. Energy facility siting should be comprehensive and should also be part of a state energy plan or policy. A flexible state energy plan might be the most workable. Energy facility siting should include all types of energy facilities -- coal, oil, nuclear, wood and refuse electrical generation and process heat and steam, solar, wind, wave, biomass, above and below ground transmission lines, cogeneration and combined-cycle.

Energy facility siting should complement private sector planning and not complicate planning by companies not currently regulated. In any case, because of the major investments involved, the process should not impose unnecessary added costs or result in a commitment to technologies which are rapidly changing and may become obsolete. Protecting the public trust as well as the market place should be clear in the formulation and implementation of a siting process.

Application of the Coastal Energy Impact Program

To provide a comprehensive approach to mitigating the potential effects of increasing coal use and provide further benefits of existing coal use, the state and national coastal zone management programs should consider using coastal energy impact program (CEIP) funds to ameliorate the effects of coal facility expansion, and using permit renewals to enhance existing coal facilities. Specifically, the CEIP funds could be used to assist communities during construction of a project or provide public access and facilities in areas of heavy demand. At existing coal unloading and using sites, the state could work with the coal transporting or using company in the permit renewal process to provide additional shoreline access. CEIP funds might then be used to provide boat launches, fishing piers and other recreational features when they do not exist locally. In such a program, small boat areas should be separated from docking areas used by large vessels to protect small boat operators from harm potentially posed by the manuevering of these different kinds of vessels in the same area.

OUTLINE AND USE OF THE REPORT

The remainder of this report is divided into three major sections:

- Projections of Coal Use and Facility Development
- Evaluation Strategy and Guidelines
- Supporting Appendices

Projections of Coal Use and Facility Development

This section reviews national and state projections of coal use. Factors affecting future coal use are also reviewed in an appendix. Facilities expecting expansion are shown.

Evaluation Strategy and Guidelines

The Evaluation Strategy and Guidelines are organized for the state project reviewer's use. This systematic review covers:

1. the major activities related to coal unloading and transshipment
2. the effects of the activities
3. laws and policies relating to the activity and its effects
4. mitigation measures
5. guidelines in the form of questions to serve as the basis for a review of any proposed coal unloading and transshipment facility
6. needed policy changes for enhancing state environmental authority for dealing with future coal unloading and transshipment facilities

Supporting Appendices

The appendices provide additional information for the project reviewer, including:

- a review of factors affecting future coal use
- a review of historic and projected coal use in Michigan and the United States

- an outline of the coal production-consumption cycle
- a review of Michigan and Great Lakes ports, with emphasis on future coal handling
- a detailed characterization of the effects of coal unloading and transshipment operations and facilities
- a review of laws, regulations, and policies

This organization gives the project reviewer the most important information first, with more detailed information appended at the back.

SECTION II

PROJECTIONS OF COAL USE AND FACILITIES DEVELOPMENT

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PROJECTIONS OF COAL USE AND FACILITIES DEVELOPMENT

INTRODUCTION

Facilities at some locations in Michigan will need expansion to accomodate future increases in coal deliveries. At the same time, other locations project decreasing use of coal and, therefore, decreasing coal shipments. One reason for this second circumstance is that older electrical generating plants of small municipal utility companies will be slowly phased out or used less while these municipal utilities buy power from the state's larger companies. This situation reinforces the projected increases in coal delivery and use by large coal users.

Coal unloading facilities in Michigan's coastal areas, when taken as a whole, are capable of handling a doubling of coal deliveries. However, because of the varying demand for coal at different locations along the coast, additional unloading facilities will be needed at some sites.

Michigan's waterways and rail lines, the principal transport paths, also have generally adequate capacity to handle the projected increase. Particular locations may need attention in the future, however.

Projections of coal use and transportation must be put into perspective. Coal use nationally accounts for 19% of all energy used. In Michigan, it currently serves 30% of the state's energy needs. Federal policy aims to increase coal use nationally by 150% (more than a doubling) by the year 2000. However, since coal is already a major fuel in Michigan and Michigan industries have established plant capabilities, Michigan probably will not double its coal use over the next 20 years. A reasonable and practical estimate of future coal use in Michigan is an increase of 50 to 75 percent by the year 2000.

Outline of this Section. The rest of this section will (1) review historic and projected national coal use and transportation, (2) review historic and projected Michigan coal use and transportation, and (3) describe projected coal transshipment facility developments in Michigan. This will provide the Department of Natural Resources with basic information for anticipating proposals for coal transshipment facilities and potential effects.

Appendix E, "Factors Affecting Future Coal Use," gives an overview of major factors encouraging and constraining future coal use at the state, regional and national levels.

U.S. COAL PROJECTIONS

HISTORIC SUPPLY AND USE

Of the last thirty years, 1979 was the year of the largest absolute increase in coal consumption not preceded by a year of major decline in production, whether measured on a tonnage basis--an increase of 55.7 million short tons, or on a Btu basis--an increase of 1.23 quadrillion Btu. Total consumption of coal in 1979 was 680.9 million short tons, or 15.08 quadrillion Btu. Electric utilities accounted for nearly 78 percent of the coal consumed in 1979, while other industries used 21 percent. Table 1 shows the changes in coal consumption by the End-Use Sector from 1949 to 1979. The largest absolute increase in coal supply in the United States over the last thirty years also occurred in 1979, an increase of 105.6 million short tons for a total supply of 775.8 million short tons.

The U.S. Demonstrated Coal Reserve Base by state is shown in Figure 1. The Appalachian and Central coal regions, the areas closest to Michigan, have about two-thirds of the nation's demonstrated coal reserves.

In 1979, coal represented 28 percent of the nation's energy production. Of the coal produced, 10.2 percent was exported. Coal was 19 percent of total energy consumption in 1979. Table 2 gives details of energy supply and consumption since 1960. Coal use by electric utilities acounted for 47.8 percent of the electricity produced (2,248 billion kilowatt-hours) in 1979. An overview of fuel for electrical generation in the United States is given in Figure 2.

COAL TRANSPORTATION IN THE UNITED STATES

At the national level, most coal is transported by rail. This trend is expected to continue into the forseeable future. In 1978, 54 percent of coal moved by rail, 19.4 percent by water, 15.6 percent by truck, and 11.0 percent by other means. See Table 3.

TABLE 1

COAL CONSUMPTION BY END-USE SECTOR,[1] 1949-1979

(Million Short Tons)[4]

		Industry and Miscellaneous					
Year	Electric Utilities	Coke Plants	Other Industry and Miscellaneous	Total	Transportation	Residential and Commercial	Total
1949	84.0 (17.4)	91.4	121.2	212.6 (44.0)	70.2 (14.5)	116.5 (24.1)	483.2 (100.0)
1954	118.4 (39.4)	85.6	98.2	183.9 (47.2)	18.6 (4.8)	69.1 (17.8)	389.9 (100.0)
1959	168.4 (43.7)	79.6	92.7	172.3 (44.7)	3.6 (0.9)	40.8 (10.6)	385.1 (100.0)
1964	225.4 (50.6)	89.2	103.1	192.4 (43.2)	0.7 (0.2)	27.2 (6.1)	445.7 (100.0)
1969	310.6 (60.1)	93.4	93.1	186.6 (36.1)	0.3 (0.1)	18.9 (3.7)	516.4 (100.0)
1974	391.8 (70.2)	90.2	64.9	155.1 (27.8)	0.1 (0.0)	11.4 (2.0)	558.4 (100.0)
1979[3]	528.8 (77.7)	77.1	65.9	143.0 (21.0)	([2]) (0.0)	9.1 (1.3)	680.9 (100.0)

1 See explanatory Notes 1 and 7

2 Less than 0.05 million short tons.

3 Preliminary

4 Numbers in parenthesis are percents. These percents may not total to 100% due to rounding.

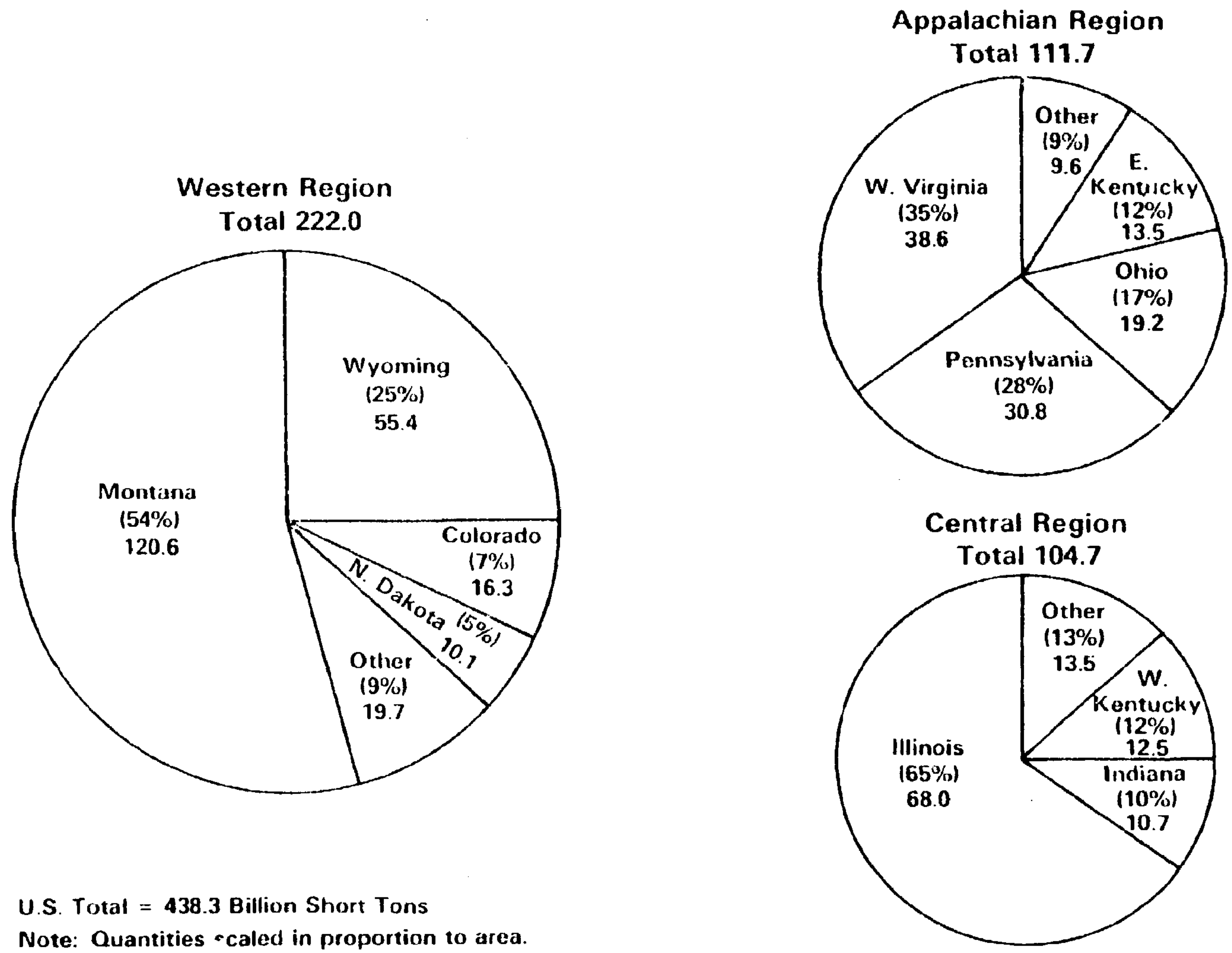
NOTE: Sum of compenents may not equal total due to independent rounding.

NOTE: After 1977, small amounts of bituminous coal and lignite consumed by the Transportation Sector are included in the Other Industry and Miscellaneous category.

SOURCE: U.S. Energy Information Administration, Annual Report to Congress, Volume 2, 1979, page 113.

FIGURE 1

DEMONSTRATED COAL RESERVE BASE BY STATE, JANUARY 1, 1980
(Billion Short Tons)



U.S. Total = 438.3 Billion Short Tons

Note: Quantities scaled in proportion to area.

The demonstrated reserve base of U.S. coal was estimated to total 438 billion short tons as of January 1, 1976. The largest coal reserves were in Montana, Illinois, Wyoming, West Virginia, and Pennsylvania. These five States contained 72 percent of the Nation's available coal. Montana and Wyoming contained 40 percent, principally of lower rank subbituminous coal. Coal in the three eastern States is principally a high grade bituminous coal.

SOURCE: U.S. Energy Information Administration, Annual Report to Congress, Volume 2, 1979, p. 120.

TABLE 2

ENERGY SUPPLY AND DISPOSITION BALANCE, 1960-1979

(Quadrillion Btu)

Activity and Fuel	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979[1]
Supply																				
Production																				
Crude oil and lease condensate	14.93	15.21	15.52	15.97	16.16	16.52	17.56	18.65	19.31	19.56	20.40	20.03	20.04	19.49	18.57	17.73	17.26	17.45	18.43	18.02
Natural gas plant liquids	1.46	1.55	1.59	1.71	1.80	1.88	2.00	2.18	2.32	2.42	2.51	2.54	2.60	2.57	2.47	2.37	2.33	2.33	2.25	2.38
Natural gas[2]	12.66	13.10	13.72	14.51	15.30	15.78	17.01	17.94	19.07	20.45	21.67	22.28	22.21	22.19	21.21	19.64	19.48	19.57	19.49	19.19
Coal[3]	11.12	10.73	11.21	12.15	12.83	13.38	13.82	14.19	13.93	14.20	15.05	13.59	14.49	14.37	14.47	15.19	15.85	15.83	15.04	17.41
Nuclear power	0.01	0.02	0.03	0.04	0.04	0.04	0.06	0.09	0.14	0.15	0.24	0.41	0.58	0.91	1.27	1.90	2.11	2.70	2.98	2.75
Hydropower	1.60	1.65	1.81	1.77	1.89	2.06	2.06	2.35	2.35	2.65	2.63	2.82	2.86	2.86	3.18	3.15	2.98	2.34	2.96	2.96
Other[4]	([12])	([12])	([12])	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.03	0.05	0.06	0.07	0.08	0.08	0.07	0.09
Total production	41.78	42.27	43.88	46.16	48.03	49.67	52.52	55.41	57.13	59.44	62.51	61.70	62.81	62.43	61.23	60.06	60.09	60.30	61.21	62.80
Imports																				
Crude oil[5]	2.20	2.25	2.42	2.43	2.58	2.65	2.62	2.40	2.76	2.99	2.81	3.57	4.71	6.89	7.40	8.72	11.24	14.03	13.46	13.53
Refined petroleum products[6]	1.80	1.94	2.14	2.22	2.38	2.75	3.01	3.15	3.46	3.91	4.66	4.97	5.59	6.58	5.73	4.23	4.43	4.73	4.36	4.11
Natural gas	0.16	0.23	0.42	0.42	0.46	0.47	0.50	0.58	0.67	0.75	0.85	0.96	1.05	1.06	0.99	0.98	0.99	1.04	0.99	1.27
Other[7]	0.07	0.04	0.03	0.03	0.07	0.04	0.05	0.05	0.05	0.06	0.07	0.08	0.11	0.21	0.31	0.19	0.18	0.30	0.44	0.38
Total imports	4.23	4.46	5.01	5.10	5.49	5.92	6.18	6.19	6.93	7.71	8.39	9.58	11.46	14.73	14.42	14.11	16.84	20.09	19.26	19.28
Adjustments[8]	-0.44	-0.62	-0.61	-0.80	-0.90	-0.74	-0.85	-1.56	-0.71	-0.47	-1.41	-0.81	-0.51	-0.48	-0.65	-1.08	-0.21	-1.91	-0.36	-1.18
Total supply	45.57	46.11	48.29	50.46	52.62	54.85	57.85	60.04	63.35	66.68	69.49	70.47	73.77	76.68	75.00	73.09	76.72	78.49	80.11	80.90
Disposition																				
Total disposition	45.57	46.11	48.29	50.46	52.62	54.85	57.85	60.04	63.35	66.68	69.49	70.47	73.77	76.68	75.00	73.09	76.72	78.49	80.11	80.90
Exports																				
Coal[3]	1.02	0.98	1.08	1.36	1.34	1.38	1.35	1.35	1.38	1.53	1.94	1.55	1.53	1.45	1.64	1.79	1.62	1.47	1.10	1.78
Other[9]	0.46	0.40	0.40	0.49	0.51	0.48	0.50	0.79	0.65	0.62	0.73	0.63	0.61	0.63	0.60	0.60	0.59	0.63	0.85	1.10
Total exports	1.48	1.38	1.48	1.85	1.85	1.86	1.85	2.15	2.03	2.15	2.66	2.18	2.14	2.07	2.24	2.39	2.21	2.10	1.95	2.88
Consumption																				
Refined petroleum products[10]	19.92	20.22	21.05	21.70	22.30	23.25	24.40	25.28	26.98	28.34	29.52	30.56	32.95	34.84	33.45	32.73	35.17	37.18	37.97	37.02
Natural gas[2]	12.39	12.93	13.73	14.40	15.29	15.77	17.00	17.94	19.21	20.68	21.79	22.47	22.70	22.51	21.73	19.95	20.35	19.93	20.00	19.86
Coal[3]	10.12	9.89	10.17	10.69	11.25	11.89	12.48	12.24	12.66	12.72	12.66	12.01	12.45	13.30	12.88	12.82	13.73	13.96	13.85	15.08
Nuclear power	0.01	0.02	0.03	0.04	0.04	0.04	0.06	0.09	0.14	0.15	0.24	0.41	0.58	0.91	1.27	1.90	2.11	2.70	2.98	2.75
Hydropower[11]	1.65	1.68	1.82	1.77	1.91	2.06	2.07	2.34	2.34	2.66	2.65	2.86	2.94	3.01	3.31	3.22	3.07	2.52	3.17	3.16
Other[4]	([12])	([12])	([12])	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.03	0.05	0.06	0.07	0.08	0.08	0.07	0.09
Net imports of coal coke	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.03	-0.02	-0.02	-0.04	-0.06	-0.03	-0.03	-0.01	0.06	0.01	([12])	0.02	0.13	0.07
Total consumption	44.08	44.73	46.80	48.61	50.78	52.99	55.99	57.89	61.32	64.53	66.83	68.30	71.63	74.61	72.76	70.71	74.51	76.39	78.15	78.02

[1] Preliminary.
[2] Dry marketed natural gas.
[3] Bituminous coal, lignite, and anthracite.
[4] Geothermal, wood, refuse, and other vegetal fuels used for electricity generation at utilities (see Note).
[5] Includes imports of crude oil for the Strategic Petroleum Reserve.
[6] Also includes imports of unfinished oils and natural gas plant liquids.
[7] Includes bituminous coal, lignite, anthracite, coal coke, and hydropower.
[8] A balancing item. Includes stock changes, losses, gains, miscellaneous blending compounds, unaccounted for supply, and shipments of anthracite to U.S. Armed Forces in Europe.
[9] Includes crude oil, refined petroleum products, natural gas, coal coke, and hydropower.
[10] Refined petroleum products supplied includes natural gas plant liquids and crude oil burned as fuel.
[11] Includes industrial generation of hydropower and net electricity imports.
[12] Less than 0.005 quadrillion Btu.

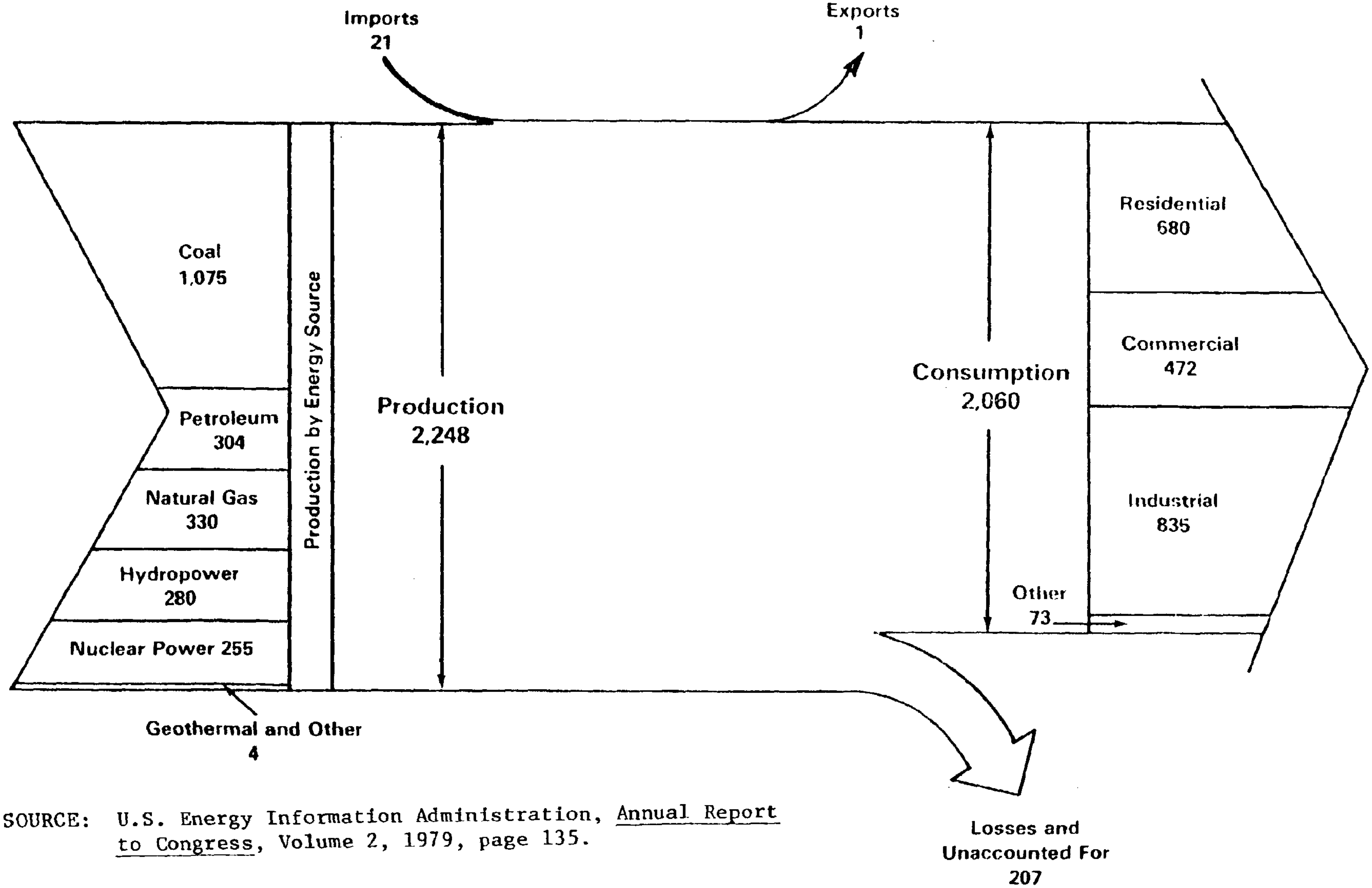
Note: Data do not include wood derived fuel consumed by the pulp and paper industry which amounted to an estimated 1.0 quadrillion Btu in 1978. This table also excludes small quantities of other energy forms for which consistent historical data are not available, such as solar energy obtained by the use of thermal and photovoltaic collectors; wind energy; and geothermal, biomass, and waste energy other than that consumed at electric utilities.

Note: Sum of components may not equal total due to independent rounding.

SOURCE: U.S. Energy Information Administration, Annual Report to Congress, Volume 2, 1979, page 3.

FIGURE 2

ELECTRIC UTILITY ELECTRICITY FLOW DIAGRAM, 1979
(Billion Kilowatt-Hours)



SOURCE: U.S. Energy Information Administration, Annual Report to Congress, Volume 2, 1979, page 135.

TABLE 3

UNITED STATES COAL TRANSPORT - 1978

Mode	Tonnage (1000's tons)	% of Total
Rail	323,500	54.0
Vessel		
River	96,301	16.1
Great Lakes	16,175	2.7
Tidewater	3,813	.6
Truck (local)	93,530	15.6
Other*	65,893	11.0
TOTAL	599,214	100.0

* Includes on-site movement by means such as conveyors.

SOURCE: National Coal Association, Washington, D.C.

U.S. PROJECTIONS

Because of the diverse and problematic circumstances which affect the future use of coal, it is difficult to arrive at one projection. The Congressional Research Service has suggested that a doubling of coal production to about 1.1 to 1.3 billion tons by 2000 is optimistic but possible. In its First National Energy Plan, the Department of Energy projected a tripling of coal production by 1995. The Second National Energy Plan (NEP II) projects an increase of 150 percent for all uses of coal (direct use, electrical generation, and synthetic fuels) by the year 2000, assuming a high world oil price. Table 4 shows the projected increases for coal and other sources of energy from NEP II. Table 5 describes the economic assumptions used in developing the projections for NEP II.

The Michigan Energy Resources and Research Association has used a coal production level of about 2.5 times current production as a base for projection for Michigan. The Department of Energy projections assume economic growth of about 3 percent per year, close to the recent average. They also assumed a lower price for oil than actually occurred. These two factors can work in opposite directions for examining the projections. If economic growth is less then 3 percent per year, this might decrease pressure to produce and use coal. If oil prices are higher, this would increase pressure for coal. Current economic conditions give little guidance on how to interpret the extent to which coal use will increase in the future. Coal has and is expected to increase substantially in its contribution to national energy needs. This will be dealt with further under Projections for Michigan below.

TABLE 4

TOTAL RESOURCE USE BY FUEL 1975 TO 2000[a]
NEP-11 HIGH WORLD OIL PRICE[b]

	1975		1990		2000	
	Quads	Percent	Quads	Percent	Quads	Percent
Total Energy Consumption	73.7		100.2		118.0[c]	
Coal						
Direct Use Plus Electricity	15.2		25.5		33.5	
Synfuels	0.0		0.2		5.5[d]	
	15.2	21	25.7	26	39.0	33
Oil						
Conventional Oil						
	20.4		19.6		16.0	
	0.0		1.8		3.3	
	0.0		0.4		2.5	
Imports	12.7		15.4		10.3	
	33.1	45	37.2	37	32.1	27
Gas						
Conventional Gas	18.5		16.9		14.6	
Unconventional Gas	0.0		1.5		4.0[e]	
Imports	1.0		2.4		1.7	
	19.5	26	20.8	21	20.3	17
Nuclear	1.8	3	9.7	10	16.5	14
New Sources[f]	1.6	2	3.2	3	6.0	6
Hydro/Geo	2.7	4	3.6	4	4.1	4

a Numbers may not add to totals because of rounding (does not include coal exports).
b April 1979 projections from SEAS FOSSIL II program based on NEP-II parameters.
c More recent projections indicated only 109 quads.
d Consists of 2.1 quads of liquid fuels and 2.4 quads of gas final product; remaining amount includes conversion losses.
e Data not regionalized in Appendix B.
f New source data from TASE scenario (see Section 2.5); includes direct solar, biomass, and wind.

SOURCE: U.S. Department of Energy, Energy Technology Scenarios for Use in Water Resources Assessments Under Section 13a of the Federal Nonnuclear Energy Research and Development Act, July, 1980, p. 5.

TABLE 5

MACROECONOMIC ASSUMPTIONS OF THE NEP-II HIGH SCENARIO*

	1977	1990	2000	Growth Rates (Percent) 1977-1990	1990-2000	1977-2000
GNP (Trillions of 1978 dollars)	1.90	2.92	3.80	3.4	2.7	3.1
Population (Millions)	216	245	262	1.0	0.7	0.8
Labor Force	94.8**	116	121	1.6	0.4	1.1
Per Capita Real GNP (Dollars)	8,780	11,900	14,500	2.3	2.0	2.0

* As projected by the SEAS model using NEP-II assumptions as input.
** 1975 estimate.

SOURCE: U.S. Department of Energy, Energy Technology Scenarios for Use in Water Resources Assessments Under Section 13a of the Federal Nonnuclear Energy Research and Development Act, July, 1980, p. 10.

TABLE 6

PROJECTED NATIONAL COAL TRANSPORT MODES*, 1985

MODE	Million Tons by Mode Percent of Total Moved						
	1975	1976	1985			2000	
			EEI	BOM	NEP	EEI	BOM
RAIL	418 65%	431.1 63.5%	503 64.5%	637 64.5%	780 65%	608 64.5%	1,023 64.5%
MOTOR VEHICLE	79 12%	89.8 13.2%	95 12.2%	120 12.2%	144 12%	115 12.2%	193 12.2%
MINE-MOUTH GENERATING PLANTS	74 11%	79.2 11.7%	89 11.4%	113 11.4%	132 11%	107 11.4%	181 11.4%
WATER***	69 11%	69.6 10.3%	83 10.7%	106 10.7%	132 11%	101 10.7%	170 10.7%
OTHER**	8 1%	8.9 1.3%	9 1.2%	12 1.2%	12 1%	11 1.2%	19 1.2%
TOTAL	648	678.6	779	988	1,200	942	1,586

NED - National Energy Plan
BOM - Bureau of Mines
EEI - Edison Electric Institute

* Primary Transport mode used to move coal from mine to final destination.

** Includes coal used at mine, taken by locomotive tenders at tipple, used at mine for power and heat; coal transported from mine to point of use by conveyor or tram; coal made into behive coke at mine; all other uses at mine; and coal shipped by slurry pipeline.

*** Includes barge transport on inland rivers and lake vessel transport on the Great Lakes.

SOURCES: Coal: A Data Book
The President's Commission on Coal, p. 195.

National Energy Transportation, Volume III-Issues and Problems, report prepared by the Congressional Research Service, March 1978, p. 58.

PROJECTED U.S. COAL TRANSPORTATION

According to projections by the Edison Electric Institute, the U.S. Bureau of Mines, and the U.S. Department of Energy for its National Energy Plan, both rail and water transport of coal are expected to increase their shares of coal movement only slightly. Rail is projected to increase from 63.5 percent in 1976 to 64.5 percent by 2000, while water transport will to rise from 10.3 percent to 10.7 percent over the same period. Table 6 gives projections for all the coal transportation modes.

THE GREAT LAKES STATES RELATIVE TO THE NATION

COAL USE

Measured on a heat content (Btu) basis, the Great Lakes states used 49 percent of the coal used nationally in 1976. The greatest coal use is concentrated in Illinois, Indiana, Michigan, Ohio, and Pennsylvania (see Table 7). In recent years, coal use has increased along with other fuel use.

COAL TRANSPORTATION IN THE GREAT LAKES REGION

Rail is the primary mode of coal transportation in the Great Lakes region. A substantial portion is transported by water. In 1977, over 39 million tons of coal and lignite were moved to or through Great Lakes coastal ports and waterways. During the same year, approximately 42 million tons were moved to or through ports or waterways of the Atlantic, Gulf and Pacific coasts. (Department of the Army, Corps of Engineers, 1977) See Table 8.

In 1980, the Port of Quebec is expected to handle 500,000 metric tons of U.S. coal transshipped from smaller lake carriers to larger oceangoing vessels bound for Europe. The coal is mined in Pennsylvania, shipped by rail to Lake Erie and then loaded onto lake vessels. In 1979, 50,000 metric tons moved in this manner through the Port of Quebec. The reason for this increased Great Lakes-Seaway coal movement is the upsurge in demand for U.S. coal abroad and the back up at the coal docks along the Atlantic coast. (Journal of Commerce, August 1980)

TABLE 7

GREAT LAKES CONSUMPTION
(Thousand Tons)

STATE OF DESTINATION	1976 SHIPMENT TO					1985 SHIPMENT TO				PERCENT INCREASE FROM 1976 TOTAL
	Elec. Util.	Coke and Gas Plants	Ret. Deal.	All* Others	Total	Elec. Util.	Coke and Gas Plants	All* Others	Total	
NEW YORK	5980	5157	20	2405	13562	12004	6408	7253	25665	89.24
PENNSYLVANIA	37249	23281	192	3870	64592	44620	26669	19459	90745	40.49
OHIO	50130	12505	692	7637	70964	64959	15181	40180	120320	69.55
INDIANA	29239	12450	363	3785	45837	41279	15786	16388	73453	60.25
ILLINOIS	35011	2735	537	3172	41455	43556	3596	15748	62900	51.73
MICHIGAN	21197	4493	248	3867	29805	24744	4449	15789	44982	50.92
WISCONSIN	10978	268	308	2017	13571	20266	278	8279	28823	112.38
MINNESOTA	10448	647	90	1137	12322	20485	842	3586	24913	102.18
REGION TOTAL	200232	61536	2450	27890	292108	271913	73209	12668	471804	61.52

*Includes Industrial

*Includes industrial, residential, and commercial

SOURCE: COAL: A DATA BOOK, The President's Commission on Coal pp. 34-35

Assumptions for the table above include:

1. Railroads are expected to remain the dominant transport mode through 1985 since long haul movement of coal will increase. By 1985 rail transport of coal will increase by approximately 2/3 over current levels.

2. Western rail transport is expected to increase 300 to 400 percent by 1985. Increases in unit train movements are expected, particularly in the West.

3. Western coal may move by water after it is railed to ports on the Great Lakes and the Mississippi River. Increased tonnage will be shipped to Detroit via the Great Lakes, Chicago via the Illinois waterway, and the South and Southwest via the Mississippi, Tennessee, and other rivers.

4. No critical problems in terminal/transfer capacity, fleet expansion, or equipment supply are anticipated through 1985.

5. Major constraints to growth of coal traffic or traffic on inland water-ways are inadequate lock capacity, limited channel depth, and the age of the Great Lakes fleet.

6. Percent shares of coal transported by primary mode (i.e. moving the coal most or all of the way from mine to final destination) will remain virtually constant through 1985: rail = 65 percent; highway = 12 percent; water = 11 percent; mine-mouth generating plant consumption = 11 percent; and slurry pipelines and other = 1 percent.

TABLE 8

SUMMARY OF COAL MOVEMENT THROUGH THE GREAT LAKES PORTS V. TOTAL MOVEMENT THROUGH U.S. PORTS - 1977

	Total	Foreign Imports	Foreign Exports	Domestic Total
United States	211,955,680	1,721,678	53,937,596	156,296,406
Coastal Total	81,569,570	1,721,678	53,937,596	25,910,296
Great Lakes	39,147,171	18,912 (Overseas)	16,880,055 (Canadian)	22,248,204
Ocean	42,422,511	1,702,766	37,057,541	3,662,204

Coastal Total--refers to traffic from or to both Great Lakes and ocean or tidewater ports.
Great Lakes --refers to traffic originating or terminating in United States ports on the Great Lakes system.
Ocean --refers to traffic having a carriage over ocean or the Gulf of Mexico.

SOURCE: Waterborne Commerce of the United States - Part 5 - National Summary, U.S. Army Corps of Engineers, 1977.

A substantial volume, 43 percent, of the waterborne coal went to Canada. Large quantities of coal move from one end of the Great Lakes to the other, as well as between parts in the mid-portion of the system.

GREAT LAKES INDUSTRIAL COAL RECEIPTS

Industry that receives coal via the Great Lakes fall into six categories (U. S. Maritime Administration, 1980):

(1) Electric Utilities
(2) Salt Producers
(3) Cement and Chemical Manufacturers
(4) Coal Suppliers and Coke Manufacturers
(5) Paper Companies
(6) Steel/Iron Ore and Automotive Companies

These companies coal use is briefly described below.

(1) Electric Utilities

Five major electric utility companies receive 95 percent of the coal transported on the Great Lakes. About 1/3 is western coal. Major western coal deliveries will increase primarily at St. Clair, Michigan (4 million tons by 1985), and Dunkirk, New York. Utility use of eastern coal will increase by about 2.3 million tons during the 1980's.

(2) Salt Producers

Salt producers use coal to generate electricity for mining. They are not expected to increase their coal use much in the foreseeable future.

(3) Cement and Chemical Manufacturers

These manufacturers use coal to produce electricity for their operations. The four firms in this category collectively project a decline in coal use during the 1980's.

(4) Coal Suppliers and Coke Manufacturers

These coal suppliers and users expect an increase of 1 to 2 million tons annually by 1985.

(5) Paper Companies

Five paper companies use coal to generate electricity for their operations. These companies do not project a growth in coal deliveries.

(6) Steel/Iron Ore and Automotive Companies

Because of the current economic situation in the steel and auto industries and the production of smaller cars requiring less steel, collective coal use in these industries is not expected to increase during the 1980's. However, individual operations may expand while others contract, indicating that site specific circumstances may be different from the general situation.

In 1980, the Port of Quebec is expected to handle 500,000 metric tons of U.S. coal transshipped from smaller lake carriers to larger oceangoing vessels bound for Europe. The coal is mined in Pennsylvania, shipped by rail to Lake Erie and then loaded onto lake vessels. In 1979, 50,000 metric tons moved in this manner through the Port of Quebec. The reason for this increased Great Lakes-Seaway coal movement is the upsurge in demand for U.S. coal abroad and the back up at the coal docks along the Atlantic coast. (Journal of Commerce, August 1980)

ADDITIONAL DEMANDS FOR COAL IN THE GREAT LAKES REGION

Low-Btu coal gasification will demands for coal transportation in the region. According to projections of the Second National Energy Plan, under high world oil prices, the southwest Lake Michigan basin may use up to 7.3 million tons (175.02 trillion Btus) of coal for production of low Btu coal gas by the year 2000. Industry sources suggest that production of low Btu coal gas is competitive with other fuels at current prices. This suggests that additional production of low-Btu gas from coal could occur in the region.

The National Energy Plan's projections do not include specific sources of coal. Southeast Michigan could be a likely candidate location for low-Btu coal gas production due to its heavy industry. Coal could be delivered either by rail or water.

PROJECTED GREAT LAKES COAL TRANSPORTATION

Many projections have been made for Great Lakes shipments of coal. The projected waterborne coal movement for 1980 ranges from 43 to 106.7 million tons. See Table 9. Earlier projections of 1961, 1970 and 1973 obviously did not account for current circumstances with respect to oil supply and price. The most recent projection (1976) estimates a volume in 1980--81 million tons--that is twice as large as the volume that was moved in 1977 (the latest year that information is available for)--39 million tons. The 1980 economic situation in the Great Lakes region would suggest that 81 million tons is still too high. Given the variability of the region's economy, the uncertain future of coal gasification, and the uncertainty of continuing long-term movements of large quantities of coal for export through the Great Lakes-seaway system, it is difficult to draw conclusions about projected waterborne coal transport. As the region's economy picks up, more coal will probably move through the Great Lakes. This study's coal transshipment/unloading facility review (described below) and a national energy transportation study (U.S. Department of Transportation, 1980, p. 75) estimate that if coal shipments increase, coal transshipment facilities will need to be expanded at ports along Lake Superior, Lake Michigan, Lake Huron, the St. Clair River, and Lake Erie.

TABLE 9

PROJECTIONS OF U.S. GREAT LAKES SHIPMENTS OF COAL
(Millions of Short Tons)

		1970	1975	1980	1985	1990	1995	2000	2005	2010	2015	2020
Corps of Engineers (1961)	(1)	83.5	93.4	106.7	114.6	124.9	130.3	135.0	139.6	143.2	148.5	--
Bureau of Mines (1970)	(2)	53.0	58.0	62.0	66.0	69.0	73.0	--	--	--	--	--
IBLLB - High (1973)	(3)	61.0	--	83.0	--	--	134.0	134.0	--	--	--	134.0
- Medium	(4)	53.0	--	62.0	--	--	74.0	74.0	--	--	--	74.0
- Low	(5)	44.0	--	43.0	--	--	43.0	43.0	--	--	--	43.0
Kearney (1976)*	(6)			81.0	--	104.5	--	105.1	--	149.2	--	170.5

* NOTE: The Kearney projections are for domestic traffic only.

SOURCES: Wisconsin University Sea Grant Program (1976). The Great Lakes Transportation System. Technical Report 230.

U.S. Army Corps of Engineers, North Central Division (1976). Great Lakes/St. Lawrence Seaway Traffic Forecast Study. Summary Report.

MICHIGAN COAL PROJECTIONS

RECENT USE

Coal in Relation to Other Fuels

In Michigan coal accounts for over 30 percent of all energy used. (See Table 10). Petroleum accounts for 36 percent; natural gas, 30 percent; hydroelectric and nuclear, 4.5 percent; and other sources, under 4 percent. From 1972 to 1977, Michigan's coal use averaged just under 6 percent of the nation's. Over this period, however, Michigan's percentage of national coal use has fallen from 7.04 percent to 5.09 percent (MERRA, 1980, p.54).

Coal for Electrical Generation and Other Uses

Over the last twenty years, the major use of coal in the United States and Michigan has been for producing electricity. About 70 percent of the coal used in Michigan is used by utilities to generate electricity. Non-utility production of electricity would raise this percentage. The Detroit Edison Company generates nearly 60 percent of Michigan's coal generated electricity, the Consumers Power Company generates about 30 percent, and the remainder is generated by eleven other firms. In the Detroit Edison service areas alone, about 90 percent of the company's power generation is from coal. Figure 3 gives an overview of this coal use. Current (1978) Michigan use of coal is about 29 million short tons.

In 1977, total energy consumption in Michigan was 2,882.8 trillion Btus. Electric utilities consumed 504.6 trillion Btus, 17.4 of the total. By comparison, electric utilities' use of fuel oils was 3.2 percent of the energy used in the state, while utilities' use of natural gas was 1.6 percent of the total. Currently, 70 percent of the coal used in the state produces 65 percent (504.6 trillion Btus) of the energy consumed in generating electricity in Michigan. Coal accounts for 27 percent (213.6 trillion Btus) of energy used by the state's industry. Industry uses 27 percent of the coal consumed in Michigan; commercial and residential coal users consume less than 1 percent.

Relative to coastal considerations, Michigan receives more coal by water than any other Great Lakes state. This focuses attention on Michigan shoreline use by future coal unloading and transshipment facilities. Reinforcing the demand on coastal areas, Michigan has the highest percentage of electric generating capacity already located in its coastal counties, 88 percent (16051 MWe). Of this, 63 percent are coal facilities, or 55 percent of its total electric generating capacity. With respect to facilities under construction or planned from 1980 to 2000, 71 percent (3491 MWe) of the additional future electric generating capacity will be located in coastal counties, and 67 percent of this coastal capacity will be coal-fired.

Transportation and Delivery of Coal to Michigan

Rail has been the predominant made of coal delivery to Michigan for over 25 years. However, water delivery has increased just recently, primarily due to western coal delivery (see Table 11). In 1975, rail delivery accounted for nearly 60 percent of the coal shipped to the state. Of this amount, about 83 percent (approximately 50 percent of the total) is delivered to electric utilities. The remaining 40 percent was shipped by water. By 1979, rail deliveries approached nearly 53 percent while water was 47 percent, with trucks, accounting for less than 1 percent.

Over this same time, 1975 to 1979, the proportion of coal transported to electric utilities increased from 2/3 to 3/4, while total coal delivery only increased from 31.3 million short tons to 32.4 million short tons. This increase in utility use was coincident with a decline in coal delivered to coke plants. One reason for the decline in the production and delivery of domestic coke and reliance on imported supplies is the environmental regulations affecting plant location and operation in the United States. This has shifted the coke source from domestic to foreigh import. (Communication, U.S. Maritime Administration)

TABLE 10

PATTERNS OF ENERGY CONSUMPTION IN MICHIGAN 1977

Prepared by the Energy Data and Modeling Division
of the Michigan Energy Administration

1977 USES / FUELS	(L.P.G.) Liquefied Petroleum Gases	Gasoline	Distillate and Diesel Fuel	Jet Fuel	Residual Fuel Oil	Total Petroleum Products	Natural Gas	Coal	Hydro and Nuclear	Other[1]	Electricity	Total (In Trillions of Btus)
	Millions of Gallons						MMCF	1000's Tons	Trillion Btus		Billions of Kwhs	
Residential	243.2 (23.2)	0 (0)	697.1 (96.7)	0 (0)	0 (0)	940.3 (119.9)	333,651 (340.7)	173 (4.4)	0 (0)	0 (0)	21.9 (74.7)	(539.7)
Commercial	27.0 (2.6)	0 (0)	302.8 (42.0)	0 (0)	148.0 (22.2)	477.8 (66.8)	171,015 (174.6)	101 (2.5)	0 (0)	33.9 (33.9)	16.0 (54.6)	(332.4)
Industrial	33.0 (3.1)	73.6 (9.2)	154.4 (21.4)	0 (0)	180.4 (27.0)	441.4 (60.7)	299,276 (305.6)	8,485 (213.6)	0 (0)	79.1 (79.1)	32.5 (110.9)	(769.9)
Transportation	3.0 (0.3)	4,859.6 (607.2)	328.7 (45.6)	218.8 (29.2)	11.6 (1.7)	5,421.7 (684.0)	4,617 (4.7)	0 (0)	0 (0)	0 (0)	0 (0)	(688.7)
Agricultural	48.6 (4.6)	37.7 (4.7)	59.9 (8.3)	0 (0)	0 (0)	146.2 (17.6)	342 (0.3)	0 (0)	0 (0)	0 (0)	.3 (1.0)	(18.9)
Electric Generation	0 (0)	0 (0)	77.1 (10.7)	0 (0)	556.5 (83.3)	633.6 (94.0)	46,174 (47.1)	20,047 (504.6)	128.7 (128.7)	0 (0)	70.7 (-241.2)	(533.2)
Total	354.8 (33.8)	4,970.9 (621.1)	1,620.0 (224.7)	218.8 (29.2)	896.5 (134.2)	8,061 (1,043.0)	855,075 (873.0)	28,806 (725.1)	128.7 (128.7)	113.0 (113.0)	0 (0)	(2,882.8)

[1]Includes Asphalt, Road Oil, Feedstocks and Petroleum Coke.
All numbers in brackets are shown in trillions of Btus.

SOURCE: Michigan Energy and Resource Research Association, Toward a Unified Michigan Energy Policy, 1980, p. 27.

TABLE 11

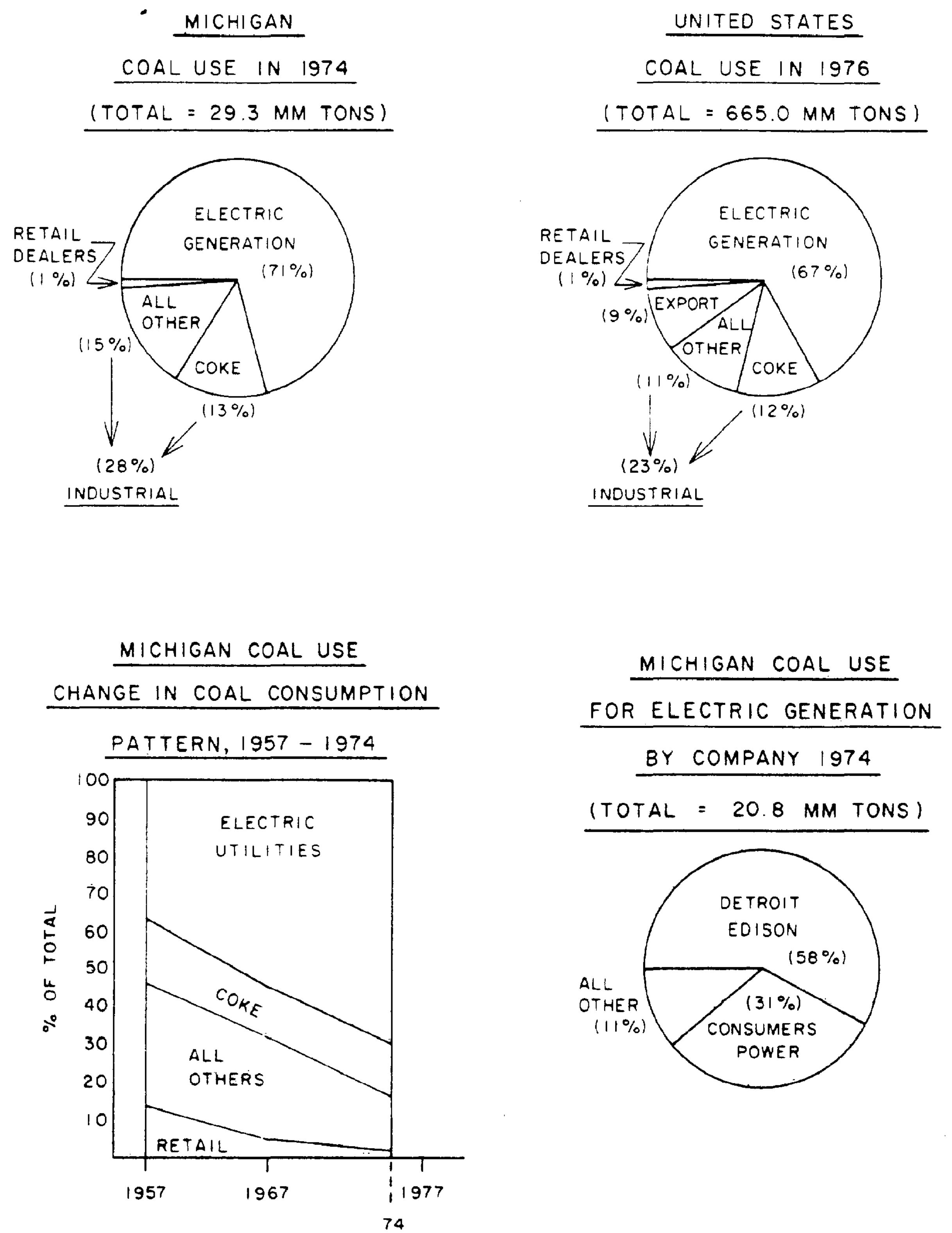
Shipments of bituminous, subbituminous, and lignite coal to Michigan 1975-1979
(In Thousand Short Tons)

	Electric Utilities	Coke Plants	Other Industrial	Retail Sales	Total
1979					
All-rail	13,879	674	2,381	30	16,963
Water	10,167	3,352	1,863	4	15,385
Truck	2	-	33	1	36
Total 1/	24,047	4,026	4,276	35	32,385
1978					
All-rail	13,664	829	1,826	40	16,360
Water	7,527	2,099	1,485	34	11,143
Truck	1	-	104	-	105
Total 1/	21,192	2,928	3,415	74	27,608
1977					
All-rail	13,438	728	2,256	159	16,581
Water	7,721	3,301	1,191	-	12,213
Truck	6	-	-	1	7
Total 1/	21,165	4,029	3,447	160	28,801
1976					
All-rail	14,558	922	2,214	224	17,918
Water	6,639	3,571	1,653	24	11,887
Truck	-	-	-	-	-
Total 1/	21,197	4,493	3,867	248	29,805
1975					
All-rail	15,523	755	2,201	262	18,741
Water	6,279	4,588	1,682	-	12,549
Total 1/	21,802	5,343	3,883	262	31,290

1/ Data may not add to totals shown due to independent rounding
Source of Data: Form EIA-6, Department of Energy.

FIGURE 3

COAL USE OVERVIEW



SOURCE: Michigan Energy and Resource Research Association, <u>Toward A Unified Michigan Energy Policy</u>, 1980, p. 128.

While transport mode is determined mainly by cost, other factors also affect it. It is cost-effective for western coal to be transported by rail to Superior, Wisconsin, and then by water to Detroit Edison facilities at St. Clair. However, at the Monroe plant water delivery is dictated by power plant operation. At that facility, rail unloading capacity and track holding of rail cars for high-sulfur coal from Kentucky is limited, so low-sulfur coal from Kentucky is moved by rail to Toledo and then by water to the power plant. The transshipment at Toledo makes the transportation cost of the low-sulfur coal more expensive. The two types of coal are blended at the power plant to meet air quality standards.

Figures 4 through 6 show the incidence of coal movemrnt in the state. The predominant movement and delivery of coal occurs in coastal areas.

Source of Michigan Coal

Eastern Kentucky provides about 38 percent of the coal used in Michigan. Other sources of coal for Michigan are Ohio, West Virginia, Virginia, Illinois, Pennsylvania, Wyoming and Montana. Western coal (from Wyoming and Montana) use in Michigan rose from 4 percent in 1973 to 12.3 percent in 1979. (MERRA, 1980, p. 25).

MICHIGAN PROJECTIONS

Review of Projections and Assumptions

Several projections have been made for Michigan's coal consumption. In 1976, the U.S. Bureau of Mines projected that Michigan would consume 36.0 million tons in 1980 and 61.5 million tons by 1985 (U.S. Bureau of Mines, 1976), a projected increase of 71 percent in five years. The Bureau of Mines 1980 projection will probably be about 5 million tons too high, given 1978 coal consumption to be 29.0 million tons, 1979 coal deliveries of 32.4 million tons, and the effects of the recession on energy use by industry in 1980.

FIGURE 4

MICHIGAN RAIL NETWORK

MAJOR COAL ROUTES - 1978

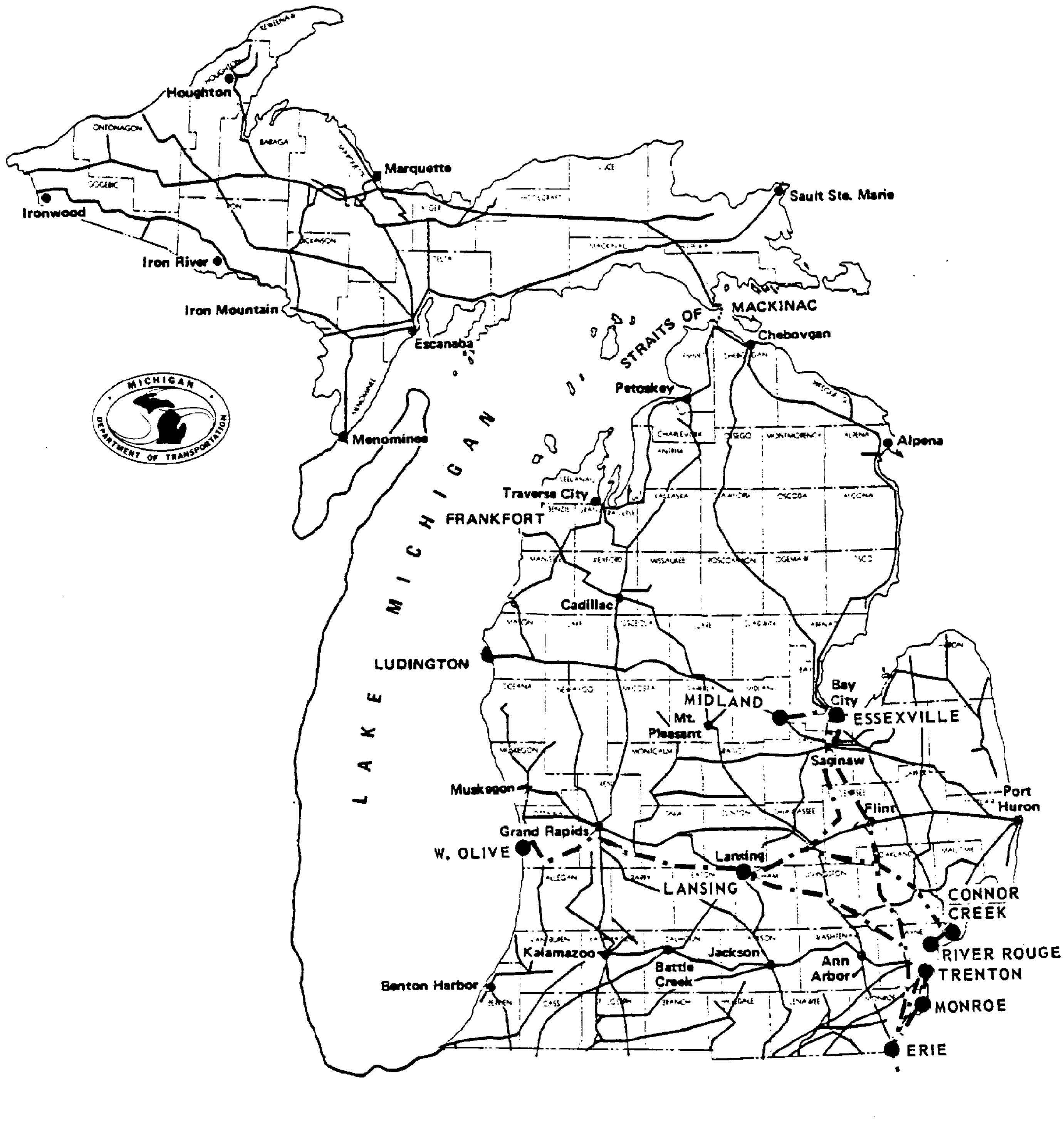
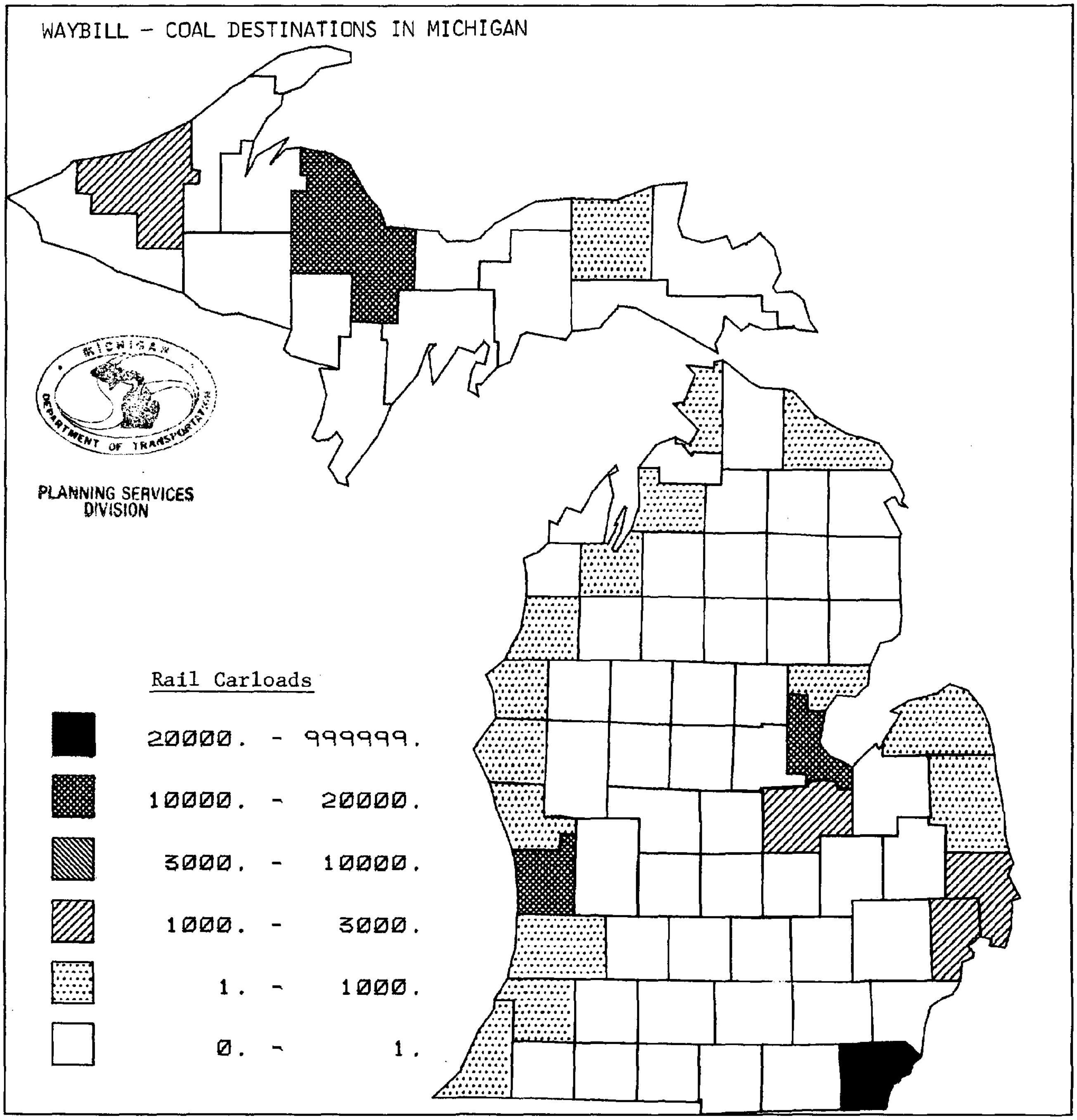


FIGURE 5

COASTAL COUNTIES RECEIVING COAL BY RAIL IN 1975
(In Carloads)*

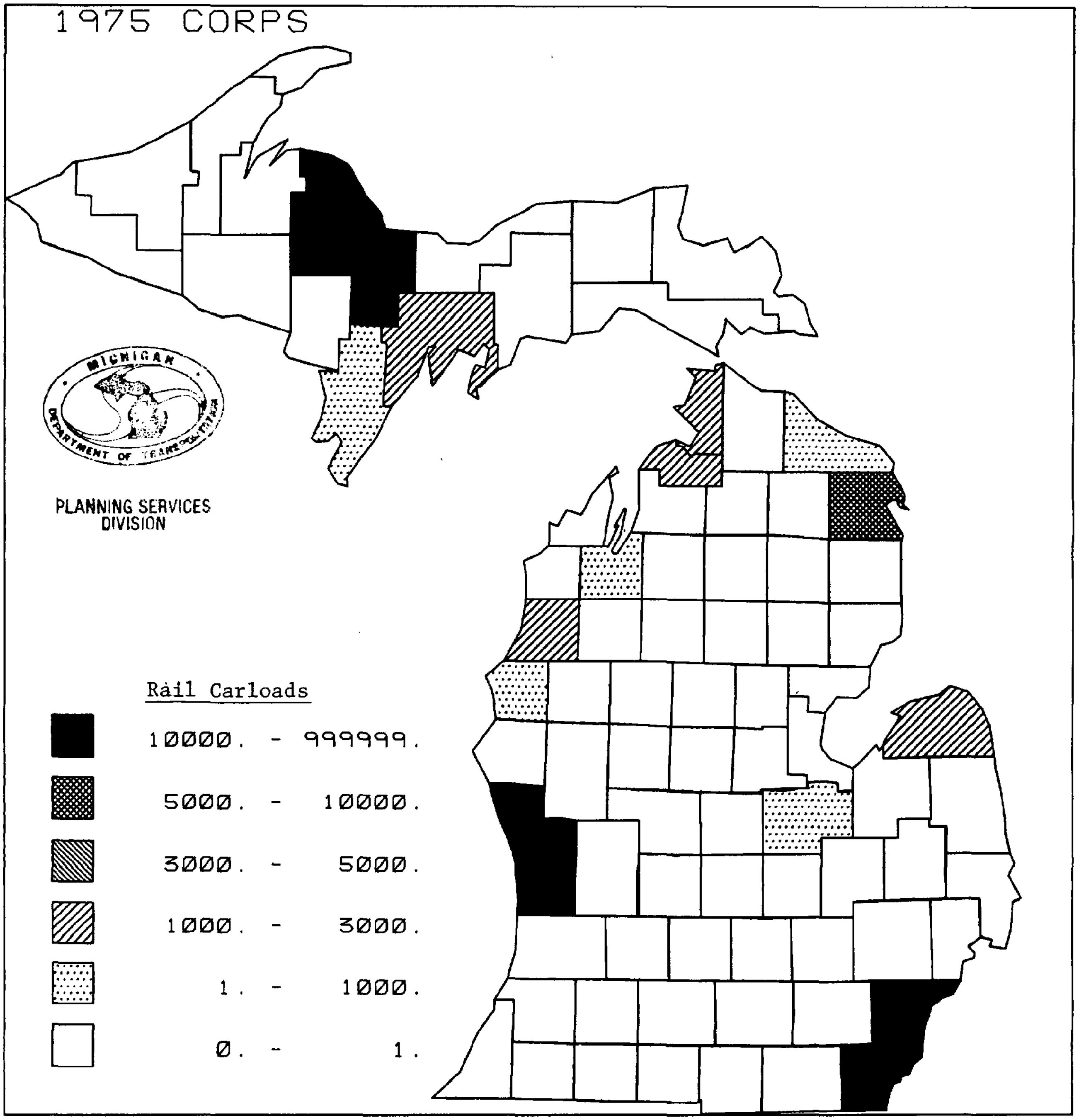


* One carload equals one hundred tons.

FIGURE 6

COASTAL COUNTIES RECEIVING COAL BY WATER IN 1975

(In Carloads)*



* 1 Carload equals one hundred tons.

The Michigan Energy Resources and Research Association report "Toward A Unified Michigan Energy Policy" is the best source for energy projections for Michigan. Based on national coal production, the Association projects coal use by the year 2000 to be 37 to 47 million tons/year for electric utilities, 10 to 20 million tons/year for industry, 5 million tons/year for lake, and 5 million tons/year for synthetic fuels. The projections total about 67 million tons/year. The assumptions on which these projections are based include:

1. National coal consumption will be between 1200 and 1800 MM tons by 2000. Probability is low of extending much beyond this range.

2. Michigan coal consumption will increase proportionally to national coal consumption. This assumes that Michigan can diversify its industrial base and/or retain its status as a major industrial state.

3. Industrial use of coal (expressed as a percent of the total coal use) will range between doubling and halving its current percent of total coal use by the end of the century.

4. Synthetic use of coal will be about 10 percent of coal use nationally, and 7 percent of coal use in Michigan by 2000. Due to major roadblocks, primarily in a financing, coupled with long lead times for the development of a viable synthetic industry, the current estimates of our synthetic fuel prospects are down considerably from estimates made a few years ago.

5. The use of coal for coke for steel making will remain steady or increase moderately in absolute terms, but decline somewhat in percentage terms by the end of the century.

Evaluation of Projections

Overall, these assumptions appear reasonable. However, specific information behind the assumptions points to ways in which extrapolation of national trends to Michigan may be inappropriate. First, Michigan currently uses a higher percentage of coal for its overall energy needs. Nationally, coal supplied 17.7 percent of the energy consumed in 1978. In the same year, coal supplied 26 percent of Michigan's energy needs. Electric generating that uses coal as its principal fuel in Michigan accounts for 61 percent of the state's capacity. Additional coal-capable units account for less than 18 percent of Michigan's electric generating capacity. However, elsewhere in the

United States, the percent of coal-fuel generating capacity is lower, such as in New York with 12 percent, and the coal-capable capacity is higher. This suggests that Michigan may not have the flexibility or capability to double coal use in electrical generation, which is the largest coal using sector. However, focusing on capacity alone can be misleading since the most efficient generating units are used to meet demand at any point in time, and power is bought from and sold to power companies outside the state. Coal is used to generate about 70 percent of the electric power in Michigan. (MERRA, 1980, p.28)

Additional information also provides insights into this situation in Michigan:

ENERGY-USING SECTOR	MAJOR ENERGY SOURCE(S)	% OF SECTOR'S ENERGY NEEDS - 1977
Transportation	Petroleum Products	99 %
Agriculture	Petroleum Products	93 %
Residential	Natural Gas	63 %
	Petroleum Products	22 %
Commercial	Natural Gas	53 %
	Petroleum Products	20 %
Industrial	Natural Gas	40 %
	Coal	28 %
Electric Utility	Coal	65 %
	Hydro and Nuclear	17 %

Energy consumption in Michigan in 1977 was 2882.8 trillion Btus. The industrial and electric utility sectors together account for 45 percent of the state's total. In these two sectors combined, coal constitutes 55 percent of their energy consumption and 99 percent of all coal used in the state. As noted elsewhere, coal provides nearly 70 percent of the energy used by utilities.

It appears that the wide range of assumed industrial use of coal (MERRA, 1980) above is due to uncertain and divergent courses of action in the future: (1) a halving of industrial coal use might be due to conservation and cogeneration, and (2) a doubling of industrial coal use might be due to boiler conversion from oil and gas to coal. However, a recent study (U.S. Environmental Protection Agency, 1980) reveals that few industries will convert to coal over the next 20 years. These trends are expected to continues.

Michigan coal-fired electric generating capacity is 11,161 megawatts. Coal-capable generating capacity under construction or planned to the year 2000 would increase this by about 50 percent over the next twenty years. This clearly suggests that Michigan coal-fired electric generating capacity will not double by the year 2000. Taking into account that (1) enforcing coal conversion orders is less than 100 percent due to exemptions and the economics of each case, (2) the capacity of the power system is 70 percent due to reserve requirements and operating capabilities, and (3) a long lead time is needed to bring generating plants on line, Michigan utilities probably will not double coal use as projections would indicate. This conclusion is more significant because electrical generation is the major coal user in the state. With current high costs of converting from oil and gas to coal, and other factors outlined in Appendix E, other industries are not expected to quickly convert to coal. Thus, Michigan will probably not move with the rest of the country in doubling coal use by the year 2000, unless major increases are made in other industrial sectors. A more reasonable and practical estimate is a 50 percent to 75 percent increase by the year 2000. However, the revised Second National Energy Plan projects about a 150 percent increase in total coal use by the year 2000. This would be consistent with MERRA's methodology.

Other industries do not expect to expand their coal use substantially in the foreseeable future. Over time, as production increases, coal use will increase, but the extent is not clear, particularly with the state's dominant auto industry producing small cars in many locations outside Michigan. Thus, future coal use by other industry in part stems from the business climate the state provides by tax and employment compensation laws and by labor initiatives. At this time, it is difficult to determine which direction these will take and what the results will be for coal use.

Industries' future demand for coal can be both direct and indirect. The indirect demand might be in the form of synthetic fuels. While not projected by the U.S. Department of Energy, southeast Michigan could be a likely candidate location for low-Btu coal gas production due to its heavy industry. If gasification facilities were built in southeast Michigan, would probably result in the construction of additional coal docks. The probability of this occurring is not certain, but several proposals for producing synthetic gas from coal have been made in the Great Lakes region.

COAL TRANSPORTATION IN MICHIGAN

Water: Michigan's Connecting Channels and Locks

The Great Lakes connecting channels and locks for waterborne commerce in the upper Great Lakes are all in Michigan's coastal zone. They include the St. Marys River and the Sault Ste. Marie Locks connecting Lake Superior and Lake Huron, and the St. Clair and Detroit Rivers which, along with Lake St. Clair, connect Lake Huron and Lake Erie.

Coal represents nearly one-fifth of the tonnage transported on Great Lakes waterways. From 1975 to 1978, domestic coal movement on the Great Lakes increased by 1.2 million tons from 21.8 to 23.0 million tons. In 1978, eastern coal was 87 percent of the domestic waterborne coal traffic, with about 85 percent loaded at Ohio facilities and the rest at Chicago. The major western coal movements are from Superior, Wisconsin, to St. Clair, Michigan, and to Marquette, Michigan. Coal delivered to Port Huron has increased from 1.1 million tons in 1975 to 2.7 million tons in 1979. An additional 4.0 million tons is expected by 1985.

Most coal on the Great Lakes which is delivered to Michigan moves through three connecting channels all located along Michigan's boundary with Ontario. These channels are: the St. Marys River, the St. Clair River and the Detroit River. Over the last 25 years, the peak combined tonnage moved through these waterways was about 49 million tons in 1966. From 1973 to 1977 the coal tonnage has been relatively stable at 33 to 34 million tons annually. (See Appendix B) The 1977 tonnages are given below:

Waterway	1977 Tonnage (short tons)
Detroit River	12,891,683
Gray's Reef Passage	417,880
Keeweenaw Waterway	73,844
St. Clair River	11,405,652
St. Marys River	8,205,491
TOTAL	32,994,550

The largest increases are expected through the St. Marys River and the St. Clair River as western coal use increases by 4 million tons between Superior, Wisconsin and Detroit Edison's facilities along the St. Clair River. However, if coal gasification occurs in the western Lake Erie Basin, more eastern coal may move through the Detroit and St. Clair Rivers to supply this potential demand.

Currently, vessels in the 1000-foot category carry the coal that moves from Superior, Wisconsin, down to the Detroit area. The connecting channels (exclusive of navigation locks) do not have capacity limitations for projected coal movement by vessels in the 1000-foot category or smaller to the year 2040. This is the case even with coal movements combined with projected movements of other commodities and goods. Due to channel configuration, vessels in the 1200-foot category would begin to constrain capacity through the St. Marys River if the Sault Ste. Marie locks could accomodate them by the year 2000, due to expected slower navigation in turns of the St. Marys River required for vessels of this size.

The Sault Ste. Marie locks will have capacity limitations by the early 1990's. For all commodities, assuming (1) a growing economy, (2) nine-month navigation season, and (3) that all waterborne coal is transported by larger vessels which must use the Poe Lock, the locks could reach capacity by the 1990's. A more slowly growing economy would put this date off several years. However, Corps of Engineers projections, even with this capacity constraint, provide for a growing movement of western coal from 17 million short tons in 1980 to nearly 31 million tons in 1992-93 passing through the

TABLE 12

SAULT STE. MARIE (SOO): UNCONSTRAINED TRAFFIC, LOCK CAPACITY, TONNAGE LOST, TOTAL TRAFFIC BY COMMODITY GROUP
(thousands of short tons)

	1980	1987	1990	1992	1993	1995	2000	2020	2040
Total Soo Traffic									
9 Month Base									
Soo Poe Lock									
Unconstrained Demand	82,640	103,832	112,914	117,765	120,191	125,041	137,169	193,571	256,589
Lock Capacity	120,074	120,074	120,074	120,074	120,074	120,074	120.074	120,074	120,074
Tonnage Lost	-	-	-	-	117	4,967	17,095	73,497	136,515
Soo Other Loocks									
Unconstrained Demand	42,887	48,529	50,947	52,739	53,634	55,425	59,903	76,780	95,868
Lock Capacity	43,729	43,729	43,729	43,729	43,729	43,729	43,729	43,729	43,729
Tonnage Lost	-	-	7,218	9,010	9,905	11,696	16,174	33,051	52,139
10 Month Ice Free Operational Plan									
Soo Poe Lock									
Unconstrained Demand	83,387	104,716	113,858	118,746	121,190	126,078	138,299	195,195	258,835
Lock Capacity	135,592	135,592	135,592	135,592	135,592	135,592	135,592	135,592	135,592
Tonnage Lost	-	-	-	-	-	-	2,707	59,603	123,243
Soo Other Locks									
Unconstrained Demand	43,348	49,061	51,510	53,330	54,240	56,061	60,612	77, 826	97,242
Lock Capacity	51,009	51,009	51,009	51,009	51,009	51,009	51,009	51,009	51,009
Tonnage Lost	-	-	510	2,321	3,231	5,052	9,603,	26,817	46,233
12 Month Plan									
Soo Poe Lock									
Unconstrained Demand	83,387	104,716	114,292	119,703	122,164	127,088	139,400	196,768	261,002
Lock Capacity	135,592	135,592	159,946	159,946	159,946	159,946	159,946	159,946	159,946
Tonnage Lost	-	-	-	-	-	-	-	36,822	101,056
Soo Other Locks									
Unconstrained Demand	43,348	49,061	51,995	54,510	55,447	57,321	62,006	79,825	99,932
Lock Capacity	51,009	51,009	61,454	61,454	61,454	61,454	61,454	61,454	61,454
Tonnage Lost	-	-	-	-	-	-	552	18,371	38,378

TABLE 12 (Con't)

	1980	1987	1990	1992	1993	1995	2000	2020	2040
Iron Ore									
9 Month Base									
Soo Poe Lock									
Unconstrained Demand	65,602	78,255	83,677	87,141	88,873	92,336	100,996	144,850	200,431
Lock Capacity	89,098	89,098	89,098	89,098	89,098	89,098	89,098	89,098	89,098
Tonnage Lost	-	-	-	-	-	3,238	11,898	55,752	111,333
10 Month Ice Free Operational Plan									
Soo Poe Lock									
Unconstrained Demand	66,212	78,976	84,447	87,941	89,688	93,182	101,918	146,183	202,273
Lock Capacity	100,152	100,152	101,152	101,152	101,152	101,152	101,152	101,152	101,152
Tonnage Lost	-	-	-	-	-	-	1,766	46,031	102,121
12 Month Plan									
Soo Poe Lock									
Unconstrained Demand	66,212	78,976	84,760	88,741	90,503	94,028	102,841	147,516	204,116
Lock Capacity	100,152	100,152	117,563	117,563	117,563	117,563	117,563	117,563	117,563
Tonnage Lost	-	-	-	-	-	-	-	29,953	86,553
COAL									
9 Month Base									
Soo Poe Lock									
Unconstrained Demand	17,038	25,577	29,237	30,624	31,318	32,705	36,173	48,721	56,158
Lock Capacity	30,976	30,976	30,976	30,976	30,976	30,976	30,976	30,976	30,976
Tonnage Lost	-	-	-	-	342	1,729	5,197	17,745	25,182
10 Month Ice Free Operational Plan									
Soo Poe Lock									
Unconstrained Demand	17,175	25,740	29,411	30,805	31,502	32,896	36,381	49,012	56,562
Lock Capacity	35,440	35,440	35,440	35,440	35,440	35,440	35,440	35,440	35,440
Tonnage Lost	-	-	-	-	-	-	941	13,572	21,122
12 Month Plan									
Soo Poe Lock									
Unconstrained Demand	17,175	25,740	29,532	30,962	31,661	33,060	36,559	49,252	56,886
Lock Capacity	35,440	35,440	42,383	42,383	42,383	42,383	42,383	42,383	42,383
Tonnage Lost	-	-	-	-	-	-	-	6,869	14,503

TABLE 12 (Con't)

	1980	1987	1990	1992	1993	1995	2000	2020	2040
Grain									
9 Month Base									
Soo Other Locks									
Node Total	26,733	27,046	27,046	27,046	27,046	27,046	27,046	27,046	27,046
10 Month Ice Free Operational Plan									
Soo Other Locks									
Node Totals	27,669	28,681	28,844	28,937	28,985	29,079	29,315	29,428	29,428
12 Month Plan									
Soo Other Locks									
Node Total	27,669	28,681	30,146	30,786	30,835	31,364	31,609	32,390	32,624
GENERAL CARGO									
9 Month Base									
Soo other Locks									
Node Total	191	204	204	204	204	204	204	204	204
10 Month Ice Free Operational Plan									
Soo Other Locks									
Node Total	200	226	233	239	242	248	264	277	277
12 Month Plan									
Soo Other Locks									
Node Total	200	266	253	266	269	284	299	392	433

NOTE: The current format of the capacity model output does not permit allocation of capacity and tonnage lost for the three locks at the Soo which are smaller than the Poe Lock.

The assumption behind the capacity analysis is that the Poe Lock is reserved for Coal and Iron Ore exclusively.

Although some coal and iron ore are assumed to pass through the three smaller locks the amount is about 10 million tons or less and is not broken out in the Coal and Iron Ore totals.

Although the total Soo Capacity is held constant under the "Lock Capacity" line on the Total Soo Traffic analysis, there is continued growth in the General Cargo commodity group with the assumption that General Cargo displaces some lesser value bulk commodities (thus accounting for the growth of GC from 266 to 433 on the last line of the table).

SOURCE: U.S. Army Corps of Engineers, 1980.

locks. A ten-month navigation season would extend the time of capacity limits at the lock to about the year 2000 and could permit over 35 million tons through the locks, doubling estimated coal traffic in 1980. Year round navigation would extend the capacity limit to about the year 2010 with a throughput of over 42 million tons. Table 12 provides details of these projections.

Some interesting implications for coal movement in connecting channels result when assumptions about specific commodities are varied. If the future demand for iron ore levels off to the projected 1987 level in Table 12, about 10 million tons of capacity are available for other commodities, which could include coal. The reason for emphasizing coal here is that it is assumed that vessels hauling both coal and iron ore would be larger to take advantage of economies of scale. In any case, more coal could be moved on the upper lakes sooner, or the year of capacity limit of the locks could be extended for coal (or other commodities) beyond 1995 or even the year 2000 depending on the growth in demand for the commodities. This could be done without extending the navigation season. However a ten-month navigation season (which is not totally out of the range of possibility even without major navigation assistance such as icebreakers) could extend the capacity limit for a growing coal demand (combined with other commodities) well beyond the year 2000 if iron ore leveled off at the projected 1987 level of Table 12.

Thus, doubling western coal movement from the Duluth-Superior harbor area down the upper Great Lakes could be accomodated without major structural changes in the navigation system or major season extension (some routine icebreaking might still occur in to ensure normal levels of commerce in harbors). Dock handling capacity in Michigan could also accomodate such an increase if this additional coal were delivered at docks throughout the state and not concentrated at one location. (See Appendix C.) This is significant since Corps of Engineers and Coast Guard programs in Michigan's coastal areas must be consistent with Michigan's coastal management program. This analysis would suggest that the navigation system outside the harbors could accomodate increased coal movement over the next twelve to twenty years without a major policy conflict over season extension. Depending on the growth in demand for western coal, plans to accomodate coal movement through the locks beyond the year 2000 need to be prepared in the early 1980's because of the long lead time necessary for evaluation, design, and construction of structural changes and power plants and the establishment of markets for coal. [Note: The Detroit Edison Company, in its long-run projections, has assumed that in the 1980s reduction in electric demand in the auto industry caused by reduced steel use in the down-sizing of cars will be offset by increased demand for smaller domestic cars. Thus, this assumption of an electric utility is consistent with the possibility of a leveling of iron ore demand, assuming that most iron ore is used to produce steel for the auto industry.] [Assumptions for lock capacity: (1) 85 percent of maximum practical capacity with 24 hour operation and (2) capacity limit is reached at 6 hour delay per vessel.] Compared with other commodities moved on the Great Lakes, coal is relatively stable. The wide fluctuations of iron ore and grain since 1972 could provide a margin for expanded coal movement through the locks to and beyond the year 2000. This would also apply to the Welland Canal and the Seaway locks.

A large percentage of ships now use the Poe Lock, which is the largest lock at Sault St. Marie. The capacity limit for coal and other commodities at the Sault Ste. Marie locks could be further extended if coal were transported in smaller vessels through the other smaller locks at the Soo. These vessels would be in the 600- to 700- foot class. Unless no other low cost transport alternative existed, domestic receivers of coal would probably not use this possibility because larger vessels offer economies of scale. However, if the Poe Lock were temporarily not available due to a circumstance such as extended maintenance, traffic would have to be diverted through the smaller locks. This would mean that more transits would be made by smaller vessels through the smaller locks. Since the larger vessels carry western coal to St. Clair, Michigan, such a consideration may be important in the planning and cost of western coal delivered to Michigan in the future.

However, smaller vessels could serve the international trade in coal because they could navigate the Welland Canal and the St. Lawrence River, and consolidate their cargoes on larger ocean-going vessels at ports along the St. Lawrence River below the Seaway locks. Reducing shoreline effects from vessel passage would mean larger vessels making fewer transits of the connecting channels. But, if international demand for western coal shipped through the Great Lakes-Seaway system occurs, capacity at the smaller Sault Ste. Marie locks may not be available as soon as the late 1980's, according to the projections of Table 12. This traffic would have to compete with vessels serving domestic demand using the larger locks.

This situation assumes three additional factors: (1) that foreign demand for western coal will be served by traffic on the Great Lakes seaway system, (2) that larger (1000-foot) vessels will not be used to serve foreign western coal demand - involving two transshipments within the system in addition to the original loading and unloading due to vessel size constraints of the Welland Canal and the St. Lawrence River and (3) that the Welland Canal and St. Lawrence River have the capacity to serve this international traffic.

The Welland Canal is an obstacle in this international movement. For most purposes, the capacity of the Welland Canal has been reached. The Canadian Seaway Authority is attempting to increase its capacity through shunter service and all-weather navigation aids. However, if Canadian demand for iron ore is dampened or cam from a source beyond the seaway and the capacity can significantly be increased by these methods, capacity for several hundred thousand tons of coal could exist. Furthermore, lower Canadian demand for iron ore would also reduce a demand for eastern U.S. coal by the Canadian steel industry. The Welland could then be used to transport this eastern or the western coal to other foreign markets.

The St. Lawrence River locks can accomodate several million tons more of coal export movement. As on the Welland Canal, since this capacity could be available throughout the year and not limited by times of peak demand (e.g., grain movement in the late fall), such coal export traffic should not be a problem. (Communication: St. Lawrence Seaway Development Corporation, August, 1980) European coal users are placing increasing emphasis on sulfur dioxide control, which could increase the demand for western U.S. coal and low sulfur eastern coal. The European concern stems in part from a desire to reduce problems caused by acid rain. In 1979, 50,000 tons of Pennsylvania coal were exported out the seaway and in 1980 another 500,000 tons are expected to be shipped via the seaway to Europe. Contacts with public and private agencies and organizations indicate that the use of the Seaway for coal transport, including consolidation of small loads to larger vessels, to other foreign markets has not been as seriously evaluated (as it should be). However, as coal washing (to remove sulfur) technology improves and its cost is reduced, and is competitive with eastern and long-distance transported western U.S. coal, use of local coal in Europe and elsewhere may reduce projected demand for eastern and western U.S. coal. Furthermore, the competitiveness of the Seaway for transporting U.S. coal for export may depend on the stability of tolls on the Seaway.

It is possible that more eastern, and perhaps western, U.S. coal could move through the Great Lakes-Seaway system to foreign markets. Over the next ten to twenty years, this could be accomplished without a formal navigation season extension. If western coal was the source, Michigan's connecting would experience more vessel traffic and added shoreline erosion. The extent of erosion is not possible to evaluate within the scope of this study; it may be minimal. In any case, it would be difficult to separate the effects of increased waterborne coal traffic from those of other waterborne commercial traffic. Fortunately, much erosion can be controlled by enforcing speed limits, in connecting channels. Also, larger vessels making fewer passages would reduce the potential for such a problem. Benefits to the region, nation, and even Michigan would need to be evaluated in the context of lower oil imports, more reliable domestic fuel sources being available, and overall lower fuel costs in the near and mid terms by using coal instead of expensive foreign oil. If foreign demand for U.S. coal moving out the Seaway is significant, planning for expanding the Seaway's capacity should as soon as possible due to the constraint at the Welland Canal.

Rail Lines

The greatest concentration of rail transport and delivery of coal in Michigan is along the corridor from Toledo, Ohio, to Detroit, Michigan. This rail corridor also moves many other commodities and goods. Assuming even a modest growth in other commodities and goods in the future, this corridor could handle well beyond a doubling or tripling of coal movement, even under current conditions. (Communication, Michigan Department of Transportation).

Other locations in the state receive substantial volumes of coal by rail (as indicated in detail in Appendix C, "Review of Coal Unloading Facilities"). Rail lines serving these locations also have considerable unused capacity available for coal transport. Overall, rail transport capacity will not constrain future coal delivery to Michigan's coastal areas during the next 20 years.

Truck/Highways

Less than half of one percent of the coal shipments to Michigan come by truck. Most intrastate movements are twenty miles or less. The principal continuing movement of coal by truck is the transfer of coal from the waterside receiving dock of the Traverse City Light and Power Company on Grand Traverse Bay to the electric generating plant in Traverse City. Overall, highways have sufficient capacity to handle large increases in coal movement to Michigan's coastal areas, subject to weight and axle limits. Local conditions may restrict certain coal truck movements.

PROJECTED LOCATION AND TYPE OF COAL TRANSSHIPMENT FACILITY EXPANSION AND DEVELOPMENT

Coal transshipment facilities in Michigan will need expansion to accomodate increased coal movement in Michigan. To determine additional facility needs, companies, dock operators and port managers were contacted. Questions were asked concerning (1) known or perceived future coal demands for the facilities, (2) the origin and transportation connections of the coal moving to the facilities, (3) use and capacity of existing facilities, and (4) expected facility changes to handle future coal deliveries. The results of this coal transshipment facility needs review are in Table 13. The complete results are included in Appendix C. Figure 4 is a map of Michigan showing its planning regions refered to in Table 13.

TABLE 13

LOCATIONS OF INCREASED COAL DELIVERY AND PROJECTED COAL UNLOADING FACILITY EXPANSION AND DEVELOPMENT IN MICHIGAN COASTAL COUNTIES

REGION/COMPANY/CITY	POSSIBILITY FOR FACILITY EXPANSION	TO BE DELIVERED BY	TIMEFRAME
Region 1			
• Detroit Lime Co. -Detroit, MI	Yes	Lake Vessel	1981
• Detroit Edison Co. -St. Clair, MI	Not Needed	Lake Vessel (Rail)	--
Region 7			
• Detroit Edison Co. -Harbor Beach, MI	Yes	Lake Vessel	--
Region 10			
• Morton Salt Division -Manistee, MI	--	Lake Vessel	1980-1985
• Traverse City Light and Power -Traverse City, MI	No	Lake Vessel	1983-1993
Region 11			
• C. Reiss Coal Co.* -Sault Ste. Marie, MI	Not Needed	Lake Vessel	1980
Region 12			
• Delta Coal Dock* -Gladstone, MI	Yes	Lake Vessel	--
• C. Reiss Coal Co.* -Escanaba, MI	--	Lake Vessel	1980
• Marquette BOard of Light and Power -Marquette, MI	Currently Expanding	Lake Vessel	1982
Region 14			
• Verplank's Coal and Dock Co.* -Ferrysburg, MI	Yes	Lake Vessel	1981

TABLE 13 (Con't)

Region 14 (Con't)			
• Grand Haven Board of Light & Power -Grand Haven, MI	No	Lake Vessel	1983
• Consumer's Power -Muskegon, MI	No	Lake Vessel	1983
• Consumer's Power -West Olive, MI	No	Rail	1980

* These facilities are expected to operate under the "coal brokerage" concept. They will receive coal, store it, then load it again for further transportation in smaller volumes to individual purchasers.

A Note on Coal Use by Lake Vessel. While coal as a fuel for vessel transport has received renewed interest nationally, in the Great Lakes region it is not clear what the future of coal is as a fuel for the commercial water sector. If this use of coal again becomes significant, more locations around the Great Lakes will be used to unload, load, and store coal for lake vessels.

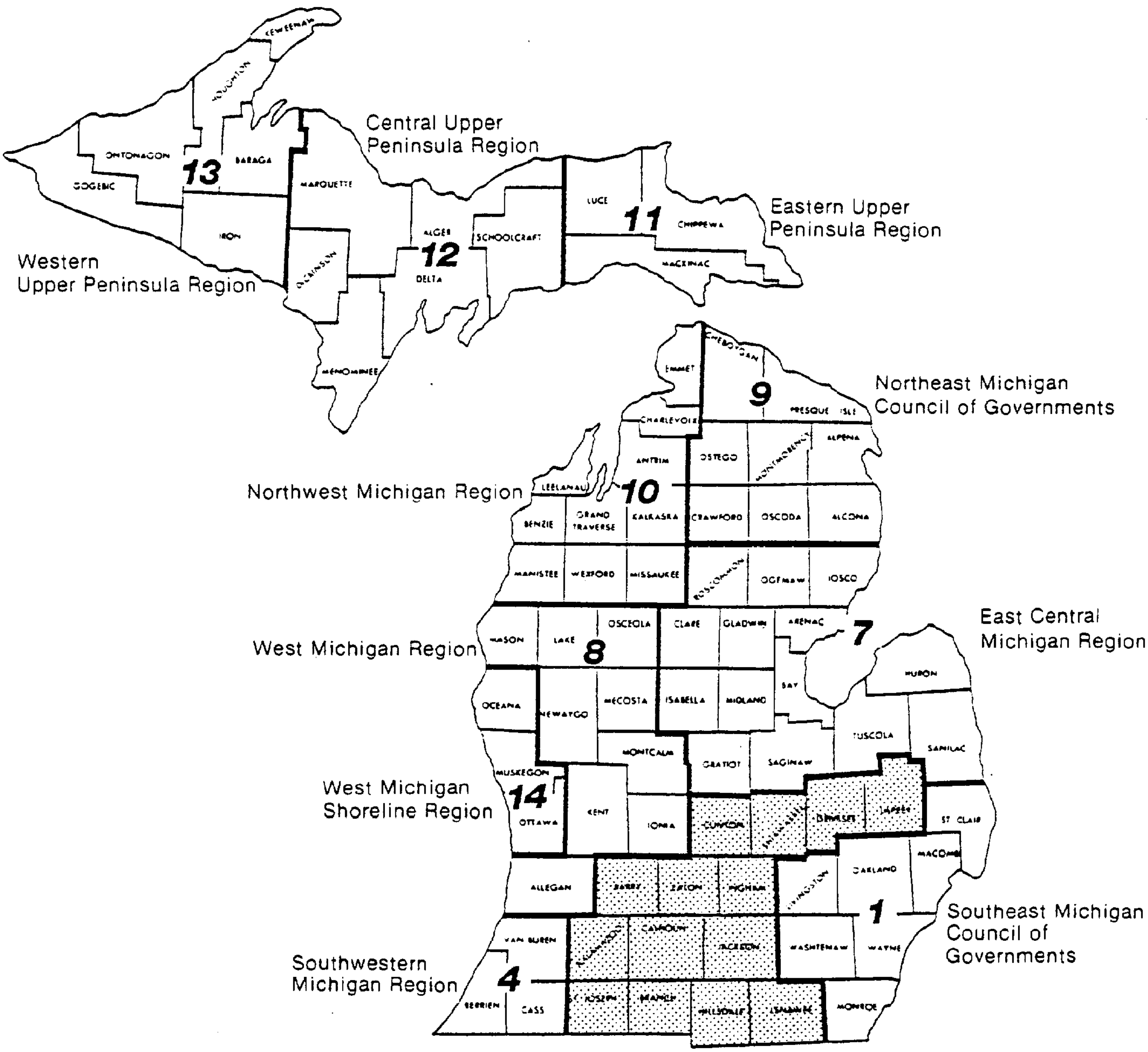
Conferences addressing coal as a significant marine fuel again in the future have reached "general agreement that (1) oil may not be available on a business as usual basis for ship bunkering in the near future, (2) it [oil's] quality is deteriorating rapidly, and (3) it is important to consider alternate fuels including coal and coal derivatives immediately." (Cleveland-Cliffs Iron Company, 1980) The Cleveland-Cliffs Iron Company is considering construction of a 1000-foot Great Lakes bulk carrier with boilers to be fired by either coal or oil. (Cleveland-Cliffs Iron Company, 1980) Currently, nine Great Lakes vessels use coal.

SUMMARY

Coal use in Michigan will increase, particularly in coastal areas. Coastal locations using coal are primarily served by water and rail transport. Thirteen coastal locations will increase deliveries of coal and five of these will require coal facility expansion during the 1980s.

FIGURE 7

MAP OF MICHIGAN'S REGIONS



SECTION III

EVALUATION STRATEGY AND GUIDELINES

Section III
EVALUATION STRATEGY AND GUIDELINES

INTRODUCTION

To evaluate proposals for coal unloading facilities in Michigan, a systematic approach is needed. On a site specific level, problems of land use in small communities and dust generation may be important, though overall the effects of coal transportation and unloading are expected to be minimal. The impacts of these activities however still must be viewed from a larger perspective of their significance in the coal production and consumption cycle and in the overall goods and commodities transportation system. Criteria for assessing the effects of mining coal and judging their relative importance must be considered.

COAL PRODUCTION AND CONSUMPTION CYCLE

The coal production and consumption cycle includes: availability of coal resources, demand for coal, mining/extraction, transportation, energy conversion, and consumption/end use. Most problems have been identified at the mining/extraction and conversion steps. Advances in reclamation and stronger state and federal laws have reduced mining-related land damage. With respect to conversion, most experts agree that reducing sulfur levels further in coal preparation and combustion is both technically and economically feasible. This will help mitigate the major problem with coal use -- sulfur dioxide emissions.

With respect to transportation, steps are taken in loading coal and handling it on site that reduce dust generation, such as washing coal before loading it at the mine, locating and shaping coal piles to reduce wind-blown dust, and placing straw on storage areas. Coal is inert, so any dust generated is more of an aesthetic problem than a chemical or biological concern. Water transport offers the least chance for coal dust generation since the holds are covered. Rail cars are uncovered but most coal is wet when loaded which reduces dust. The project staff observed coal being unloaded, transferred from storage to conversion, crushed, and groomed. At the sites which were observed, no coal dust could be seen, except for small amounts raised when coal was moved from a vessel unloading area to storage. It should be emphasized that this amount of dust was very small, and that the characteristics of shipments and other conditions will vary from site to site. However, if fugitive coal dust generation is minimized in unloading and handling, then potential problems with turbidity in adjacent water will be lessened in coastal areas.

Land based effects of coal transportation and unloading are principally rail corridor conflicts and shoreline access competition with other coastal users. Coal unloading facilities, along with the their associated coal-using plants are usually located away from sites of other coal facility activities to avoid conflicts. These unloading areas can require large amounts of land, however they can be situated to reduce the length of shoreline that they front on if sufficient area is available inland from coastal areas. That is, rather than being aligned linearly along the coast, unloading facilities and storage areas could be aligned perpendicular to the shoreline.

Most of the communities along rail corridors originally benefited from the presence of the railroads, yet the advent of longer and slower moving unit trains has intensified some undersirable results for communities. Measures can be taken, however, to reduce the effects of unit train transport and these are covered in the mitigation strategy below.

OVERALL COMMODITIES AND GOODS MOVEMENT

Coal is only one of many commodities and goods transported on the water, rail, and highway systems. The effects of coal transportation and unloading are often difficult to separate from the effects of transporting many other commodities and goods. Coal transportation does not dominate the use of any transport mode, but coal may be predominant in commodity deliveries to coastal coal-using facilities.

The effects of moving coal are not exclusive to coal. Other commodities being transported generate dust, have a greater potential for degrading water quality, and create land use problems. Generally, coal, in comparison with other commodites, is a safe commodity to transport and unload.

CRITERIA FOR ASSESSING THE SIGNIFICANCE OF EFFECTS

Throughout this report environmental and socio-economic problems have been addressed according to the activities contributing to them. However, there is a need to establish priorities when dealing with the entire range of effects on the environment. To do this, a systems approach may be preferable because some effects may not be severe over the whole spectrum of coal-related activities.

When looking at environmental and socio-economic effects, not all criteria for setting priorities are given equal weight in evaluation.

Although the scope of this study is general and generic, most of the impact criteria are determined on a regional basis. A high degree of objectivity is always desired when ranking problems, but a certain amount of subjectivity is involved because the study is regional and the information gathered is problem-specific and quantification is inherently difficult. This subjectivity can be reduced by doing a site-specific analysis.

The criteria for evaluating the effects of coal unloading/transshipment facilities in the coastal zone are:

- emphasis in literature -- the most severe effects are frequently cited and documented in the pertinent literature.
- personal communication with experts -- communication with recognized experts helps determine the most important effects. Experts include researchers, scientists, regulatory agency representatives, etc.
- magnitude of effect -- the term "magnitude" is used to mean degree, extensiveness or scale of effect. The analysis of magnitude of effect, although in some ways subjective, can nevertheless be factual and unbiased as long as it does not include weights that show preference or bias. (Lepold et al, 1973) Other considerations include the range or the physical area covered and the degree of importance to the environment.

- duration of effect -- refers to time frame of the effect on the environment (e.g., short term or long term). Of prime importance here is the ability of the natural system to return to its normal state after being affected. Aside from short-term and long-term effects, duration also refers to the continuousness or intermittence of an impact. So, duration of effect has to be looked at in relation to all of these causal factors affecting the environent.

- public (social) cost of effect -- refers to the human environemnt in relation to effects on the physical environemnt. Major adverse changes in the human environment can be interpreted as having a high social cost.

- coastal sensitivity -- attempts to separate coastal and non-coastal activities and the associated effects on the environment. Also, coastal sensitivity refers to the severity of effect associated with coal movement and storage specific to the coastal zone.

Based on these objective and subjective criteria, a summary of the potential environmental effects follows.

SUMMARY OF POTENTIAL ENVIRONMENTAL EFFECTS

This summary of environmental effects is intended to give the proposer and the reviewer an overview of the potential consequences that should be considered in evaluating a proposal for a coal unloading facility. No attempt is made here to indicate which effect is more important nor to suggest that coal should not be transported and used. The significance of effects will be dictated by the site-specific circumstances. The effects are also relative: what may appear to be very significant might be minor in the overall scheme of using coal or producing energy. Most experts concur that from an environmental standpoint, coal is a safe commodity to transport, unload and transship. A discussion of potential environmental effects of coal transport and unloading follows.

Fugitive Coal Dust Generation. Of all the effects associated with coal movement and storage in the coastal zone, fugitive dust generation will probably be the most important, affecting air quality, water quality, and terrestrial ecosystems.

Not much is known about the effects of coal dust in the atmosphere. The small amount of information that is available has focused on the adverse effects on human health, structures and materials, and economically important plants. (Dvorak et al, 1978) Also, little is known about the effects of coal dust on the natural ecosystem. Coal dust does have the potential to combine and react with other atmospheric pollutants to form various secondary pollutants, such as sulfate aerosols and peroxyacetyl nitrate (PAN). (Dvorak et al, 1978) In addition, coal fines in the atmosphere have the potential to sorb gaseous materials. These particles may then find their way into the lung tissues of humans and animals by being inhaled (communication, W.C. Sonzogni). The gases that are sorbed by coal often come from smelters and power plants, facilities that use coal or are found near coal storage areas.

Coal fines in the atmosphere contain a relatively high percentage of large size particles. Particles exceeding 25 n (microns) contain 50-85% of the total mass. These large particles settle quickly, but coal particles 5 n settle slowly and can be dispersed great distances by updrafts and turbulence. It is the smaller particles which are most likely to end up in the lower respiratory tract of humans and animals or to penetrate stomatal openings in plants, causing leaf necrosis. (Dvorak et al, 1978) For a more complete discussion of coal dust effects on the atmosphere see Technical Appendix G.

Waters may receive atmospheric coal dust through settling or from precipitation. The major concerns associated with coal fines in the water include increases in dissolved and suspended solids, and increases in trace elements. (Missouri River Basin Commission, 1979)

Coal dust may fall or be blown into a waterway during loading and unloading at a coal terminal. Turbidity is the parameter most likely to be severely affected during these operations. Increased turbidity may adversely affect aquatic ecosystems by decreasing phosynthetic activity in plants because of reduced light penetration, as well as contributing to the destruction and displacement of aquatic fauna by the depositing of a smothering blanket of particulates. (Dvorak et al, 1978).

Release of Toxics from Sediments. Toxic release from sediments can adversely affect water quality by altering the chemical equilibrium at the sediment-water interface, causing elevated BOD (biochemical oxygen demand), COD (chemical oxygen demand), and a reduction in DO (dissolved oxygen). (Commerce Division, Long Beach Harbor, 1978)

This may result from increased loadings of coal fines to a harbor, as well as from the resuspension of bottom sediments caused by dredging and vessel passage. The severity will depend upon the harbor dynamics (e.g., flow rate), the quality of the sediments, the hardness of the water, and several other site specific factors. (Commerce Division, Long Beach Harbor, 1978)

Aquatic Ecosystem Disruption. Changes in water quality can adversely affect aquatic ecosystems. Turbidity associated with spillage of coal and dredging can damage or kill aquatic organisms on the bottom of a harbor. (Commerce Division, Long Beach Harbor 1978) Potential pH changes associated with coal dust in a waterway may reduce the suitability of an area for aquatic vegetation, as well as for fish populations and spawning. (Dvorak et al 1978) Dredging activities and vessel passages also may disrupt fish spawning behavior. (Roy F. Weston Inc., 1974) For a more complete discussion of coal related activities affecting aquatic ecosystems see Technical Appendix G.

Erosion. Before construction of unloading/transshipment and stockpiling facilities, the area has to be graded, thereby stripping the entire site of existing vegetation. Loss of soils from erosion occurs during the removal, reapplication, and stockpiling phases of coal handling (Missouri River Basin Commission, 1979) Wind erosion may also be a problem on exposed soils, causing fugitive dust generation. This dust then falls on plant leaves decreasing transpiration and photosynthesis. (Szabi, 1978)

Erosion will also occur on shorelines, especially along rivers, conneting channels, and harbors, because of changing water levels, moving ice, and waves caused by vessel passage in connecting and contricted channels. (Valentine-Thomas & Associates, 1979) Although the amount of shore erosion occurring in a channel that can be attributed to vessel movement (and specifically to coal vessels) cannot be discerned in certain areas, it may be quite significant.

Associated with shoreline erosion is the problem of increased turbidity. Increased turbidity (as mentioned earlier) will contribute to the many associated problems of sediment loads as they affect the flora and fauna.

Noise. Noise is a potentially dangerous by-product of every aspect of coal transportation and storage in the coastal zone. The general effects that these noise levels will have on humans and other animals are unknown, but depend on several site-specific factors such as location and duration of impact. Physical environmental explanations of noise problems (i.e., adverse effects on heart rate, blood pressure, etc.) generally involve considerations of overstimulation. (Porteous, 1977) Much of the noise associated with coal unloading/transshipment is intense and of long duration, and may be confined to the site. For a more complete description of noise impacts see Technical Appendix G.

Land Resource Requirements. Land will be required for coal unloading and transshipment facility expansion along the Michigan coast. In most cases, this land is only a portion of the total land needed to complete the coal use process; i.e., a coal unloading facility is usually associated with a power plant or other coal-burning structure. The value of the coastal land for other purposes should be considered. Configuration of the coal unloading, handling and using structures must be considered in relation to efficiency of industrial processes and in relation to other coastal uses.

EVALUATION STRATEGY

The evaluation strategy covers the following activities related to coal unloading:

Part 1. Transportation

a. Water Transportation

b. Rail and Truck Transportation

Part 2. Facility Development and Operations

a. Dredging Activities
b. Dredge Material Disposal
c. Nearshore Construction
d. Facility Development for Land Delivery
e. Operations for On-site Handling of Coal

For each activity the following information is provided:

1. Activity Description
2. Potential Effects
3. Existing Policy Framework
4. Evaluation Guidelines
5. Potential Mitigation Measures
6. Policy Recommendations

This evaluation strategy was developed with the project reviewer in mind. A proposal can be traced completely through the evaluation process from transportation to coal storage, or beginning at an intermediate point. In order to make it convenient for the project reviewer and to make sure no potential effect, policy or mitigation measure is left out, the strategy has some intentional redundancy in its organization.

The effects of each activity, listed under "Potential Effects," will vary from site to site. Since this report is the result of a generic and not a site-specific examination of effects, the reviewer will have to use policies and procedures set down in the laws, rules, and regulations cited to evaluate site-specific proposals for coal unloading and transshipment facilities.

A Note on Potential Mitigation Measures

The potential mitigation measures described below reflect a comprehensive but not exhaustive list of efforts that can be taken to reduce the particular problem. Many of the measures are already used to reduce impacts from coal delivery and facility development. Some are exclusive while others are complementary. Not all will be cost-effective at every site.

These circumstances will need to be evaluated individually for each site. Appendix H gives a more detailed description of mitigation measures.

Since little cost information of use in a generic study like this was available for mitigation measures, the relative cost effectiveness of each measure could not be determined. The economics of each site along with other social and environmental considerations should determine the correct approach to take if the problem exists or is critical enough to require a remedy.

Furthermore, the consistency requirements of the coastal zone management program require that the activities of other state and federal agencies be consistent with the state's coastal management program. This consistency requirement can be used as a tool for assisting in the mitigation of any potential problems arising from coal transshipment facilities or expansions by incorporating this evaluation strategy in the review of proposed facilities or changes.

Part 1
TRANSPORTATION

WATER TRANSPORTATION

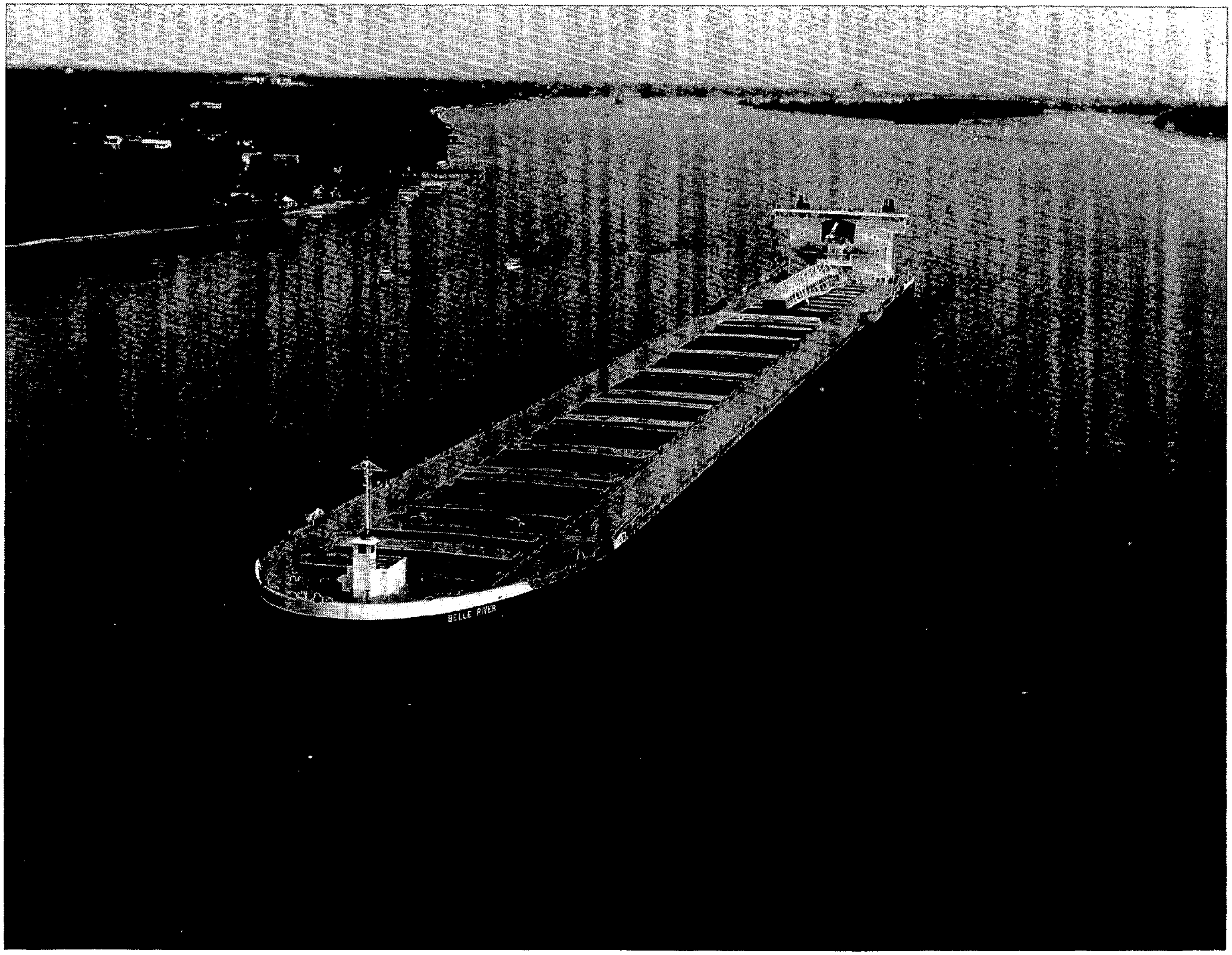
Activity Description

Water transportation of coal is defined simply as the operation of ships which carry coal. Supplementary evaluation guidelines for constructing vessel coal unloading facilities and for dredging, activities to enable vessel transport, are outlined in Section 2, Guidelines for Facility Development.

Potential Effects

Environmental impacts of waterborne coal transport are primarily of two types: movement impacts and discharge impacts. Movement impacts include land damage such as shore erosion, problems resulting from the resuspension of particulates, and structural damage to onshore facilities. The characteristics of ship operation which most directly determine these impacts are vessel speed and proximity of operation to the shoreline and channel bottom.

Discharge impacts refer to problems associated with bilge discharges, sanitary waste disposal, and ballasting; bilge discharge would probably be most important. Coal dust may find its way into the bilges of ships and could, if expelled, have an uncertain effect on the marine environment. Ballasting and sanitary waste discharge impact are believed to be not significant with respect to coal. Coal vessels do not store their cargo in ballast compartments, so coal dust would not be expelled with ballast discharge.



The Belle River - American Steamship's 1000 foot, 79,000 ton capacity self unloader serving Detroit Edison.
(Photograph courtesy of the Detroit Edison Company)

Existing Policy Framework

Movement Effects Policy

Federal

- Ports and Waterways Safety Act of 1972 P.L. 92-340

  Attempts to prevent damage to structures in, on, or immediately adjacent to the navigable waters of the United States or the resources within these waters.

With respect to the structural damage which may be caused by vessel operation within the coastal zone, the Ports and Waterways Safety Act gives the Secretary of Transportation the power to:

(1) prevent damage to, or the destruction of, any bridge or other structure on or in the navigable waters of the United States, or any land structure or shore immediately adjacent to such waters; and

(2) protect the navigable waters and the resources therein from harm resulting from vessel or structure damage, destruction, or loss.

Action taken pursuant to the prevention of such damage may include but is not limited to such measures as establishing water or waterfront safety zones or the enactment of other measures for limited or controlled access or activity when necessary for the protection of any vessel, structure, waters, or shore area. (33 USC Subsection 1225[a]).

Regulations promulgated by the Secretary of Transportation implementing the Ports and Waterways Safety Act are authorized under Section 1231 and may be found in Title 33 of the Code of Federal Regulations (CFR). (33 USC Subsection 1231[a]).

Title 33 of the CFR contains regulations relating in a general way to navigation safety, and enforcement authority. By regulating such variables as vessel speed, channel routes, and vessel size restriction, impacts of coal transportation such as shoreline erosion, resuspension of particulates, and on-shore structural damage may be minimized. Speed limits between specific geographical points and within individual harbors have been established pursuant to the act for many Michigan ports and waterways. These include: The St. Marys River (Part 92.49); Keweenaw Waterway (Part 162.115); St. Clair River (Part 162.135); Detroit River (Part 162.135); Rouge River and Short Cut Canal (Part 162.140); and various harbors on Lake Michigan (Part 162.120).

In addition to these limitations, part 164.15 of Title 33 contains general safety rules concerning the responsibility of vessel owners or masters while underway. Included in their responsibilities are consideration for the proximity of the vessel to fixed shore and marine structures, the comparative proportions of the vessel and the channel, the density of traffic, the damage that might be caused by the vessel's wake, and any local speed limits. All of these are variables of shoreline erosion, particulate resuspension and on-shore structural impacts.

Authority for enforcing the rules set forth in Title 33 can be found in Part 160. Part 160 states that the law enforcement responsibilities under the Ports and Waterways Act are held by the United States Coast Guard District Commander, "Captain of the Port", or an authorized representative of one of these. Violation of a regulation issued under the act carries a civil penalty of not more than $10,000.

Discharge Effects Policy

Federal

- Federal Water Pollution Control Act Amendments of 1972, P.L. 92-500

  Section 311--dealing with oil and hazardous substance liability--regulates the discharge of vessel bilge water containing such substances and may indirectly control the discharge of oily liquids containing coal fines.

Impacts other than those caused by the movement of vessels through the water would most likely constitute discharge impacts and would be related to water quality protection laws and regulations. The expulsion of coal dust containing liquids from vessels operating in the Great Lakes and connecting channels would have an uncertain impact on the environment, and clearly should be examined. Such discharge would probably occur, if at all, as a result of fugitive dust finding its way into a vessel's bilge, which often serves as a kind of "catch-all" for uncontrolled vessel wastes and seepage.

The discharge of polluting substances into the water of the United States is addressed under provisions within the Federal Water Pollution Control Act (86 Stat. 816,868). The expulsion of such substances by vessels falls under the jurisdiction of the Secretary of Transportation and the United States Coast Guard, and is addressed by Title 33 of the CFR. The discharge of liquid containing coal dust is not specifically addressed in these regulations, as it is not perceived to be a major problem. However, to the extent that coal dust mixes with other bilge that is regulated, it may be indirectly covered.

Parts 155.220, 155,340, 155.350, and 155.360 of the CFR require that vessels may not operate without a system for the retention and controlled disposal of "oily bilge slops." The discharge of noxious bilge is a violation under the Water Pollution Control Act.

Potential Mitigation Measures

Movement Effects

- Establishing and enforcing speed limits can assist in reducing shore erosion, resuspension problems, and risk to structures resulting from waves and/or collisions.

- Modification of channels is often used as a technique to reduce ship induced shoreline losses. Channel modification may be economically justifiable for reducing movement effects, but it may also aggrevate ship movement impacts depending on local conditions and the nature of the project.

- The selective use of dredged material might help to dissipate some of the energy of passing vessels, via small subsurface features. Also, selective placement of dredged material may limit near shore sediment transport and some of the water movement, and reduce the amount of sediment released into the channel.

- Shoreline Protection -- Shoreline protection methods that have been used to alleviate ship-induced effects include:

  (a) Gabion Shoreline Protection -- Gabions are wire baskers filled with rocks and wired together to form a wall or a lining. Gabions are economical, stable on steep slopes, and have low maintenance requirements and long life in the absence of destructive forces.

  There are some disadvantages to gabions: their tear resistance may not be high enough to withstand heavy ice movement during the spring ice break-up, and they may be expensive to install, because contractors maybe unfamiliar with large-scale installations.

  (b) Rip-Rap Shoreline Protection -- The realignment of Shoreline by selective filling and armament with stone or concrete. Where proper shoreline conditions exist, rip-rap is an economical way of checking shoreline erosion. It also provides good wave energy dissipation.

  (c) Sheet Pile Shore Protection -- Anchored bulkheads, of flexible steel sheet piles restrained by tiebacks, are often used to protect a shoreline. They have a long expected life, have small maintenance requirements, are aesthetically consistent, and provide recreational access for fishing and boating.

  The major drawback of anchored bulkheads is the high cost for materials and installation.

  (d) Vegetation -- Establishing vegative plantings is often the most inexpensive, effective and environmentally sound technique for shoreline protection. The major drawback can be the difficulty of establishing and retaining vegetative cover.

Discharge Impacts

- Pumping noxious bilge waste into onshore recepticles, as already required by law, will eliminate discharge impacts.

- Separating noxious from nonnoxious bilge waste prior to pumping of bilge, as already required by law, will reduce overboard discharge effects.

Evaluation Guidelines

1. Movement Effects

A. General

(1) Can existing channels and berths accomodate increased coal vessel delivery? If not, then the modification of the submerged lands and/or shore facilities needs to be considered.

(2) Is use of the channels and harbors for coal transport in this area consistent with the coastal management plan?

B. Shore Erosion

(1) Is the proposed area a high risk erosion area under the authority of the Shorelands Protection and Management Act?

(2) Is the area a shoreland area of particular concern under the coastal management plan?

(3) Has shore erosion occurred in the vicinity of the proposed facility?

(4) Has an analysis of potential shore erosion been done for the channel and/or harbor?

(5) Will an increase in use of the channels and harbors cause an increase in shore erosion? If not go to c. below.

(6) Does the analysis indicate the type of erodible material and expected shore recession?

(7) Does this analysis indicate major or minor shore erosion?

(8) Have mitigation options been evaluated? Do these options include those outlined above?

(9) Can the proposed mitigation be practically and economically done?

(10) Has the interaction between the mitigation proposed and the shore erosion process been determined?

C. Resuspension of sediment

(1) Is resuspension of sediment likely to occur from increased coal movement?

(2) Is the sediment polluted? What is the nature of the pollutants?

(3) If the channel or harbor must be redeveloped to accomodate increased coal movement, will resuspension likely occur?

(4) Do any sensitive aquatic habitats exist in the area (especially, fish spawning areas)? Will resuspended sediments affect these habitats?

(5) The significance of resuspension must be evaluated on a site specific basis.

D. Structural damage

(1) Has structural damage from vessel passage previously occurred in this area?

(2) Is structural damage likely with increased coal movement? Will this structural damage be significant?

2. Discharge Effects

Coal transportation is not anticipated to increase the hazard of bilge discharge. The effects of bilge discharge are already covered by existing law. These cannot be evaluated unless a vessel operator violates this law and the Coast Guard or other agency does the appropriate monitoring.

Policy Recommendations

1. Programs and regulations should be developed and enforced to increase the cooperation between the Michigan Department of Natural Resources and the United States Coast Guard to minimize onshore vessel impacts.

   Variable factors, such as vessel speed and route, may substantially reduce shore erosion and suspension of particulates. Coordination between agencies capable of identifying the sources of these problems and agencies such as the USCG, possessing enforcement authority under the Ports and Waterways Safety Act, could reduce of shore erosion where it is affected by passage of a potentially larger number of coal vessels.

2. Emissions from coal-fired transport vessels should be investigated to determine whether regulations should be developed under the of the Clean Air Act.

   Contacts with experts in the transportation field of transportation have indicated that the use of coal to power lake vessels may be significant in coming years. Emissions from this source are not currently regulated under the provisions of the Clean Air Act.

RAIL AND TRUCK TRANSPORTATION

NOISE

Activity Description

Diesel locomotives are responsible for most of the noise associated with rail transport. Contributing components are the horn, the diesel exhaust muffler, the diesel engine and surrounding casing, the cooling fans, and the wheel/rail interaction. Additional noise comes from empty cars with loose chains and vibrating parts.

Electric locomotives also generate noise. The horn, cooling blowers, wheel/rail interaction, and the electric traction motors all make noise. Braking the locomotive from high speeds produces the most noise, but excepting high speed braking, the electric locomotive is considerably quieter than the diesel.

The major sources of truck noise are the engine, exhaust, cooling fans, and tires. The high-compression diesel truck engine causes more vibration and thus produces more noise than does the spark ignited gasoline engine. Techniques for reducing noise from these sources are under study.

Potential Effects

Coal and other commodity transport is already generating noise in many coastal locations. The effects of noise on the environment can range from relatively mild problems such as occasional sleep disturbance at low levels, to severe medical and emotional effects at extremely high levels. Members of both human and wildlife communities may suffer such things as increased stress levels, central nervous system damage (in extreme cases), and disruption of normal behavior patterns. Increased noise in the coastal zone, as a result of greater coal movement, could therefore produce detremental effects in certain areas. The relationship between the of noise produced by coal unloading and transshipment and surrounding land uses should be evaluated. Most noise will be confined to the transportation corridors and of short to medium duration.

Trucks are often used to transport coal over short distances, both on and off plant sites. (Photograph courtesy of the Detroit Edison Company.)

A full unit train -- often containing 90 cars or more -- awaits unloading. (Photograph coutesy of the Detroit Edison Company)

In terms of frequency of impact, it is difficult to separate the noise from rail or truck coal transport from the transport noise of other goods and commodities. Along certain rail lines which carry a high proportion of coal increased coal movement may have noticeable effects on noise levels. A more definite or quantitive statement cannot be made unless specific transport routes are evaluated in detail. However, the consequences for human and other populations must be placed in the perspective of total commodity transport. The incremental effects of increased coal movement in Michigan are expected to be minimal. Specific sites may be more heavily affected.

Existing Policy Framework

Federal

- Noise Control Act of 1972 P.L. 92-574

  To protect health and welfare, ambient noise levels are recommended; they may become standards for facilities regulated by State and local governments.

State

- Vehicle Noise Control Act P.L. 300 of 1949 as amended by Acts 73 and 492 of 1978 (Part of Michigan Vehicle Code)

  Enacts state noise standards identical to federal regulations, thereby broadening noise control coverage.

Section 4916 [a][1] of the Noise Control Act of 1972 mandates that the Administrator of the Environmental Protection Agency, after consultation with the Secretary of Transportation, shall publish regulations and standards for surface carriers engaged in interstate commerce by railroad. These regulations are to reflect the degree of noise reduction achievable through the application of the best available technology, while taking into account the cost of compliance. Consequently, the Secretary of Transportation, after consultation with the Administrator of the EPA, is to evolve regulations to insure compliance with the forementioned standards through the use of his powers of enforcement and inspection under other Federal Acts (42 USC Subsection 4916 [b]).

All rail noise standards are in force when the dB(A) level, or A-weighted sound level in decibals, is measured in accordance with the technical requirements of Subpart C of Part 201. It should also be noted that these regulations set standards for locomotives and railcars manufactured after December 31, 1976, only, and are not retroactive. Older cars and locomotives would seemingly be exempt. There are no regulations specific to unit train transport of coal. This activity would be covered under the provisions of law generally.

Section 4917 [a] of the act deals with the creation of standards dealing with noise emissions from motor vehicles in much the same way as Subsection 4916[a] deals with railroad noise emissions. The regulations enacted pursuant to this section can be found in Title 40 CFR Part 202, and took effect on October 15, 1975. These provisions apply only to motor vehicles engaged in interstate commerce, do not apply to auxiliary equipment normally operated when the vehicle is stationary or moving at less than five miles per hour, apply only to motor vehicles which have a gross vehicle weight rating or gross combination weight rating of more than 10,000 pounds, and do not apply to warning devices such as horns or sirens. The specific regulations are found in Subpart B of Part 202.

Sections 4917[c][1] and [2] of the Federal Noise Control Act of 1972 specify that no state or political subdivision of a state may adopt or enforce standards applicable to the operation of motor carriers engaged in interstate commerce unless they are identical to the standards proposed by the Federal regulations and the United States Secretary of Transportation has been consulted. The State of Michigan has enacted regulations, under Act 300 of the Public Acts of 1949, as amended by Act 73 and 492, Public Acts of 1978, which are identical to the federal standards for motor carriers and has thereby broadened the noise control coverage within Michigan to include state highways and streets, regardless of the presence of an interstate activity. The Michigan act also broadens the applicability of the standards to include all motor carriers with a gross vehicle weight rating or gross combination weight rating of more than 8,500 pounds as opposed to the federally determined 10,000 pound level. (Act 300, PA 1949, as amended by Act 73 and Act 492, PA 1978, Sec. 707c. [1][a][i][ii][iii]).

Potential Mitigation Measures

For both trucks and rail, emphasis should be placed on reducing noise at the source rather than on the use of shields or covers as secondary noise-reduction devices. However, engine covers and panels have proved to be the most successful short-term approach to reducing noise.

- For truck and trains, modified casing with acoustical absorbent material around the engines can lower overall engine noise.
- Rail mufflers on the exhaust system can greatly reduce the noise from diesel locomotives.
- The use of a continuous welded rail can achieve noise reductions greater than 5 decibels. It may be possible to use this type of rail in urban areas. Otherwise, proper maintenance of the rail and bed will keep noise from this source sufficiently low.
- For trucks, mufflers have been effective in reducing noise and research on new types of mufflers is being conducted in an effort to reduce noise even further. Possible innovations include placing a resonator close to the exhaust manifold, exhaust pipe wraps, and double wall or laminated exhaust pipes.
- Railyards and lines may use a buffer zone of natural vegetation or sound-absorbing structures to reduce noise impact on communities.
- To the extent feasible, the impact of rail and truck movement may be reduced by acquiring scheduling commitments or by permitting delivery only during specified hours.

Evaluation Guidelines

1. What are the ambient noise levels along the transport route?
2. How many trips by rail or truck are projected to handle the increased movement of coal?

3. What areas are potentially affected by noise -- residential, commercial, industrial, recreational, public and semi-public -- along the transport route?

4. Are there any areas along the route which could be expected to be sensitive to increased noise levels? What periods of the day would be particularly affected? What is the expected duration of the forecasted noise levels?

5. Will the increase in noise from coal movement significantly affect land uses adjacent to the transport route? If not, mitigation measures may not be necessary. Site specific circumstances will be important.

6. What mitigation techniques will be considered?

    a. Alternate technology
    b. Scheduling
    c. Buffer areas
    d. Alternative routing

Policy Recommendations

1. The State and the U.S. Environmental Protection Agency (EPA) should work towards the updating of regulations concerning allowable coal carrier noise emissions.

   As new technology has been developed in recent years with respect to noise emissions, tighter regulations in the form of lower allowable decibel limits may now be achieved. These regulations should probably only apply to new vehicles to prevent economic hardships for current operators and must be promulgated by the EPA due to the preemptory nature of the Noise Control Act of 1972.

2. The State and U.S. Environmental Protection Agency should work towards completion of railyard noise standards which would include standards for truck and train loading and unloading.

The loading and unloading of coal to and from trucks and trains has the potential for producing significant noise levels. To adequately regulate rail yard noise production as a whole, these sources of noise should be included in any standards promulgated.

FUGITIVE DUST

Activity Description

Fugitive dust is produced during the loading, unloading, and transportation of coal and may potentially effect the coastal zone environment in many ways. During loading and unloading, dust may be generated by collisions between pieces of coal and/or coal hitting dock surfaces or ship structures following a free fall from equipment such as conveyors. During transportation, wind blowing over uncovered coal in trucks or rail cars may raise dust.

Potential Effects

Effects on vegetation, water, air, and man-made structures are possible by-products of fugitive dust generation. These effects may be significant in the coastal zone due to factors such as the proximity of dust generating sources to the waters, wind pattern and velocity differences, and higher ground water levels. Fugitive dust can cause difficulties with transpiration through plant stomata, aesthetic problems, and other undersirable chemical and biological changes.

Existing Policy Framework

Federal

- Clean Air Act as amended P.L. 91-604 as amended by P.L. 92-157, P.L. 93-15, P.L. 93-319, P.L. 95-95

  Directives issued under Title I of the act have mandated fugitive dust mitigation provisions in State Implementation Plans (SIP's) for some areas.

State

- Regulations proposed for adoption to Michigan State Implementation Plan proposed R. 336.1370 - R. 1372

  Proposed fugitive dust control programs for Michigan sources.

Federal policy toward air quality is implemented under the Clean Air Act Amendments of 1977. In this act, Congress directed the United States Environmental Protection Agency to establish primary and secondary National Ambient Air Quality Standards [NAAQS] to protect the public health and welfare, and directed the states to develop and adopt State Implementation Plans [SIP's] to attain and maintain these standards. Part D of Title 1 of the act outlines the necessary provisions of a satisfactory SIP for a non-attainment area.

The Environmental Protection Agency issued an August 1977 memorandum concerning Guidance on SIP Development and New Source Review in Areas Impacted by Fugitive Dust. This Guidance recognizes fugitive dust as a significant contributor to the paticulate matter problem within urbanized areas throughout the nation and distinguishes between its impact on rural versus urban areas.

The State of Michigan Air Quality Implementation Plan Revisions of 1979 contained provisions under Commitment for Fugitive Dust Regulations, in which the state committed itself to developing fugitive dust regulations for at least the primary nonattainment area in Wayne County and possibly a wider geographic area. Rules have since been promulgated for the entire state of Michigan representing fugitive dust additions to the state implementation plan, and are currently being reviewed. The Department of Natural Resources is committed to January 1, 1981, for adoption of these rules into the Michigan SIP. In addition to the statewide rules, Wayne County is evolving its own requirements.

Included in the rules currently under review are several sections which would relate directly to fugitive dust created in the transportation of coal (see Appendix). These provisions may be cited as Proposed Rules R.336.1370-R.1372 of the Michigan Administrative Code. Most important within these rules are R. 336.1371, Fugitive Dust Control Programs, which describes the requirement for fugitive dust control programs for applicable facility operators including coal transporters and R. 336.1372, Fugitive Dust Control Program; Required Activities; Typical Methods, which outlines necessary program content and typical control methods.

Potential Mitigation Measures

- Better designed trucks with covered bodies are the most effective means of reducing wing loss and spillage. Spillage and dust will remain a problem with older, uncovered trucks. One solution would be to use tarpaulin covers.

- To control wind loss of coal dust, wind guards (30 cm high) are partially effective for uncovered trucks or rail cars.

- Sealing the surface of each load of coal with a latex-polymer or an asphalt emulsion has been effective in reducing wind loss.

- Coal should be wet down before transport. Washed coal retains much of its moisture, which aids in reducing wind losses.

- Dustproofing the coal with oil or calcium chloride is a common practice. Application of dust suppressants is most efficient while the coal is in the air, as during loading.

Evaluation Guidelines

1. What are the ambient particulate levels along the transport route?

2. How many trips by rail or truck are projected to handle the increased movement of coal?

3. Can specific factors be identified which could increase dust generation--wind, source of coal, rough track?

4. Will any communities or environments along the transport route be sensitive to coal dust?

5. If fugitive dust becomes a problem, can appropriate techniques be applied or retrofitted to reduce this effect?

6. Will the increase in particulate levels from coal movement significantly affect adjacent use of the transport route? If not, mitigation measures may not be necessary. Site specific circumstances will be important.

7. What mitigation techniques will be considered for the potential effects?

    a. Alternative technology
    b. Buffer areas
    c. Alternative routing

Policy Recommendation

Rules and regulations concerning fugitive dust mitigation techniques during rail transport should be promulgated and enforced.

Because substantial amounts of fugitive dust are produced by rail transport of coal, regulations such as those proposed for truck transport as amendments to the Michigan State Implementation Plan should be enacted. As rail transport is often an interstate activity, federal regulations in this area may be most effective.

COMMUNITY EFFECTS FROM RAIL TRANSPORT

Activity Description

Unit train rail transportation of coal may cause disruptions within communities through which the coal is moved.

Potential Effects

Coal unit trains can interfere with the activities of communities through which they pass since they are generally longer and slower moving than other types of rail transport. Coal train movement could divide a community which might hamper emergency services or endanger and inconvenience motorists and pedestrians, and affect community safety.

Existing Policy Framework

State

- P.A. 198 of 1873 as amended by P.A. 239 of 1966

  Deals with regulation of the allowable duration of rail crossing blockage.

The State of Michigan Compiled Laws contain provisions which limit the obstruction of vehicular traffic by a railroad train to five minutes (see above citation or 1970 Michigan Compiled Laws Annotated 466.23). These provisions also make it unlawful for successive train movements to obstruct any vehicular traffic on any public streets or highways until all previously delayed traffic has been cleared, or a period of five minutes has elapsed between train movements, and impose penalties for violation of these laws (Secs. 466.24 and 466.25).

It should be noted that although these laws appear to cover the problem of vehicle disruption quite thoroughly, the average time for which a unit train blocks a crossing ranges between 1.5 and 3.4 minutes (Ernst & Whinney, 1979), and crossings of such a duration are not rgulated under the above cited laws. To efficiently assess and regulate the impact of unit train movement through a community, one must consider factors such a total traffic delay times, which often are more substantial than the actual times of crossing, and do not seem to be currently regulated in Michigan.

Potential Mitigation Measures

- Communities anticipating increased rail shipment of coal should evaluate the existing rail infrastructure and provide adequate warning equipment at crossings. Switching operations should be updated to eliminate unnecessary delays at crossings that have no trains approaching.

- To the extent feasible, the community should acquire scheduling commitments with the railroads to establish a predictable or consistent train schedule.

- Railyards and transshipment facilities should incorporate a buffer zone using natural vegetation to reduce adverse aesthetic effects, where feasible.

- Alternative emergency routes should be planned for communities interrupted by frequent train transportation. The affected community should look into the possibility of using the emergency services of neighboring communities when delays at crossings threaten emergency service.

- When feasible, new rail lines or spur lines should be routed through the outskirts of the community to avoid community disruption.

Evaluation Guidelines

1. What rail interference on communities is currently being experienced?

2. To what extent will rail movements through communities be increased with completion of the proposed facility?

3. Of the communities affected by increased rail delivery of coal, what are the major characteristics of community structure and what will the major community interferences likely be?

4. Are there economically feasible alternative rail routes available for coal delivery with potential for fewer community impacts? Are these routes considered in the proposal?

5. Is scheduling information available suggesting when movement of coal through communities will likely occur?

6. Have design studies been undertaken for structural or non-structural measures to minimize any of the identified current or anticipated community impacts?

Policy Recommendation

Low cost solutions to rail interference with community activities do exist and should be examined by state and regional planning agencies. These could include both structural and non-structural projects such as modification of operating practices, rail road facilities, community transportation facilities, or community development patterns.

The Coastal Energy Impact program should consider grants for planning and ameliorating the effects on communities through funds for grade separation/overpasses, pedestrian walkways, signals and other safety measures, as well as non-structural plans for adjacent land patterns.

ROAD DAMAGES FROM TRUCK TRANSPORT

Activity Description

Trucks transporting heavy commodities such as coal may increase damage to road surfaces in some areas.

Potential Effects

Increasing transportation of coal by truck may require redesign of local roads and will increase maintenance costs for pavement cracking, potholes, and damage to access ramps and shoulders. The volume of coal moved by truck into and within Michigan is small, but the effects may be locally significant. The major continual movement of this type occurs in the Traverse City area between the utility coal unloading facility and the powerplant.

Existing Policy Framework

State

- Michigan Vehicle Code P.A. 300 of 1949 as amended by House Bill 5675 of 1980 (act number assignment pending)

Regulations evolved pursuant to this act related to truck weight restrictions

The State of Michigan does have Maximum Truck Loadings and Dimensions (Michigan Department of Transportation, Numbered T-1 1/79), regulations pertaining to the operation of trucks and trailers according to Act 300, P.A. 1949 as amended. Truck dimensions in Michigan are not restricted strictly by weight, but rather by number of axles and vehicle configuration. Special permits are issued by the Department of Transportation for the occasional movement of oversize or overweight vehicles or loads which cannot be dismantled, reduced, or otherwise rearranged to come within the legal limits.

The upper limit under Michigan law for any one axle is 18,000 lbs, with a maximum allowable axle limit of eleven. Vehicle configurations and axle spacings are also regulated. Michigan's truck weight restrictions are generally considered to be quite lenient relative to regulations in other states. Highways within Michigan are, however, designed to withstand the 18,000 lb/axle load over a twenty-year life span.

Potential Mitigation Measures

- Prohibit operations of coal trucks on roads not designed for their use.

- Assess a tonnage tax for use of roads.

Evaluation Guidelines

1. How many truck deliveries are anticipated for fulfilling the facility needs? What weights (size of load) is anticipated? Over what distances will the truck transport be accomplished?

2. What is the condition of the roads which will be used for truck transport? Can the road accomodate the increased coal movement within acceptable limits of road wear?

3. Should special weight or other transportation restrictions be enforced during periods of the year when damage to roads is more likely to occur?

Policy Recommendations

Cooperation between state transportation agencies should be pursued concerning weight limitations or regulations on interstate coal transport by motor carrier.

Part 2

FACILITY DEVELOPMENT AND OPERATIONS

DREDGING ACTIVITIES

Activity Description

Dredging refers to of removing sedimentary materials from lakes, harbors, and connecting channels to maintain, improve, or extend navigable waterways. Dredging involves the interrelated actions of excavation, transportation, and disposal of material (dredge material will be dealt with separately). Barges usually draw twelve feet or less of water and deep draft Great Lakes vessels currently utilize about 26 feet. These drafts usually dictate depth and amount of dredging.

Potential Effects

During the excavation phase of a dredging operation the more commonly experienced short-term effects include:

- creation of turbidity and reduction of light penetration in water
- resuspension of sediments in the water column
- disturbance and destruction of aquatic organisms and habitat
- dissolved oxygen depletion
- creation of floating scum and debris
- disruption of recreational activities

Increased turbidity contributes temporarily to diminished overall biological productivity in river, harbor, and lake environments, and it causes reduction of light penetration which decreases photosynthetic activity.

Resuspension of sediments during excavation contributes to the release of nutrients and other contaminants entrapped in the sediments, the disturbance and destruction of fish and benthos and their habitats, depletion of dissolved oxygen in the water table, and the creation of floating scum and debris. Minor disruption of recreational activities in the harbor could also occur. The movement of dredges and barges to the disposal site adds to the traffic in the harbor and creats obstacles to the movement of recreational water craft.

Long-term effects of the excavation phase of dredging include: (1) increased shore erosion due to changes in current patterns and bottom geometry (bedform) which result in destabilization of the coastline, and (2) decrease in recreational activities including fishing and swimming because of changes in fish populations and species composition, and a decrease in water quality.

Environmental concerns in the material transportation phase of dredging are related to operating techniques and equipment maintenance. Spillage will be the main problem associated with the transportation of dredged material, causing turbidity and disturbing the habitat of aquatic organisms. The maintenance of equipment has a bearing on the losses occurring during transportation either by barge, hopper vessel, or pipeline.

Material loss will be expected in cases where there are loose fitting couplings at the bottom of bucket dredges, hopper dredges, and bottom dump scows, and breaks in transport pipelines.

Existing Policy Framework

Federal

- Rivers and Harbors Act of 1899 as amended 33 U.S.C. 401-413

  Permits are required for dredge, and fill activities in navigable waters, which may affect facilities siting.

- National Environmental Policy Act of 1969 (NEPA) P.L. 91-190

  Environmental Impact Statements (EIS's) must be prepared for all major Federal actions significantly affecting the quality of the human environment. Environmental Impact Assessments (EIA's) usually done to determine which actions require EIS's.

State

- Great Lakes Submerged Lands Act P.A. 247 of 1955

  Regulates, by permit, the use, filling, or sale of submerged lands within state boundaries.

- Inland Lakes and Streams Act P.A. 346 of 1972

  Regulates, by permit, activities including the dredging or filling of bottomland, placement of structures, construction of artificial waterways, and structural interference with the natural flow of an inland lake or stream.

- Geomaere-Anderson Wetland Protection Act P.A. 203 of 1979

  Regulates, by permit, alterations of wetlands, including drainage of surface water, construction, dredging and filling.

- Shorelands Protection and Management Act P.A. 245 of 1970

  Regulates land uses and developments within (1) environmental areas (2) areas prone to high risk erosion (3) areas within the 100-year flood plain.

- Michigan Environmental Protection Act of 1970 P.A. 127 of 1970

  Provides litigation guidelines for cases involving the states air, water, and other natural resources; and mandates the consideration of environmental factors in administrative decision-making.

Potential Mitigation Measures

- Schedule dredging operations to avoid environmental impacts during periods which appear to be susceptible to stress (i.e. fish spawning seasons).

- Scheduling dredging operations to avoid recreational conflicts. For instance, dredge in the fall when recreational boating has subsided below summer levels.

- Simple equipment maintenance and efficient operation can improve sediment removal efficiency and reduce turbidity in surrounding waters.

- Develop guidelines for use of floating turbidity curtains (diapers) to help reduce turbidity. Turbidity curtains are effective in still water, but will be ineffective in areas where currents exceed 1 knot.

- Use of a different type of dredge, (mechanical or suction-mechanical) can at times reduce overall turbidity.

- Specific on-site evaluations should be made on a case-by-case basis, taking into consideration all of the environmental impacts (physical, chemical, and biological).

- Bucket dredges, hopper dredged, bottom-dump scows, and pipelines should be well maintained to reduce material losses.

- Operating practices and maintenance standards should be established to ameliorate potential impacts.

Evaluation Guidelines

1. Is the dredging proposal for maintenance or for initiating new developments?

2. What proportion of total traffic moving through the proposed dredging area is coal traffic? Are the vessels used for coal transport making the principal demand for the dredging? If not, this is probably a multi-purpose dredging project.

3. To what extent will the dredging alter existing shoreline configuration, water quality, and resource and biological capabilities?

4. Does the dredging proposal fit into any existing regional economic or environmental planning and development scheme?

5. Is the dredging proposal consistent with state and federal policies?

6. Have appropriate mitigation measures been considered?

Policy Recommendations

1. The state Departments of Natural Resources and Transportation should prepare a coordinated, flexible, long-range dredging and dredge disposal plan for coal and other goods and commodities transport. The plan should include port needs, water quality, fish and wildlife habitat, public health considerations and project alternatives.

2. Proposals for channel improvements such as dredging should examine technological alternatives, such as using integrated tug barges.

   Such alternatives, where feasible, would utilize transport modes less dependent on deep channels and would decrease the need for both initial and maintenance dredging projects.

DREDGE MATERIAL DISPOSAL

Activity Description

Dredge material disposal refers to redepositing aquatic bottom sediments at another site. The disposal operations which represent the greatest potential hazard to the environment. More information about dredge material disposal is needed because (a) no single disposal alternative is suitable for all regions or groups of projects, and (b) no single alternative results in impacts so great that it can be dismissed from consideration.

Potential Effects

Dredge material disposal may cause increased turbidity, destruction and displacement of benthos, and contaminant and nutrient release from sediments. The water methods of disposal are described below.

Open Water Disposal

Depending on the quality of the sediments, open water disposal is often a good method; however, there are some potential effects associatd with this activity.

Disposing of sediments in open water. In the case of open water causes increased turbidity, but this is primarily a matter of aesthetic concern rather than biological damage. However, increased turbidity from disposal operations may affect fish spawning.

Displacement or destruction of benthic organisms will result from open water disposal. These organisms will be particularly susceptable in the larval stage, or in situations where there is a mismatch of sediment types (i.e. sand on silt).

Aquatic organisms may take in chemical contaminants from dredged material. Different types of organisms will take in different quantities of contaminants (i.e. heavy metals) depending on certain biological and environmental factors.

Wetlands Disposal

Wetlands have been used as dredge material disposal sites for many years. It can be one of the least expensive disposal methods if the wetland is close to the dredging operation.

Recently there has been increased concern about using coastal wetlands as dredge material disposal sites. Wetlands serve many functions. They contribute greatly to an area's fish and wildlife resources, serve as storage spaces for run-off and flood waters, and act as natural filters for pollutants. The value of low lying wetlands becomes evident when these areas are filled and then become inundated as a result of above average precipitation.

In its September 1975 guidelines on the disposal of dredge material, the Environmental Protection Agency (EPA) described disposal operations in wetlands as being most severe, and stated that destruction of highly productive wetlands may represent an irreversible loss of a valuable aquatic resource. Although individual alterations of wetlands may constitute a minor change, the cumulative effects of numerous changes often result in an impairment of the wetland resource.

Upland Disposal

Confined or diked containment of dredged material as an alternative for disposal should also be considered. Confining contaminated material can be an environmentally sound and preferred alternative; however, there are reasons why confined disposal may be less effective in protecting water quality or organisms.

There is a potential change in the geochemical environment that could lead to increased release of contaminants to the environment. Difficulty in retaining the finer grained particles in the chosen environmental setting could result in release of contaminants to lakes, wetlands, or small streams. Confined facilities result in a permanent change in the physical landscape, creating aesthetic and alternative land use effects.

Filling

Fill can be defined as earth or any other material placed in a submerged area for the purpose of erecting structures. This may be to enlarge the facility, to extend land for the placement of a dock, or to provide more area for a unit train queue which requires substantial space. Dredging to obtain fill materials affects the quality of the aquatic environment by permanently removing large quantities of sand and gravel. The actions associated with this removal cause the benthic communities at the dredge site to be destroyed or displaced, quantities of the overlying sediments and sand to be resuspended, and potential changes in the chemical equilibrium at the sediment-water interface.

Where dredge material is deposited as fill, some of the material may flow over retaining dykes and bulkheads. Until this settles, it may adversely affect water quality. If the dredge material is contaminated, some pollutants may re-enter the water column. Even unpolluted sediments would have a short term adverse impact on water quality by causing increased turbidity until the sediments settle out of the water column. Also, these sediments may exert an oxygen demand which may harm biota.

Wetlands can be lost because they often have to be filled in areas where unloading/transshipment facilities are constructed or expanded. Wetland vegetation will be destroyed as a result of construction activities, and the water retaining capabilities as well as other ecologically productive functions of wetlands will be diminished.

Existing Policy Framework

Federal

- Rivers and Harbors Act of 1899 as amended 33 USC 501-413

  Permits from the Corps of Engineers are required for dredge, and fill activities in navigable waters; 1970 Amendments requires confined disposal for polluted dredge material.

- Federal Water Pollution Control Act Amendments of 1972 as amended P.L. 92-500

  Provides that the Corps of Engineers shall administer permits for placement of dredged material.

- National Environmental Policy Act of 1969 (NEPA) P.L. 91-190

  Environmental Impact Statements (EIS's) must be prepared for all major Federal actions significantly affecting the quality of the human environment. Environmental Impact Assessments (EIA's) usually done to determine which actions require EIS's.

State

- Great Lakes Submerged Lands Acts P.A. 247 of 1955

  Regulates, by permit, the use, filling, or sale of submerged lands within state boundaries.

- Inland Lakes and Streams Act P.A. 346 of 1972

  Regulates, by permit, activities including the dredging or filling of bottomland, placement of structures, construction of artificial waterways, and structural interference with the natural flow of an inland lake or stream.

- Geomaere-Anderson Wetland Protection Act P.A. 203 of 1979

  Regulates, by permit, alterations of wetlands, including drainage of surface water, construction, dredging and filling.

- Shorelands Protection and Management Act P.A. 245 of 1970

  Regulates filling activities, land uses and developments within (1) environmental areas, (2) areas prone to high risk erosion, (3) areas within the 100-year floodplain.

Potential Mitigation Measures

- Evaluate dredged material disposal options -- all practical alternatives to discharging materials in the waters of the Great Lakes should be considered.

- If a confined disposal site is to be constructed it must be designed, built, and operated in such a way as to achieve maximum effective capacity and satisfactory effluent quality; for example, surface trenching proved to be a cheap and effective way of providing natural drainage.

- The regulated discharge of disposal area effluent through a natural marsh can be effective in removing nutrients.

- Dredge material (particularly dewatered dredge material) has value for land filling or in construction. Uses of dredge material for road construction and dike raising should not be overlooked when considering alternatives.

- Wetland vegetation, soils, and hydrology should not be altered by dredging or filling to insure that the water retention and ecologically productive functions of the wetlands will not be diminished.

- It may be feasible to place polluted sediments in the innermost areas of landfills to prevent resuspension in the water table.

- Dredge spoils can be treated with flocculents to reduce the time it takes for sediments to settle. This treatment also will minimize the release of pollutants absorbed by the sediments.

  For a site-specific review of dredge disposal operations consider the following:

- Existing information -- an overview of past dredging and disposal activities, sediment quality history, and known environmental sensitivities of the area may expedite decisions on disposal options.

- Physical characterization of sediments -- the physical characteristics of a sediment provide an indication of the potential for chemical contamination and assist in identifying possible uses of the dredged material. (i.e. beach nourishment).

- Chemical characterization of sediments -- the chemical characteristics of the sediment, when compared to open lake bottom conditions, provide a relative indication of sediment quality, and the potential for the dredged material to degrade the substrate at an open lake disposal site.

- Bioassessment of sediments -- to determine the effects of dredging and dredge disposal on biota would involve exposure of specified aquatic organisms to sediments and measuring lethal (acute toxicity) and sublethal (reproductive impairment) responses.

Evaluation Guidelines

1. What is the purpose of any fill activities -- to enlarge a facility, provide for a dock, provide area for unit train delivery?

2. Are other locations available that would minimize the need to fill, particularly if wetlands are proposed for filling?

3. Are wetlands in the area sensitive or highly productive? Have they been included as an area of particular concern in the coastal management plan?

For related guidelines, see mitigation measures (this section) and evaluation guidelines for dredging.

Policy Recommendations

See Policy Recommendation 1 under Dredging.

NEARSHORE CONSTRUCTION

Activity Description

Nearshore facilities include docks, piers, wharves, rail and spur lines, and auxillary structures for unloading and transshipment of vessels. Activities relaated to nearshore facilities include:

- Construction -- An increase in surface runoff will result during construction with the addition of impervious surfaces such as roads and roofs of buildings. With more impervious surfaces, the ratio of the rate of runoff to the rate of rainfall will be higher. Increased runoff may contribute to increased turbidity in the local waterway.

- Materials Delivery and Storage -- Sheet pilings used in construction have the potential to release heavy metal ions to the environment through leaching during storage. In addition, small discharges of grease and oil may be expected from trucks, trains, and heavy machinery during the delivery and construction operations.

Potential Effects

Water quality impacts associated with construction of a coal facility could have adverse effects on fish by:

(a) lowering the survival rate of incubating eggs because of increased sedimentation

(b) decreasing the availability of food, by reducing populations of phytoplankton and zooplankton, and

(c) altering normal behavior patterns of fish with mechanical disturbances.

The release of heavy metal ions from sheet pilings could alter the water chemistry and adversely affect the aquatic environment.

Any man-made structure influences wildlife using an area. During construction, nearshore feeding by waterfowl will be affected in areas with large machinery. The use of the beach by shorebirds may be limited by construction activities.

Excessive noise from construction may have adverse effects from a community standpoint. Noise effects is not only a function of maximum noise levels occurring over a period of time, but also of the magnitude of fluctuations in levels during that period. The effects of excessive noise will be discussed later. It is generally concluded that noise from the operation of construction machinery will have negative effects on the surrounding area, but will be temporary.

Aesthetically, assembling tall equipment (shiploader, dock hopper) introduces a vertical element in contrast with the horizontal lines of the site, which some observers will consider a visual nuisance.

Existing Policy Framework

Federal

- National Environmental Policy Act of 1969 (NEPA) P.L. 91-290

  Environmental Impact Statements (EIS's) must be prepared for all major Federal actions significantly affecting the quality of the human environment. Environmental Impact Assessments (EIA's) usually done to determine which actions require EIS's.

State

- Great Lakes Submerged Lands Act P.A. 247 of 1955

  Regulates, by permit, the use, filling, or sale of submerged lands within state boundaries.

- Inland Lakes and Streams Act P.A. 346 of 1972

  Regulates, by permit, activities including the dredging or filling of bottomland, placement of structures, construction of artificial waterways, and structural interference with the natural flow of an inland lake or stream.

- Geomaere-Anderson Wetland Protection Act P.A. 203 of 1979

  Regulates, by permit, alterations of wetlands, including drainage of surface water, construction, dredging and filling.

- Shorelands Protection and Management Act P.A. 245 of 1970

  Regulates land uses and developments within (1) environmental areas (2) areas prone to high risk erosion (3) areas within the 100-year flood plain.

- Soil Erosion and Sedimentation Act P.A. 347 of 1972

  Regulates, by permit, erosion effects of development which involves earth changes in areas adjacent to waterways and in other areas.

- Michigan Environmental Protection Act of 1970 P.A. 127 of 1970

  Provides litigation guidelines for cases involving the state's air, water, and other natural resources; and mandates the consideration of environmental factors in administrative decision-making.

- Regulations proposed for adoption to Michigan State Implementation Plan proposed R. 336.1370 - R. 1372

  Proposes fugitive dust control programs for Michigan sources.

Potential Mitigation Measures

- Spray critical construction areas and temporary roadways to keep dust levels low.

- Carefully manipulate drainage from the site. Impoundments will help remove suspended solids introduced by erosion from construction areas.

- Harm to vegetation and associated wildlife will be minimized by proper selection of construction areas, replanting selected trees, and by new planting of native plant species affected by construction.

- Rapid stabilization of disturbed areas will help reduce dust and erosion problems. For instance, the disturbance caused by construction of a coal facility could be rectified by sodding, or by importing topsoil and reseeding (fast cover crop such as rye grass). Such action would reduce the damage and would serve to stabilize the soil. Also, trees could be planted to restore the attractiveness of the area.

- Transplanted trees from construction areas to the perimeter can help screen dust and noise. Also, limiting off-road vehicular traffic will prevent needless destruction of vegetation in non-construction areas.

Evaluation Guidelines

1. Can the proposed facilities and activities: a) demonstrate acceptable levels of compatibility with shoreland and water uses; and b) mitigate anticipated losses of recreational opportunities?

2. Are the facilities and activities sited and designed to avoid adverse impacts on recreational boating, including marinas?

3. Does the facility construction provide for public access to the water, if feasible, without interfering unduly with port operation or constituting a safety hazard?

4. Does the proposal involve development in or adjacent to wetland or other critical habitat areas? If so, have these been designated as areas of particular concern in the coastal management plan?

5. Is the proposed shoreland facility located within embayments subject to poor circulation patterns?

6. Have mitigation techniques been considered for any of the following purposes: to minimize water or air quality effects, to reduce recreational or asthetic impacts or to provide protection for habitat and wildlife resources?

Policy Recommendations

1. Where nearshore construction requiring a permit is proposed for an area adjacent to or otherwise affecting a designated environmental area (under the Shorelands Management and Protection Act), the project review should assure adequate protection for the designated environmental area.

Care should be taken to consider the potential effects on environmental areas of problems originating in nearby areas. Lowered air or water quality may not be restricted to the project area and should be considered in the review process.

2. The state should continue to complete the designation as "environmental areas" of all areas so applicable under the Shorelands Management and Protection Act. Furthermore, interim guidelines for the evaluation of proposals and plans in candidate areas should be established.

   The DNR eventually intends to consider about 300 miles as environmental areas and has currently so designated approximately 100 miles of shoreline. Areas which are yet undesignated may have important environmental value, and mechanisms for proposal evaluation in such sites should be established so that projects are not held up unnecessarily.

3. The current lack of specificity regarding standards for administering provisions of the Great Lakes Submerged Lands Act and Inland Lakes and Streams Act should be corrected.

   The regulatory framework focuses on what DNR calls performance standards, rather that on a policy tactic of defining those uses which will or will not be permitted. Performance standards for project review, however, are not explicitly delineated.

4. Public access to areas with recreational value should be evaluated in proposals for the construction of coal related development and plans for the continuation of such access should be included where feasible.

   Facilities should be evaluated with consideration of any preclusion of recreational access that would be caused by their construction.

5. Aesthetic values should be considered in evaluating proposals for facilities in or near recreation areas.

Facilities which would adversely affect resort or recreation areas in such ways as view disruption, dust generation, or water and beach related aesthetic consequences should probably be permitted only under extenuating circumstances, if at all, or in circumstances where no other feasible or economically practical areas are available.

6. Coordination between facility operators and various state agencies should be sought to plan for conducting the most potentially disruptive operations at the most advantageous time possible from the point of view of recreation.

   Coordination between operators and the state Fisheries Division, for example, could move towards coal deliveries by vessel during periods when least disruption of fish spawning or migration may occur.

7. The state and sub-state regional agencies should conduct a review of vacant urban waterfront areas. Vacant and usable urban waterfront areas, largely in southern Michigan, may have high value as potential recreation facilities, and is value should be assessed prior to the permitting of coal facility development.

8. Whenever possible, proposals for individual dock delivery should be discouraged where group coal delivery sites are feasible. Such "group sites" would minimize the need for dredging.

9. Coordination of port planning should be pursued on both state and local levels.

   Currently, planning in many ports in Michigan is largely non-existant or minimal. Though improvements in this area are occuring, much work needs to be done if coal traffic increases of the magnitude expected are realized. Multi-state regional concerns (such as plans for port development elsewhere in the region) and national policy (e.g., promoting coal use) should be considered in port planning at local and state levels.

FACILITY DEVELOPMENT FOR LAND DELIVERY

Activity Description

Land-delivery facilities include rail spur lines, rail terminals and access roads. Land clearing and facility development refers to all of the activities associated with site preparation for unloading/transshipment operations including removal of vegetation, excavation and grading, construction, and final assembly and arrangement of facility components.

Potential Effects

Land Area Required

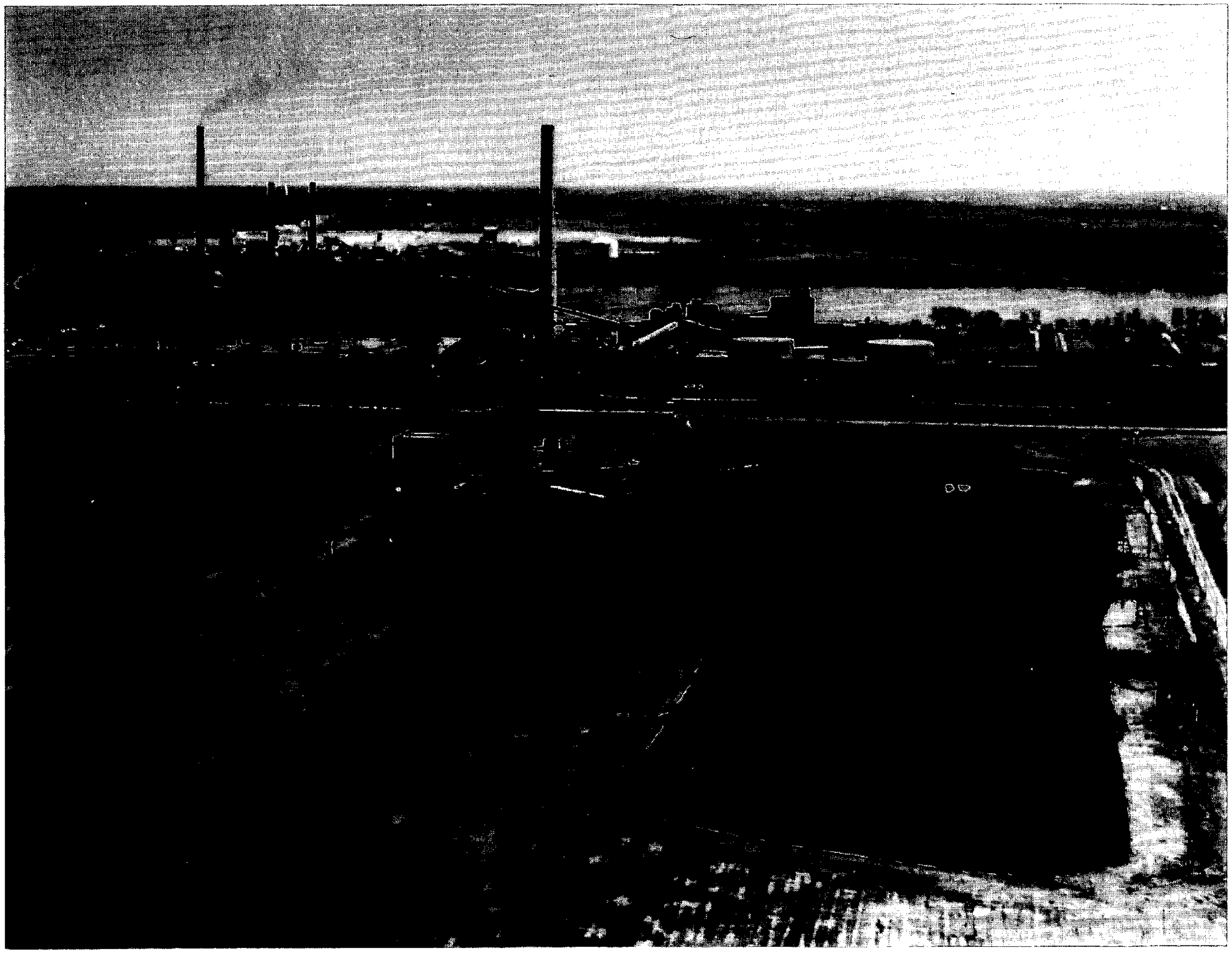
Land for rail car queueing may take 20 to 30 percent or more of the area for handling and storage (which might take 25 to 50 acres depending on reserve storage needs). Generally, water delivery will take considerably less land than rail delivery.

Land Clearing

The environmental concerns associated with land clearing for constructing an unloading/transshipment facility include: air quality, water quality, erosion, and land-use changes. The major contributing activity is landscape alteration.

Disturbance and destruction of fields, forests, and woodlots can be expected with site preparation. Stripping vegetation should be avoided because it causes compaction and denudation of soils, increases erosion, and degrades surface water quality due to increased overland flow.

Impacts on coastal wetlands should also be avoided because wetlands absorb wave energy, help stabilize soils, act as sediment and nutrient traps, and are a natural filter for pollutants.



Many acres of land must be committed to storage at a large coal using facility. (Photograph courtesy of the Detroit Edison Company)

Dusty condition arising when heavy equipment removes vegetation, will reduce local air quality because generally the particulate concentrations around the disturbed areas are in excess of the ambient air quality standards.

The water quality parameter most likely to be affected during land clearing is turbidity, primarily because of increased surface runoff associated with land clearing. Also, overland flow will increase because vegetal cover and rough ground surfaces (which retard the flow) have been reduced. As development increases, overland flow increases because the water now flows over smooth surfaces which quickly discharge it to the drainage channel.

Landscape alteration will also contribute to hazards for wildlife. During land clearing, wildlife will be less likely to use an area because of disrupted habitat and increased human activity. For predator species (e.g., hawks), any loss of habitat carries with it a loss of hunting grounds, and a loss of food. Most wildlife species do not tolerate crowding and the end result is a decrease in wildlife populations.

The aesthetic impact is a subjective area in which it is difficult to establish standards to suit everyone. There is a wide range of opinions to be recognized. Strong objections from some people can always be found on an aesthetic basis and this should be considered a social cost. Generally, any preparation of the site for construction (removal of vegetation, leveling of topography) will cause aesthetic concern.

Facility Development

Development of coal unloading facilities may lower water quality and raise erosion rates and noise levels.

Sheet pilings used in construction can release heavy metal ions to the environment through leaching, during storage. In addition, small discharges of grease and oil may be expected from trucks, trains, and heavy machinery during delivery and construction.

Surface runoff will increase during construction because of additional of impervious surfaces such as roads and roofs of buildings. With more impervious surfaces, the ratio of the rate of runoff to the rate of rainfall will be higher. Increased runoff may contribute to turbidity in the local waterway.

An increase in local employment will result from construction activities, a positive but temporary situation for local communities. Since housing for these employees would be dispersed, the effects of absorbing new employee families not already living in the area is expected to be minimal.

Existing Policy Framework

Federal

- National Environmental Policy Act of 1969 (NEPA) P.L. 91-190

  Environmental Impact Statements (EIS's) must be prepared for all major Federal actions significantly affecting the quality of the human environment. Environmental Impact Assessments (EIA's) usually done to determine which actions require EIS's.

- Clean Air Act as amended P.L. 91-604 as amended by P.L. 92-157, P.L. 93-15, P.L. 93-319, P.L. 95-95

  Directives issued under Title I of the Act have mandated fugitive dust mitigation provisions in State Implementation Plans (SIP's) for some areas.

- Noise Control Act of 1972 P.L. 92-574

  To protect health and welfare ambient noise levels are recommended; they may become standards for facilities regulated by state and local governments.

State

- Soil Erosion and Sedimentation Act P.A. 347 of 1972

  Regulates, by permit, erosion effects of development which involves earth changes in certain areas.

- Michigan Environmental Protection Act of 1970 P.A. 127 of 1970

Provides litigation guidelines for cases involving the state's air, water, and other natural resources; and mandates the consideration of environmental factors in administrative decision-making.

Potential Mitigation Measures

- Spray critical construction areas and temporary roadways to help keep dust levels low.

- Carefully manipulate drainage from the site. Impoundments will help remove suspended solids introduced by erosion from cleared areas.

- Damage to vegetation and associated wildlife will be minimized by proper selection of construction areas, replanting selected trees, and by new planting of native plant species affected by construction.

- Rapid stabilization of disturbed areas will reduce dust and erosion problems. For instance, the disturbance caused by land clearing could be rectified by sodding, or by importing topsoil and reseeding (fast cover crop such as rye grass). Such action would reduce the environmental impact of land clearing and would serve to stabilize the soil. Also, trees could be planted to restore the attractiveness of the area.

- Transplanting trees from cleared areas to other areas will help screen dust and noise. Also, limiting off-road vehicular traffic will prevent needless destruction of vegetation in non-construction areas.

- Locate the structures in areas where vegetation is in early or mid-successional stages (fields and young wood-lots) will hasten the natural revegetation process.

- Reduce the area for equipment laydown and access roads to lessen effects on wildlife.

- Actively manage the area for wildlife. For instance, stationary equipment can create increased roosting and nesting sites for gulls, pigeons, and swallows.

- Reclaim disturbed areas with wildlife in mind. Planting food plants, establishing water holes, and creating nesting sites will help keep wildlife in the area.

- Sound levels during construction should be monitored to determine the effects of noise and to identify and control noise from those activities which may significantly affect sound levels.

- Coastal Energy Impact Program funds should be made available to communities with significant demands placed on them by a concentration of construction employees' families.

Evaluation Guidelines

1. Has siting, construction and operation of new facilities for highway or rail delivery of coal been carefully evaluated by DNR in close cooperation with the State Department of Transportation and affected local entities?

2. Has the state review of the project proposal emphasized adequacy and completeness of the prepared environmental impact statement(s) it required?

3. If new facilities for rail or highway transport are proposed, has the applicant presented sufficient evidence to demonstrat need for the facilities and inadequacy of existing transportation systems?

4. Have efforts been made to reduce adverse consequences, including those on cultural and historic resources, critical habitats, agricultural lands and community land uses?

5. What impact could the proposal have on:

   a. restricting public access to the waterfront?
   b. precluding future shoreland industrial development options?

6. Have mitigation techniques for anticipated adverse impacts of the proposed facility been considered?

7. Has there been coordination with local community planning for land use and transportation?

8. Is any new housing expected to be concentrated in surrounding communities for new construction employees families? If so, can water, sewer, police, fire, school and other public services handle any increase in demands?

Policy Recommendations

No policy changes are recommended.

OPERATIONS FOR ON-SITE HANDLING OF COAL

Activity Description

The handling operation includes coal loading, coal unloading, and the transfer of coal for storage or use.

Potential Effects

Handling

The primary environmental effects of coal handling are the land area requred and dust generation.

Land Area -- Land is required for the coal handling system and for storage. In the Great Lakes region, a six-month reserve supply is usually stored to allow for winter disruption of shipping. Land area utilized will vary from facility to facility. A 1000-MWe coal-fired plant needing 90 to 180 day reserve will require 25 to 50 acres, respectively, for coal storage. Depending on the layout of the unloading, handling, storage and coal-using areas and whether the coal arrives by water or rail, this land area may be immediately along the coast or inland. If coal is primarily delivered by lake vessel, more storage area will be required because the shortened shipping season creates the need to stockpile coal while the lakes are ice-covered.

Conveyor system -- several conveyors are used to transport coal within the transshipment/unloading facility. In all new facilities conveyors will be covered, but minor fugitive dust emissions may still result from spillage at major transfer points. In older facilities the conveyor system may not be totally covered, and is anticipated (along with the storage pile) to be a primary source of fugitive dust.

Unloading (receiving) Bins -- Bins into which trucks dump coal, with feeders underneath to transfer coal to a conveyor, are very common. Fugitive dust can escape where trucks dump at the top and where the feeders empty the coal at the bottom. The dust generated is substantial if the coal is dry and if there are high winds.

Rotary Car Dump -- Unit trains are unloaded by a rotary car dump. The system is designed so that the entire coal car plus a portion of the track can be rotated 180 degrees. The coal is then dumped into a hopper below the track. Dust will be generated by the dumping. The rotary car dump is often enclosed in a building, which helps to contain most of the dust.

Transfer House -- A transfer house is a structure located at major transfer points such as the main conveyor to radial stacker. Because these houses are enclosed, fugitive dust associated with their use will be minimal.

Stockpile -- The stockpile is established by overhead conveyors which carry coal from the loading/unloading stations. The conveyors feed coal into telescopic chutes which discharge it onto piles. The coal piles built up at the chute discharges are placed in the stockpile areas by bulldozers, which are also used for compacting the coal to reduce the risk of spontaneous combustion. The dust here comes from the loadout chutes, associated conveyor system, and from the bulldozer grooming operation.

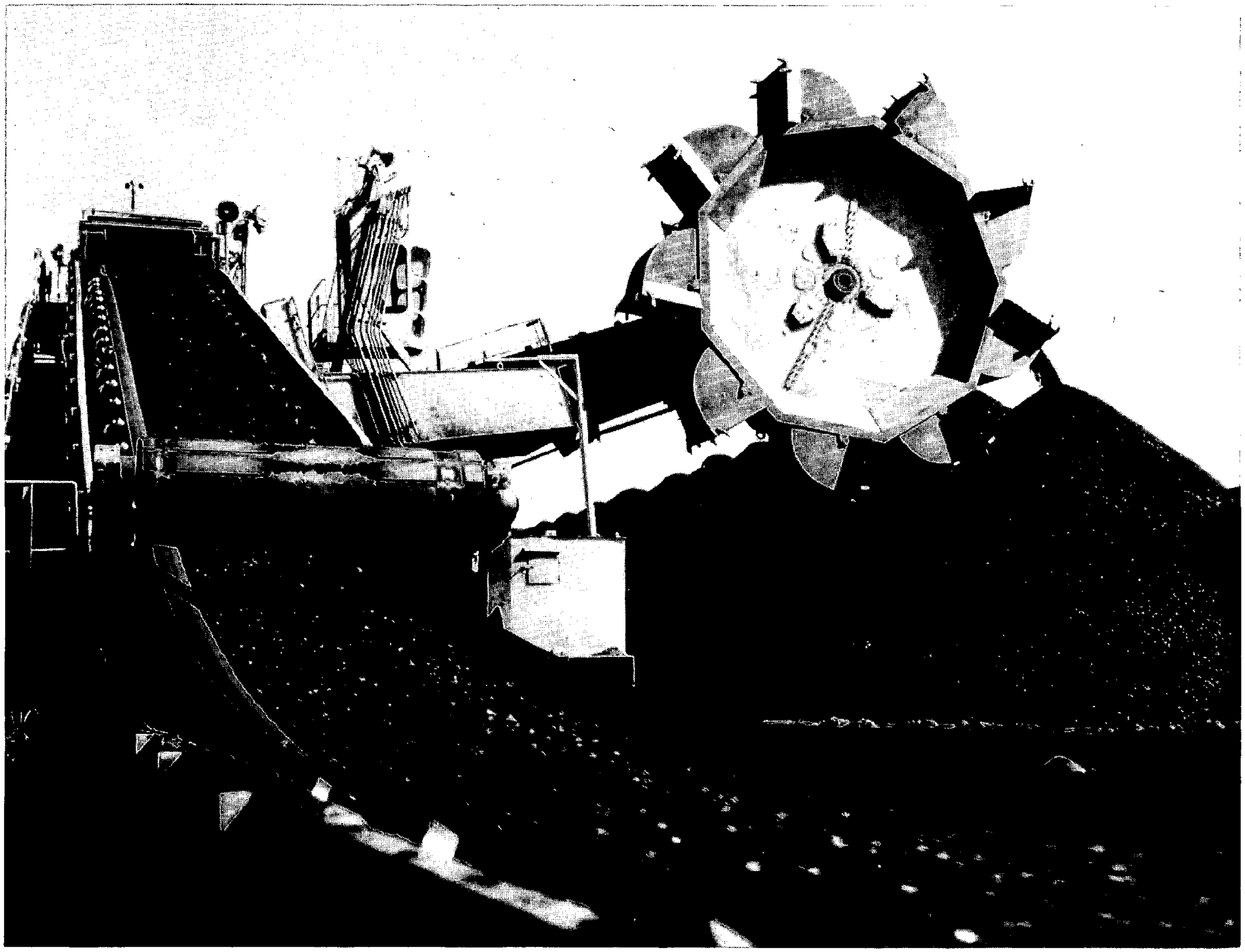
Rotary Plow Feeder -- Coal from the stockpile is reclaimed for loading onto ships or unit trains by the rotary plow feeder. The rotary plow feeder moves horizontally along the top of a reclaim tunnel, sweeping coal through a gate onto a conveyor belt below. A system of conveyor belts carries the coal to a surge bin which feeds the shiploader or loading station. Coal dust is generated here at the major transfer points; reclaim tunnel to conveyor belt, conveyor belt to surge bin, and surge bin to shiploader or loading station.

Loading Stations -- A loading station is a structure for loading a unit train. The station is comprised of a surge bin located above the track, large enough to hold incoming coal while cars are changing, a loadout chute, and a control room. Another type of loading station involves a large silo, under which the unit train moves for unloading. Some type of station will be located everywhere unit trains are loaded. Dust will be generated here by coal dropping into the cars during loading for transshipment.

Ship Loader -- The ship loading operation is a major source of coal particulates. The shiploader is an enclosed system which operates over the ship and lowers a telescopic chute into the hold of the vessel to complete the loading operation. During loading, some coal is released into the air from the loading chute and from the conveyor. Together these two components constitute a point source of windblown material close to the water. The dust from vessel loading is important locally since it could produce high particulate concentrations in the waterway over short periods of time. In the short run these particulates will settle out near the dock area. Eventually the material will be transported downstream by resuspension from ships. A significant input of coal particulates from a facility to a waterway may occur when coal is trapped in the ice cover and then transported to the harbor during the spring ice break-up.

The ship loading and unloading operations will contribute to other environmental problems. Near shore coal handling will affect aquatic ecosystems by causing increased turbidity from spillage. This increase will cause a decrease in light penetration, which will reduce the suitability of the area for aquatic vegetation.

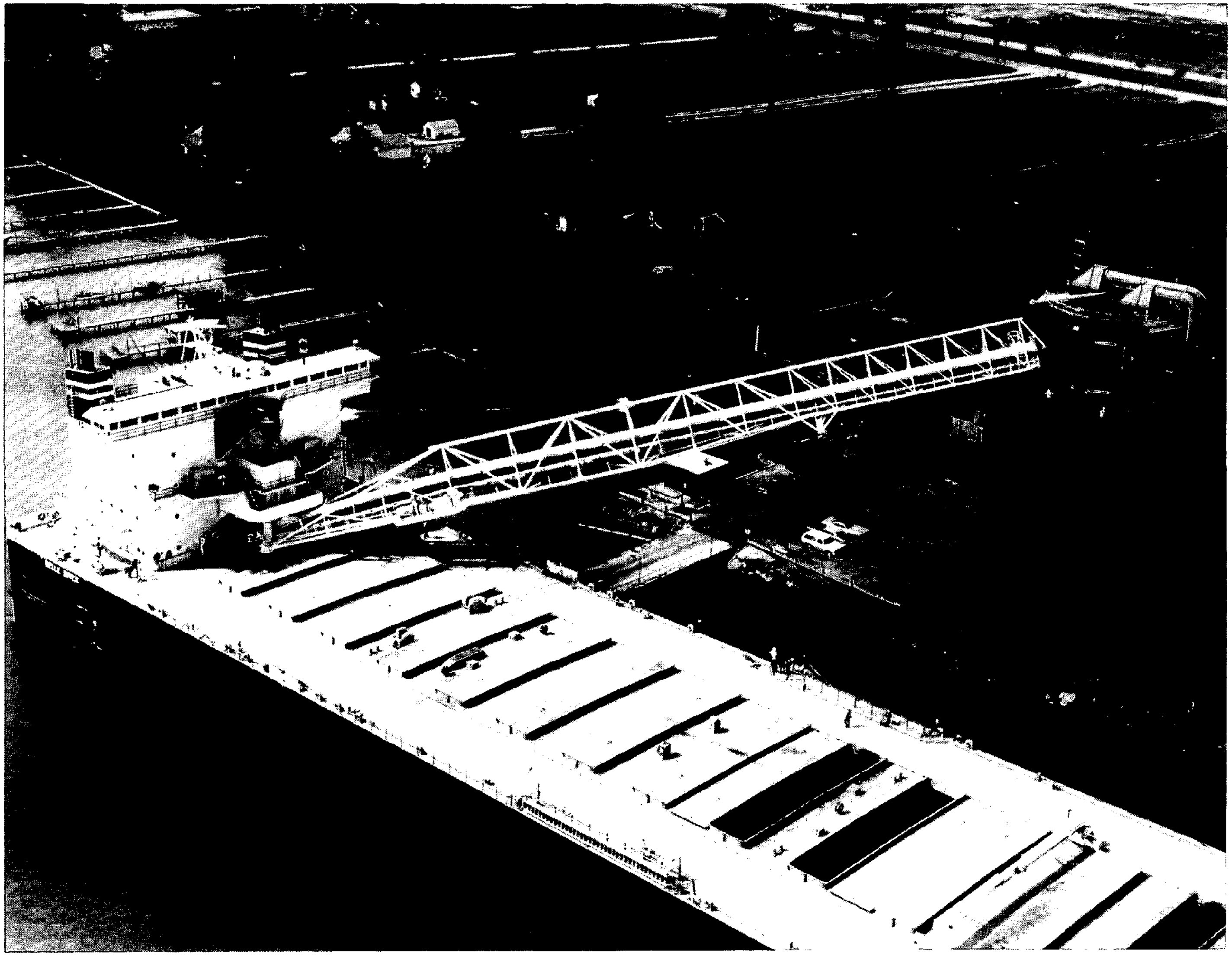
Empty unit train cars leave the Rotary Car Dump House where they were individually rotated 180 degrees -- emptying their contents onto an under structure conveyor. (Photograph courtesy of the Detroit Edison Company)



A rotary plow feeder is taking coal from a pile and "feeding" coal to a conveyor. (Photograph courtesy of the Detroit Edison Company)

Storage piles are continuously groomed by earthmovers. The coal pile near the center of the photo is being formed by coal leaving the termination point of a conveyor system-possibly bringing newly delivered coal for storage. (Photograph courtesy of the Detroit Edison Company)

A lake vessel unloads onto an open pile while earth movers and coal carrying trucks transfer the newly arrived coal to storage areas. (Photograph courtesy of the Detroit Edison Company)



A lake vessel unloads into an enclosed hopper. This system is likely to produce less fugitive dust than the open-pile unloading. (Photograph courtesy of the Detroit Edison Company)

Accumulations of coal on the harbor bottom due to spillage will alter the composition of benthic fauna. The effects of coal on the harbor bottom will include a reduction in density, diversity, and dominance by tolerant organisms.

In addition, the most significant noise sources associated with coal transshipment/unloading facilities are the onshore ship loading machinery and the on-board coal handling machinery. This machinery produces continuous noise which will be maintained at a steady level during each four hour loading/unloading operation. The enclosed conveyor system's contribution to noise will be practically imperceptible.

Employment -- Once the coal handling and storage areas have been constructed, employment will shift from construction to operation and maintenance work forces. Persons with many different levels of skills and training will be required. Operation and maintenance employment for coal handling and storage may range from 30 to 40 persons for a 1000-MWe coal-fired electrical generating plant up to 90 to 100 persons for a large 3000-MWe plant. It is expected that employees' families would reside throughout an area rather than being concentrated in one location. Increased stable employment that this would offer would be a positive effect.

Storage

Stockpiles are used widely at transshipment/unloading facilities as well as at user sites (utilities, industry). Users of coal often maintain 60 to 90 day supplies. The two most significant impacts associated with coal storage are fugitive coal dust and spontaneous combustion. For land area and employment effects, refer to the section on "Handling" above. Several operations cause fugitive dust emissions from the storage area. The Midwest Research Institute evaluated the four major emission producing activities and their approximate relative contributions as follows:

- loading onto piles 12%
- equipment and vehicle movement in storage area 40%

- wind erosion 33%
- loadout from piles 15%

Loading onto Piles -- The dust generated from coal loading is caused by dumping coal from the overhead conveyor to the coal pile. Concentrations are usually less significant than the amount of coal dust resulting from the grooming operation of the coal pile.

Equipment and Vehicle Movement in Storage Area (grooming and reclaiming) -- Grooming refers to compacting a coal storage pile with bulldozers or caterpillar tractors to reduce the risk of spontaneous combustion. Reclaiming refers to moving the stockpile around with bulldozers and front end loaders to reduce of dead space and to reclaim the coal for loading onto a conveyor belt or rotary plow feeder. Grooming and reclaiming go on constantly, and hence these operations appear to be the most consistent source of coal dust.

Although a source of dust generation, grooming lessens the risk of spontaneous combustion; as the risk is reduced when coal is compact. The compaction tends to reduce the rate of moisture movement through the pile, and to increase the quantity of water which can be retained by the pile. Spontaneous combustion can release atmospheric contaminants such as sulfur oxides, hydrocarbons, and nitrogen oxides.

Minor topographic changes will occur as a result of the cycle of stockpile building and reclaiming. The major topographic change will be compaction of the soil under and around the stockpile which can possibly cause some minor changes in drainage patterns.

Fugitive dust from the stockpile is also the major source of coal particulates for a waterway. Some of this dust comes directly from wind action on the coal pile. However, much of it is caused by the grooming operation. Increased coal dust in the waterway will increase turbidity and may alter the pH of the water.

Wind Erosion -- Even without grooming and reclaiming operations the coal pile will generate particulates at low levels on an almost continous basis, due to wind. Coal dust blowing from storage piles onto adjacent land areas could cause disease of trees and other plants by clogging leaf pores and coating leaf surfaces, and general aesthetic degradation of the area. Sudden changes in wind direction will give rise to visually dense dust plumes. Coal dust blowing from storage piles may also effect wildlife through: (a) ingestion of plant material coated by dust, (b) discoloration of fur and feathers or allergic reactions to coal dust, and (c) possible heavy metal uptake through plants, as a result of coal leachate from storage piles which may affect the soil and groundwater.

Existing Policy Framework

Federal

- Clean Air Act as amended P.L. 91-604 as amended by P.L. 92-157, P.L. 93-15, P.L. 93-319, P.L. 95-95

  Ambient air quality standards have been set for SO_2, TSO, NO_2, CO, HC, and O_x; more are being considered.

  New Source Performance Standards (NSPS) apply to coal-fired boilers and regulate SO_2, NO_x, and particulates. Lower emission levels are being considered, as are regulations for small particulates. Stricter standards specific to FBC may be established.

  Standards for hazardous pollutants regulate mercury, beryllium, and asbestos.

  NSPS and regulations for the prevention of significant deterioration may affect plant siting.

  Best Available Control Technology (BACT) may be required when locating in "clean" regions. BACT will be determined on a case-by-case basis.

  Lowest Achievable Emission Rates (LAER) may be required when locating in non-attainment regions.

- Resource Conservation and Recovery Act of 1976 P.L. 89-272

  Solid waste disposal must comply with most stringent air and water standards; monitoring is required.

New regulations will be developed in 1-2 years for a Federal hazardous waste handling permit system and state programs for non-hazardous solid wastes.

State

- Michigan Environmental Protection Act of 1970 P.A. 127 of 1970

  Provides litigation guidelines for cases involving the state's air, water, and other natural resources; and mandates the consideration of environmental factors in administrative decision-making.

- Clean Air Act as amended P.L. 91-604 as amended by P.L. 92-157, P.L. 93-15, P.L. 93-319, P.L. 95-95

  Directives issued under Title I of the act have mandated fugitive dust mitigation provisions in State Implementation Plans (SIP's) for some areas.

- Noise Control Act of 1972 P.L. 92-574

  To protect health and welfare ambient noise levels are recommended; they may become standards for facilities regulated by State and local governments.

Potential Mitigation Measures

Handling

- Receiving Bins -- Receiving bins should be designed with a semicircular backstop to prevent coal spillage from the bin into the waterway, and to prevent the wind from blowing coal dust out of the bin.

- Conveyor System -- The main conveyors should be completely enclosed to reduce dust blown into the atmosphere. Also, conveyor to conveyor transfer points should be enclosed. Any dust generated during transfer will be ventillated to baghouse dust collectors.

- Unloading Bins -- Emissions should be controlled at the bottom with sprays or a dust collector with bags. Scrubbers are sometimes used. Enclosure of the bin on three sides and with a sloping roof will contain the dust in many cases. If supplemental control is required, curtains can be hung to partially close the opening when a truck is dumping. A dust collector (baghouse collector) can then be used. Sprays do not function well at bin locations because the areas are large and the dust generation is violent and intermittent.

- Loading Stations -- A loadout chute can prevent large amounts of dust and spillage when coal is transferred to cars in high volumes. The chute is a large, vertical, telescopic device that travels to the car bottom with each car, raises with the coal as the car is loaded, stops and crowns the car, stops the flow of coal as cars are changed, and repeats the cycle. This helps prevent the escape of dust because the chute remains in contact with the coal in each car during loading.

- Rotary Car Dump -- The operation should be enclosed in a building, and dust emissions should be ventillated to baghouse collectors.

- Stacker/Reclaimer -- Fugitive dust emissions generated during the stacking and reclaiming operations should be ventillated to a baghouse collector or controlled by spraying.

- Dust Control System -- The major dust control technique be spraying, which should be done through spray headers at the four transfer points where dust generation is most likely to occur: (a) the top of the receiving bin, (b) receiving bin to conveyor, (c) conveyor to radial stacker, (d) head pulley radial stacker (transfer house).

- Advances in coal handling technology for both vessels and shoreside facilities could reduce the potential for spillage and dust. This technology changes rapidly.

Storage

Methods for controlling dust from coal storage piles are limited in effect or are very expensive. However, a number of methods will at least partially alleviate the impact of dust from a coal storage pile.

- As a minimum, coal piles should be capped with larger sized coal to prevent the loss of fines due to wind.

- Bituminous coal should be tightly packed to prevent fires (spontaneous combustion).

- Some installations use concrete silos, which hold up to 10,000 tons and control dust effectively.

- An earthen impoundment can help contain and control coal dust from a coal pile.

- All semi-permanent storage capacity should be established on the periphery of the storage pile. The exterior face should then be treated for aesthetic considerations. The peripheral reserve storage will act as a windbreak completely surrounding the storage pile.

- The effects of grooming the coal pile with large bulldozers should be closely examined. All dozers should be equipped with wet suppression systems.

- The design of the fans on bulldozers should be changed to minimize the blowing of coal dust into the air.

- All active portions of the pile should be sprayed. A major portion of these particulates can be controlled by water sprays.

- Settling basins should be used to mitigate runoff.

Evaluation Guidelines

1. Can new coal facility areas be located in areas downwind of intensive public use and other outdoor recreation, residential and retail business development?

2. Has coal dust generation at stockpiles and at points of unloading and conveyance been minimized to the extent feasible, using the best available technology?

3. Can appropriate mitigation techniques be implemented in conjunction with project approval?

4. What are the climatic and wind conditions at the project sites?

5. Is land available on the site for expansion of stockpiling if necessary?

6. Will land area needs for storage of coal conflict with other land uses?

7. Have measures been taken to avoid shoreline placement of coal or stockpiling where feasible?

8. Has a buffer zone been assured for protection of shoreline areas from facility operation?

9. Are stockpiling and operations activities proposed in areas consistent with state environmental objectives for protecting critical habitats?

Policy Recommendations

1. Rules and regulations concerning the mitigation of fugitive dust generation during the grooming of active storage piles should be promulgated and implemented to whatever extent practicable.

   Current proposed fugitive dust regulations for the State of Michigan, though including coverage of inactive storage piles, do not regulate dust generated during the performance of such activities as coal removal from piles or coal compaction. Though complete elimination of such dust would be impossible, mitigation techniques for its minimization do exist.

2. Nonpoint source controls on coal pile runoff should be required for existing as well as proposed facilities.

   Though the exact impact of coal dust on aquatic and other runoff effected ecosystems has not yet been conclusively determined, mitigation techniques such as the construction of sedimentation basins would serve as relatively low cost preventives.

SUPPORTING APPENDICES

SUPPORTING APPENDICES

APPENDIX A

POLICY RECOMMENDATIONS RELATED TO MICHIGAN COAL FACILITIES

I. ENERGY

State Policy

1. *The State of Michigan policy on future coal use should recognize (1) the current significant use of coal in the state, and (2) the need for diverse energy sources in the long-run to provide a stable economic-industrial base not threatened by dependence on any one source.*

II. TRANSPORTATION

Waterborne Transport

2. *Programs and regulations should increase the cooperation between environmental agencies and the United States Coast Guard to minimize onshore vessel impacts.*

Variable factors such as vessel speed and route may substantially affect such environmental impacts as shore erosion and suspension of particulates. Coordination between agencies capable of identifying the sources of these problems and agencies such as the USCG, with enforcement authority under the Ports and Waterways Safety Act, could be greatly beneficial.

3. *Rules and regulations should be developed under the the Clean Air Act to deal with emissions from coal-fired transport vessels.*

Experts in transportation indicate that coal as a power source for lake vessels may be significant in coming years. Emissions from this source are not currently regulated under the Clean Air Act.

Motor Carrier Transport

4. *State and regional planning and policy agencies should update Environmental Protection Agency regulations concerning allowable motor carrier noise.*

As new technology has been developed in recent years with respect to motor carrier noise emissions, tighter regulations in the form of lower allowable decibel limits may now be achieved. These regulations should probably only apply to new trucks to prevent the creation of economic hardships on current operators and must be promulgated by the EPA due to the preemptory nature of the Noise Control Act of 1972.

5. *State and regional planning and policy agencies should work towards Environmental Protection Agency inclusion of truck noise emissions within EPA's railyard noise standards which are currently being developed.*

Loading and unloading coal from trucks may produce significant noise levels. To adequately regulate rail yard noise as a whole, truck noise should be included.

6. *State and regional planning and policy agencies should cooperate to set uniform weight limitations for interstate coal trucking.*

Because state regulations differ concerning vehicle weight restrictions, all roads traveled by coal transporting trucks may not be adequately designed, and road surface damage may result. Cooperation in setting weight regulations may lead to more uniform standards and roads better able to withstand frequent transport of heavy commodities such as coal.

Rail Transport

7. *Rules and regulations concerning the implementation of fugitive dust mitigation techniques during rail transport should be promulgated and enforced.*

Because fugitive dust is produced by rail transport of coal, regulations such as those proposed for truck transport is often an interstate activity, federal regulations in this area may be most effective.

8. *State of Michigan laws regulating the allowable period of railroad crossing blockage by trains should be amended to minimize the greater potential community disruption of longer and slower moving coal transport trains.*

Studies have shown that when pre-train delay times, actual blockage times, and post-train traffic dispursion times are taken into consideration, periods of train interference with community activities may far exceed the five minute limit imposed by Michigan laws. Michigan statutes should therefore be amended in such a way as to minimize the total traffic delay times caused by the passage of a train through a community. The growing use of unit trains in coal transport may make the need for the amendment of such laws acute.

9. *Low cost solutions to rail interference with community activities should be examined by state and regional planning agencies. These could include both structural and non-structural projects, such as modification of operating practices, railroad facilities, community transportation facilities, and community development patterns.*

III. FACILITY DEVELOPMENT AND OPERATION

10. *The state Departments of Natural Resources and Transportation should prepare a coordinated, flexible, long-range dredging and dredge disposal plan for coal and other goods and commodities transport. Factors to include are port needs, water quality considerations, fish and wildlife habitat effects, other state priorities with respect to the need for and location of deepwater ports.*

11. *Proposals for the improvements such as dredging should include consideration of alternatives, such as the utilization of integrated tug barges.*

Such alternatives, where feasible, would use transport modes less dependent on deep channels and would decrease the need for initial and maintenance dredging.

Stockpiling

12. *Rules and regulations to mitigate fugitive dust generation during the grooming of active storage piles should be promulgated and implemented to whatever extent practicable.*

Proposed fugitive dust regulations for Michigan, though including inactive storages piles, do not regulate dust generated during such activities as coal removal from piles or coal compaction. Though complete elimination of such dust generation would be impossible, mitigation techniques do exist.

13. *Nonpoint source controls on coal pile runoff should be required for existing as well as proposed facilities.*

Though the exact impact of coal dust on aquatic and other runoff-effected ecosystems has not yet been conclusively determined, mitigation techniques, such as constructing sedimentation basins, would be relatively low cost solutions to potential adverse impacts.

Shoreland Development

14. *Where a proposed facility or activity requiring a permit is adjacent to or otherwise impacting on a designated environmental area, as provided for under the Shorelands Protection Management and Act, the project review should assume protection for the designated environmental area.*

Care should be taken to consider the potential effects on environmental areas of impacts originating in nearby non-environmental areas. Impacts on air or water quality, may not be restricted to undesignated areas, and should be considered in the review process.

15. *The state should complete the designation as "environmental areas" of all areas so applicable under the Shorelands Protection and Management Act.*

The DNR intends to consider about 300 miles for designation as environmental areas and has currently designated approximately 135-140 miles of shoreline. Areas yet undesignated should be protected by provisions contained in Section 404 of the Federal Water Pollution Control Act and the Michigan Wetlands Protection Act (P.A. 203 of 1979).

16. *The current lack of specificity regarding standards for administering the Great Lakes Submerged Lands Act and Inland Lakes and Streams Act should be corrected.*

The regulatory framework focuses on what DNR calls performance standards, rather than on defining those uses which will or will not be permitted. Performance standards for project review, however, are not explicitly delineated.

It should be noted that the Department of Natural Resources is currently involved in making rule changes to remedy this problem, though the language of these rule changes is not yet available.

Recreation/Coal Facility Interaction

17. *Public access to areas with recreational value should be considered in proposals for the construction of coal related development, and continuing such access should be included where feasible.*

Facilities should be evaluated with consideration of any preclusion of recreational access created by their construction.

18. *Aesthetic values should be considered in evaluating proposals for facilities in or near recreation areas.*

Facilities which would adversely affect resort or recreation areas by view disruption, dust generation, or water and beach related aesthetic impacts, should be permitted only under extenuating circumstances, if at all, or in circumstances where no other feasible or economically practical areas are available.

19. *Coordination between facility operators and state agencies should be sought to plan for conducting the most potentially disruptive facility operations at the most advantageous time possible from the point of view of recreation.*

Coordination between operators and the state Fisheries Division, for example, could schedule coal deliveries by vessel during periods least disruptive of fish spawning or migration.

20. Vacant and usable urban waterfront, largely in southern Michigan, may have high recreational value, and this should be assessed prior to permitting coal facility development.

IV. PLANNING AND GENERAL RECOMMENDATIONS

21. Appropriate agencies should study the effects of coal and coal dust on the aquatic environment.

Such studies should concentrate on the level of chemical reactivity of coal in water, any biological effects on aquatic communities, aesthetic effects of coal in water, and increased dredging requirements due to significant coal dust input through runoff.

22. Coordination and cooperation among agencies should be pursued in reviewing permit applications or project proposals for transshipment and handling facilities, as the complex interactions of these projects require an integrated approach.

23. Coordination of port planning should be pursued on both state and local levels.

Planning in many Michigan ports is largely nonexistant or minimal. Though improvements in this area are occurring, much work needs to be done if coal traffic increases to the magnitude expected.

Incentives for local port authority development are currently present within P.A. 639 of 1979, however this Act leaves the initiation of port development projects largely up to local authorities and may not provide the necessary level of state coordination. The Michigan Governor's Port Council is currently developing criteria for approving local port authorities.

24. Planning and permit processes for coal unloading and transshipment facilities should be integrated with planning and permitting of energy and industrial facilities on a comprehensive basis.

Coal unloading and transshipment facilities are, in all cases examined, associated with and located near a coal using facility. Planning for the two facilities must be done together. Energy-related industrial facilities planning must consider all feasible types of fuel and energy sources and locations. The Michigan Environmental Review Board should consider requiring for state environmental impact statements that all feasible alternatives to energy projects be considered, even those beyond the legal purview of the organization involved, so that the public interest is served by the least costly approach to energy delivery to the end user. Long-range productivity of the firm, as well as the end user should be factors in this evaluation.

25. *Coal transportation, facility development and facility operation planning should be part of an overall energy facility siting process.*

Such a process should be comprehensive in nature and comprise part of an overall state energy plan or policy. Coordination among such groups as the public utilities commission, air and water pollution control agencies, local zoning boards, and other state and local interests could also be inherent in such a process.

Using existing permit and review processes of the Department of Natural Resources, the Public Service Commission, and other commissions and agencies, the state should develop a coordinated siting process. Two possible approaches include (1) establishing an energy facility siting board of commission and department heads to coordinate and permit energy facilities, or (2) designating a lead agency to coordinate the review and permitting of energy facilities with other state commissions and agencies. These coordinated review and permitting processes should incorporate a planning function to anticipate future facility needs.

26. *In order to provide a comprehensive approach to mitigating the potential effects of increasing coal use and provide further benefits of existing coal use, the state and national coastal zone management programs should consider using coastal energy impact program (CEIP funds to ameliorate the effects of coal facility expansion, and using permit renewals to enhance existing coal facilities.*

Specifically, the CEIP funds could be used to assist communities during construction of a project or provide public access and facilities in areas of heavy demand. At existing coal unloading and using sites, the state could work with the coal transporting or using company in the permit renewal process to provide additional shoreline access. CEIP funds might then be used to provide boat launches, fishing piers and other recreational features. These features should be provided in a way that does not conflict with commercial uses of the area nor creates safety problems for small boat operators.

APPENDIX B

HISTORICAL COAL MOVEMENT IN MICHIGAN PORTS AND WATERWAYS

SUMMARY

PURPOSE

For a study of the potential implications of increased coal movement in Michigan, historical information may be valuable. Examining past conditions which may have approximated those expected in years to come could assist us in making projections about the type and degree of facility changes necessary to adapt to new increases, as well as produce clues about ways of managing future demands. Answers to questions such as, what were the peak years of coal movement in Michigan?; what were the heavily used ports and waterways during these years?; and what were the trends of coal movement in various ports and waterways over time?, may provide indications of the ability of ports and waterways to move and receive large quantities of coal. Historical data, however, is at best speculative when being applied to future projections, but may serve to spawn questions for further research about the applicability of past trends.

RESULTS

For this historical study of waterborne coal movement in Michigan, data was examined for the years 1955 through 1977. This period contained both years of peak coal usage in the Great Lakes region such as 1956 and 1966, as well as more recent years of lower usage. The source of this information was Waterborne Commerce of the United States, compiled annually by the U.S. Army Corps of Engineers. Data was collected on receipts and shipments of coal to and from twenty-four Michigan ports, as well as receipts, shipments, and through traffic for five Michigan waterways.

Several gaps in data exist within the twenty three-year period for some ports and waterways, as do some anomalies in reported data (see Port of Detroit, 1972). These may be caused by reporting or surveying deficiencies, but do not affect the overall usefulness of our study. The reader should also note that because distinctions have been made between receipts, shipments, and through traffic, substantial overlap or double counting of coal may have occurred, and totaling the various categories would exaggerate total movement figures.

The major receiving ports are divided into three size-related groups on the basis of 1970 tons received. Within each group, ports are classified as increasing, decreasing, or stable in their coal receipts for the 1970-1977 period. Values for 1970 and 1977 tonnages have also been included in the following tables, as have rotations indicating 1955-1977 trends.

TABLE B-1

PORT TRENDS 1970 - 1977

RECEIPTS

SMALL 0 - 100,000 TONS/YR.

1970	INCREASING	1977	1970	DECREASING	1977
*(72,970)	Holland	(157,809)	*(72,272)	Traverse City	(62,416)
*(-)	Presque Isle	(707,475)	+(75,604)	Calcite	(11,448)
*+(9,436)	Gladstone	(24,160)	*+(204)	Frankfort	(-)
*(38,824)	Monroe	(1,063,578)			

1970	STABLE	1977
*(14,956)	Cheboygan	(18,872)
*(7,352)	Ontonagon	(9,347)

MEDIUM 100,000 - 500,000 TONS/YR.

1970	DECREASING	1977	1970	STABLE	1977
+(274,656)	Escanaba	(154,722)	#+(216,243)	Manistee	(125,214)
*(316,268)	Harbor Beach	(268,318)	+(112,543)	Petoskey Penn. Dixie	(122,404)
+(270,879)	Luddington	(35,159)			
*(111,489)	Grand Haven	(87,682)			
*(149,382)	Charlevoix	(39,936)			
+(106,008)	Menominee	(83,697)			

LARGE 500,000 TONS/YR. AND UP

1970	DECREASING	1977	1970	STABLE	1977
+(9,014,448)	Detroit	(6,275,792)	*+(1,642,800)	Muskegon	(1,553,742)
+(1,566,838)	Saginaw River	(158,382)			
*+(790,596)	Alpena	(497,869)			
*(629,292)	Marquette	(351,388)			

KEY - * generally increasing 1955-1977
+ generally decreasing 1955-1977
*+ generally stable 1955-1977
# unusually high year

The above tables make it clear that Michigan ports have generally been decreasing their receipts during the 1970-1977 period. The only ports which do not either decrease or remain relatively stable during 1970-1977 are those in the "small" category. For this reason, increases made by these ports have not greatly affected the overall picture. The most significant changes in coal receipts can be seen in the "large" ports of Detroit and the Saginaw River. Decreases in the receipts of these ports color the entire picture of Michigan receipts.

The period of 1955 through 1977 displays similar results. Small and medium ports however, do show more increases over the longer period than over the 1970-1977 span. The large ports have generally decreased receipts over this time, as they have in recent years. It appears clear, when data from peak and low receipt years is examined, that the largest ports fluctuate most dramatically and greatly affect the annual receipt totals.

Trends in coal movement through Michigan waterways are displayed in the table below:

TABLE B-2

WATERWAY TRENDS 1970-1977

RECEIPTS AND SHIPMENTS

1970 DECREASING		1977	1970 STABLE		1977
+(417,159)	St. Mary's River	(28,589)	*+(75,179)	Keweenaw Waterway	(68,483)
*(4,808,760)	St. Clair River	(1,557,919)			
+(9,014,448)	Detroit River	(6,800,706)			

THROUGH TRAFFIC

1970 INCREASING		1977	1970 DECREASING		1977
*+(3,723,106)	St. Mary's River	(8,205,491)	+(20,928,412)	Detroit River	(12,891,683)

1970 STABLE		1977
+(40,603)	Keweenaw Waterway	#(73,844)
+(12,604,693)	St. Clair River	(11,405,652)
+(678,329)	Gray's Reef Passage	(417,800)

KEY - * generally increasing 1955-1977
+ generally decreasing 1955-1977
*+ generally stable 1955-1977
# unusally high year

During 1970-1977 waterways have generally decreasing or stable coal movement. The exception to this trend is the St. Mary's River which has recently increased its through traffic. During 1955-1977, a more clearly decreasing trend in coal movement can be observed. The peak years of 1956 and 1966 show marked increases in tons moved through the waterways, as would be expected, indicating increased waterway use during periods of high coal use. The St. Clair River and Detroit River seem to have been handling the most traffic in recent years, as well as during the longer period examined. Indications are, however, that all five waterways could accomodate more traffic than they currently do.

TABLE B-3

RECENT PAST HISTORY OF COAL RECEIPTS AND SHIPMENTS IN MICHIGAN HARBORS & PORTS

PORTS	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
Alpena Harbor	593,893	609,583	672,567	510,927	670,163	618,494	497,923	555,537	678,446	594,935	699,029	771,152	673,361
Calcite	106,796	152,496	136,138	87,236	89,935	90,577	68,218	75,206	80,289	72,565	92,034	69,343	96,767
Charlevoix Harbor	34,470	29,873	44,829	51,829	50,561	54,030	48,318	56,911	65,574	66,456	-	5,211	199,564
"	-	-	-	-	(3)	-	-	-	-	-	-	-	-
Cheboygan Harbor	2,018	9,644	15,027	6,560	12,701	19,115	12,570	14,755	18,130	12,905	21,597	16,296	20,822
Detroit	9,692,420	10,442,212	10,408,578	8,041,122	10,120,787	10,291,446	8,992,199	9,819,303	10,912,853	12,038,471	12,194,366	11,539,065	10,998,943
"	-	-	-	-	(2,137)	-	-	-	-	-	-	-	(1,500)
Escanaba	238,305	257,612	249,651	253,052	227,863	244,292	262,690	249,766	239,374	313,512	431,923	309,486	288,989
Frankfort Harbor	-	380	18,445	107,713	510	1,006	937	1,735	1,981	205	2,070	1,653	1,232
"	-	(170,381)	(138,622)	(27,838)	(130,811)	(103,692)	(90,211)	(87,220)	(77,535)	(67,272)	(65,093)	(32,346)	(25,041)
Gladstone Harbor	19,408	16,553	29,165	26,936	28,681	24,041	15,689	36,472	35,210	20,479	31,683	16,722	26,895
Grand Haven Harbor	67,989	77,816	57,123	66,777	51,717	48,370	83,750	86,418	76,139	65,475	68,572	109,244	123,835
Harbor Beach	57,362	54,511	50,381	45,709	45,028	51,387	37,567	40,513	45,166	31,687	39,566	41,346	81,063
Holland Harbor	59,643	56,152	76,902	46,476	62,674	65,698	85,766	66,536	99,712	67,422	103,291	92,080	70,121
Ludington Harbor	98,629	550	123,403	145,806	206,105	192,133	139,904	221,387	179,143	199,400	335,244	196,388	173,615
"	-	(336,302)	(264,357)	(236,556)	(251,376)	(219,266)	(173,184)	(159,433)	(155,882)	(121,794)	(116,832)	(125,158)	(88,736)
Mackinac Harbor	2,566	3,755	unrep.	2,966	2,594	3,867	2,482	1,741	1,755	1,745	1,725	-	-
Manistee Harbor	183,562	215,099	194,542	174,757	214,677	186,050	208,875	197,607	206,031	221,047	56,658	185,520	221,622
"	-	-	-	-	-	-	-	-	-	-	(6,948)	-	-
Marquette Harbor	192,276	198,958	212,885	178,449	205,795	205,587	248,856	295,321	443,169	394,291	463,390	617,601	604,625
Menominee Harbor	435,177	535,508	467,941	374,776	432,863	474,494	311,412	334,792	307,238	223,462	221,896	210,801	196,657
"	-	(288)	(7,232)	(33,234)	(219)	(466)	(25)	-	-	-	-	-	(1,232)
Monroe Harbor	19,478	20,926	33,120	-	19,431	29,618	28,359	18,929	27,643	28,522	35,894	31,487	38,390
Muskegon Harbor	749,451	1,182,805	1,337,620	1,169,544	1,318,265	1,190,584	1,091,450	1,142,732	933,755	1,151,812	1,250,101	1,282,700	1,343,377
"	-	(46,314)	(55,555)	(46,708)	(38,950)	(28,280)	(21,337)	(19,286)	(13,401)	(9,744)	(4,456)	(11,909)	(2,767)
Ontonogon Harbor	-	-	-	-	-	-	-	2,674	-	-	11,520	21,737	32,010
Petosky Penn Dixie Harbor	unrep.	155,440	102,394	129,761	139,082	152,286	142,808	124,706	145,179	149,605	unrep.	unrep.	154,295
Presque Isle Harbor	-	-	-	-	-	-	-	-	-	-	-	-	-
Saginaw River	1,649,854	1,538,763	1,573,364	1,267,189	1,829,955	1,874,003	1,930,888	2,108,699	2,320,500	2,524,542	2,984,180	3,270,792	3,165,719
St. Joseph Harbor	28,866	13,119	15,875	11,414	13,099	4,545	4,507	4,030	3,033	3,335	-	-	-
Traverse City	50,161	41,587	47,760	45,149	43,842	41,690	41,702	46,572	47,331	58,839	50,416	58,350	55,786
TOTALS	14,282,324	15,613,342	15,867,710	12,744,148	15,786,328	15,863,313	14,256,870	16,202,342	16,867,651	18,240,766	19,095,155	19,846,974	18,567,688
	-	(553,285)	(465,766)	(344,336)	(423,496)	(351,704)	(284,757)	(265,939)	(246,818)	(198,810)	(193,329)	(169,413)	(119,276)

RECENT PAST HISTORY OF COAL RECEIPTS AND SHIPMENTS IN MICHIGAN HARBORS & PORTS (Con't)

PORTS	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Alpena Harbor	662,057	668,964	790,596	692,513	633,604	541,679	671,183	594,050	625,062	497,869
Calcite	81,943	70,186	75,604	68,376	61,572	95,027	102,070	59,599	39,090	11,448
Charlevoix Harbor	208,542	109,998	149,382	116,715	132,565	141,652	147,596	123,216	113,223	39,936
Cheboygan Harbor	-	-	14,956	16,136	12,180	8,110	9,373	-	-	18,872
Detroit	10,988,896	9,224,557	9,014,448	7,954,463	217,496	8,162,918	6,570,022	6,859,019	6,800,706	6,275,792
Escanaba	240,631	277,946	274,656	166,703	213,613	208,103	231,683	194,095	199,847	154,722
Frankfort Harbor	-	345	204	-	-	-	-	-	-	-
"	(19,585)	(7,684)	(11,305)	(6,641)	(3,281)	(2,317)	(955)	(479)	(900)	(988)
Holland Harbor	81,764	107,378	72,970	97,058	84,032	141,345	125,029	103,008	109,324	157,809
Harbor Beach	255,728	237,163	316,268	124,380	233,859	201,260	237,402	283,011	296,511	268,318
Gladstone Harbor	17,803	25,505	9,436	9,085	9,375	18,952	-	8,799	21,860	24,160
Grand Haven Harbor	100,122	98,739	111,489	127,579	78,866	87,839	97,037	82,189	109,017	87,682
Ludington Harbor	180,573	146,334	270,879	79,820	16,448	16,710	9,690	11,183	34,915	35,159
"	(40,742)	(30,823)	(19,793)	(18,102)	(13,268)	(8,611)	(22,214)	(12,499)	(3,905)	(6,497)
Mackinac Harbor	-	-	-	-	-	-	-	-	-	-
Manistee Harbor	239,521	247,077	216,243	115,360	145,075	159,604	147,851	154,050	104,779	125,214
Marquette Harbor	639,358	641,625	629,292	524,047	655,587	633,923	909,581	1,096,902	502,055	351,388
Menominee Harbor	149,159	131,080	106,008	73,970	68,171	69,841	49,822	65,477	51,593	83,697
Monroe Harbor	24,355	65,973	38,824	20,943	30,130	37,253	215,438	1,139,816	954,803	1,063,578
Muskegon Harbor	1,596,516	1,416,818	1,642,800	1,806,363	1,429,794	1,898,685	1,919,538	1,503,672	1,736,475	1,553,742
"	(715)	(763)	(711)	(3,327)	(319)	(207)	(146)	(1,620)	(9,567)	
Ontonogon Harbor	26,268	19,419	7,352	-	-	-	-	-	-	9,347
Petoskey Penn Dixie Harbor	116,020	137,345	112,543	114,211	127,797	124,058	123,300	119,872	108,390	122,404
Presque Isle Harbor	-	-	-	-	-	-	-	-	581,210	707,475
Saginaw River	1,653,181	668,964	1,566,838	1,087,254	646,936	77,401	364,219	62,193	-	158,382
"	-	-	-	-	-	-	-	-	-	(26,257)
Traverse City Harbor	53,523	65,620	72,272	72,832	82,545	65,416	67,336	46,805	60,141	62,416
TOTALS	17,315,960	14,361,036	15,493,060	13,267,808	4,879,645	13,049,412	11,998,170	12,506,835	12,449,001	11,541,678
	(61,042)	(39,270)	(31,809)	(28,070)	(16,868)	(11,135)	(23,315)	(14,598)	(14,372)	(33,742)

KEY

Figure directly opposite port name represents receipts.

Bracketed [()] figure represents shipments.

All values represent short tons of coal and lignite.

TABLE B-4

RECENT PAST HISTORY OF COAL MOVEMENTS ON MICHIGAN WATERWAYS

WATERWAY	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
Detroit River	29,679,831	10,442,212	10,408,578	8,033,540	10,122,924	10,291,446	8,975,428	9,819,303	10,910,129	12,089,574	12,204,589	11,513,410	11,006,101
"	*24,173,404*	*24,283,126*	*23,301,322*	*18,951,290*	*19,314,441*	*20,299,974*	*19,444,943*	*19,778,902*	*21,609,876*	*20,358,983*	*22,177,536*	*23,385,029*	*21,652,256*
Gray's Reef Passage	*1,600,166*	*2,000,804*	*1,811,617*	*1,103,632*	*916,084*	*641,873*	*565,676*	*587,319*	*727,172*	*998,033*	*1,020,253*	*823,476*	*936,292*
Keweenaw Waterway	270,969	394,293	358,765	295,847	376,467	374,612	409,257	413,743	486,738	425,655	238,618	285,746	181,180
"	*81,811*	*46,196*	-	*33,807*	*52,654*	*9,637*	*80,590*	*59,494*	*10,730*	*21,426*	*72,719*	*119,154*	*110,562*
St. Clair River	1,997,795	2,166,718	2,194,129	1,739,659	2,566,779	2,325,077	3,025,833	3,450,583	4,097,732	3,941,807	4,341,362	4,455,251	4,481,500
"	*unrep.*	*unrep.*	*unrep.*	*unrep.*	*unrep.*	*unrep.*	unrep.	*15,776,843*	*16,852,827*	*15,628,366*	*17,030,352*	*18,815,511*	*14,311,378*
St. Mary's River	715,523	680,191	612,268	486,841	unrep.	485,987	420,296	398,182	406,498	451,551	466,468	523,994	432,631
"	*7,612,926*	*8,691,833*	*7,494,067*	*5,163,537*	*5,472,496*	*5,316,037*	*4,421,570*	*4,728,465*	*5,151,499*	*5,105,666*	*5,765,343*	*5,849,017*	*5,202,674*
TOTALS	32,664,118	13,683,414	13,573,740	10,555,887	13,066,170	13,477,122	12,830,814	14,081,811	15,901,097	16,908,587	17,251,037	16,778,401	16,101,412
	33,468,297	*35,021,959*	*32,606,996*	*25,252,260*	*25,755,675*	*26,267,251*	*24,512,679*	*40,931,023*	*44,352,104*	*42,112,474*	*46,066,203*	*48,992,187*	*42,213,162*

WATERWAY	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Detroit River	10,988,896	9,224,557	9,014,448	7,954,463	8,971,357	8,162,918	6,605,487	6,859,019	6,275,792	6,800,706
"	*20,791,612*	*18,306,547*	*20,928,412*	*19,233,422*	*18,146,643*	*16,620,234*	*14,752,260*	*13,630,872*	*13,111,112*	*12,891,683*
Gray's Reef Passage	*544,351*	*736,958*	*678,329*	*570,289*	*622,932*	*686,985*	*657,179*	*734,909*	*598,129*	*417,880*
Keweenaw Waterway	122,435	55,304	75,179	15,729	47,741	76,874*	77,701	58,803	87,181*	68,483
"	*56,364*	*10,786*	*40,603*	*31,347*	*7,569*	-	*35,635*	*37,814*	-	*73,844*
St. Clair River	4,196,730	4,890,487	4,808,760	4,672,907	4,623,843	3,885,918	3,643,343	2,119,692	1,539,844	1,557,919
"	*15,668,327*	*12,227,644*	*12,604,893*	*14,138,034*	*13,265,990*	*11,603,922*	*11,590,661*	*11,677,639*	*11,594,880*	*11,405,652*
St. Mary's River	489,792	442,109	417,159	301,097	285,205	290,796	254,038	107,266	79,453	28,589
"	*4,156,527*	*11,051,731*	*3,723,106*	*4,877,313*	*4,969,905*	*5,994,021*	*5,554,071*	*6,737,428*	*8,009,395*	*8,205,491*
TOTALS	15,797,853	14,612,457	14,315,546	12,944,256	13,154,146	12,339,632	10,580,569	9,144,780	7,895,089	8,455,697
	41,216,181	*42,333,665*	*37,975,343*	*38,850,405*	*37,013,039*	*33,804,162*	*32,589,806*	*32,818,662*	*33,313,516*	*32,994,550*
	-	-	-	-	-	76,874*	-	-	87,181*	-

KEY

Figure directly opposite waterway represents total receipts and shipments.

Figure in italics represents total movement through waterway.

* Represents total movement of coal for years where source did not distinguish between receipts and shipments and through traffic.

The following three tables illustrate coal receipts by both rail and vessel in Michigan's coastal zone. For comparison purposes, these tables express coal volumes in terms of carloads -- with one carload equalling one hundred tons. The percentage of total state receipts of each county for each mode is also indicated.

Table B-5, Port Coal Receipts, represents vessel transported coal received at Michigan ports in 1975, broken down by counties.

Table B-6, Railroad Coal Shipments, displays the volume of receipts of coal by rail at various points in Michigan's coastal counties in 1975. Table B-7 is also included to define the specific routes of coal carrying unit trains within Michigan.

TABLE B-5

PORT COAL RECEIPTS
BY COASTAL COUNTY - 1975 (In Carloads)*

COUNTY	RECEIPTS	PERCENT OF TOTAL
Alcona	0	
Alger	0	
Allegan	0	
Alpena	5940	2.88
Antrim	0	
Arenac	0	
Baraga	0	
Bay	0	
Benzie	0	
Berrien	0	
Charlevoix	1232	0.60
Chippewa	0	
Cheboygan	0	
Delta	2027	0.98
Emmet	1198	0.58
Grand Traverse	468	0.23
Gogebic	0	
Houghton	0	
Huron	2830	1.37
Iosco	0	
Keweenaw	0	
Leelanau	0	
Luce	0	
Mackinac	0	
Macomb	0	
Mason	111	0.05
Marquette	10,969	5.31
Manistee	1540	0.75
Menominee	654	0.32
Monroe	11,398	5.52
Muskegon	15,036	7.28
Oceana	0	
Ontonagon	0	
Ottawa	83,219	40.32
Presque Isle	595	0.29
Sanilac	0	
Saginaw	621	0.30
Schoolcraft	0	
St. Clair	0	
Tuscola	0	
Van Buren	0	
Wayne	68,590	33.23
TOTAL	206,424	

* One carload equals one hundred tons.

SOURCE: Michigan Department of Transportation

TABLE B-6

RAILROAD COAL SHIPMENTS
BY COASTAL COUNTY - 1975 (In Carloads) *

COUNTY	SHIPMENTS	PERCENT OF TOTAL
Alcona	0	
Alger	0	
Allegan	802	0.571
Alpena	0	
Antrim	9	0.006
Arenac	20	0.014
Baraga	0	
Bay	19400	13.811
Benzie	0	
Berrien	482	0.343
Charlevoix	0	
Chippewa	0	
Cheboygan	0	
Delta	800	0.570
Emmet	92	0.066
Grand Traverse	19	0.014
Gogebic	0	
Houghton	0	
Huron	271	0.193
Iosco	0	
Keweenaw	0	
Leelanau	0	
Luce	2	0.001
Mackinac	0	
Macomb	1750	1.246
Mason	50	.036
Marquette	23100	16.445
Manistee	60	0.043
Menominee	0	
Monroe	47450	33.780
Muskegon	57	0.041
Oceana	18	0.013
Ontonogan	2300	1.637
Ottawa	14250	10.145
Présque Isle	5	0.004
Sanilac	269	0.192
Saginaw	1502	1.069
Schoolcraft	0	
St. Clair	2950	2.100
Tuscola	0	
Van Buren	12	0.009
Wayne	24800	17.655
TOTAL	140470	

* One carload equals one hundred tons.

SOURCE: Michigan Department of Transportation

TABLE B-7

UNIT COAL TRAIN ROUTES WITHIN MICHIGAN

1. West Olive (Consumers Power, Campbell Plant): 4 Trains/wk.
   C & O via Toledo, Plymouth, Lansing, Grand Rapids, Holland.

2. Essexville (Consumers Power, Karn & Weadock Plants): 4 Trains/wk
   equally split C & O and GTW
   C&O via Toledo, Plymouth, Flint, Saginaw
   GTW via Toledo - D & TShorleline, Detroit, Durand, Saginaw

3. Midland (Dow): 2 Trains/wk.
   GTW via Toledo - D & TShoreline, Detroit, Durand, Saginaw, Bay City

4. Lansing (Board of Power & Light): 1 Train/wk.
   GTW via Toledo - D &T ShoreLine, Detroit, Durand, Lansing

5. Monroe (Detroit-Edison): 12 Trains/wk
   Conrail via Toledo, Monroe

6. Trenton (Detroit-Edison Channel Plant): 4 Trains/wk
   D&TSL via Toledo

7. River Rouge (Detroit-Edison): 1 Train/wk
   Conrail via Toledo

8. Connor Creek (Detroit-Edison): Train/wk
   Conrail via Toledo

9. Erie (Detroit-Edison): 80 Trains/Yr.
   D&TSL via Toledo

SOURCE: Michigan Department of Transportation

APPENDIX C

RESULTS OF THE COAL FACILITY REVIEW

The results of our coal facility review can be broken down into nine distinct categories of information. These include:

1. origin data
2. mode data
3. data concerning numbers of individual receipts
4. point of vessel loading data
5. end use data
6. comparisons of industry v. utility use
7. 1979 throughput data
8. throughput capacity data, and
9. projected future changes in coal related activities at these facilities, including expansion.

ORIGIN OF COAL MOVEMENT

Examination of data gathered pertaining to the initial origin of coal being received and used in the state of Michigan provides the basis for several conclusions. First, it is clear that the number of individual facilities served strictly by coal from the eastern portion of the United States far out weighs the number of facilities receiving both eastern and western coal; and no facilities currently receive only western coal. In contrast to the apparent one sided impression created by this data is the fact that although the number of facilities receiving coal from the western part of the country is low, the actual tonnages used by these facilities is often quite high. Utilities such as Detroit Edison's St. Clair plant, the Upper Penninsula Generating Company in Marquette, and the Upper Penninsula Power Company in Houghton, all receive western as well as eastern coal and exhibit annual throughputs of western coal in the millions of tons.

One possible conclusion drawn from this data could be that even without a large increase in the number of facilities using western coal, transportation emands for the eastern movement of the fuel to a few large users may increase or at least remain high in terms of tonnages moved. It should however be noted that the only large western coal using facility expecting to increase its throughput is Detroit Edison's St. Clair Power Plant.

Another observation which may be pertinent with respect to future coal facility development within Michigan may be that it is generally the larger facilities (at least over two million tons annual throughput) which tend to use both eastern and western coal. In years to come, the construction on new, large coal fired plants, might be expected to use both types of coal, and use the west to east transportation system further.

COAL DELIVERY BY MODE

Data concerning the mode of transport of coal to various utilities and industries in the Michigan coastal zone shows that the great majority of coal delivery in this portion of the state occurs by way of lake vessel.

Sixty-seven percent (67%) of all coastal zone facilities using coal rely exclusively on waterborne transport, 14% employ only rail, and 19% use a rail/water mix to obtain their fuel.

By breaking the state of Michigan down into Coastal Regional Planning Areas (see Figure), and examining the transport mode data with respect to these sub-state regions, several observations can be made. Perhaps most apparent is the basic difference in the utilization of rail and lake vessels as transport modes between coastal regions located in the southern two-thirds of the lower penninsula and the rest of the state. The results of the study show that while facilities in the southern half of the state of ten received coal by rail as well as water, utilities and industries in the nine northern regions rely exclusively on vessel transport for the receipt of coal supplies.

FUTURE EFFECTS

These observations can clearly be of some use when trying to determine areas which would be most likely to be impacted by coal transportation in certain ways. For example, one conclusion may be that impacts associated with the transport of coal by rail, such as community interference, noise, and fugitive dust, are not currently important considerations in the state's northern regions with respect to coal transportation. Following the same logic, one could also assume that regions in the southern half of the state may be subjected to a wider range of transport related effects, and therefore could require mitigation measures for dealing with incremental effects of both increased rail and vessel coal movement.

Further insight regarding transportation impacts can be gathered by combining the mode data with information concerning the number of actual vessel and train receipts by facilities in the various regions and their points of origin. An examination of this type provides not only an indication of where trains and vessels transport coal to in Michigan, but also from where and how often.

COAL RECEIVING

The results of the study concerning individual receipts and their origin continue to support the conclusion that southern Michigan is the most heavily taxed by coal transportation impacts. Though it is the northern regions which rely exclusively on vessel transport for the receipt of coal, regions in the southern half of the state on the whole do receive more individual vessel shipments in a given year. The fact that rail receipts are restricted to facilities in the southern regions of course indicates that any rail related effects now occurring may increase in extent or magnitude with an increase in coal use, data shows over one thousand individual train shipments to regions 1, 7, and 14.

VESSEL LOADING

Though information regarding the specific point of train loading prior to facility receipt was often hard to obtain, geographic conditions make it clear that any coal transporting trains must pass through some part of southern Michigan in route to any facility in the state, providing the potential for adverse impacts in these regions should coal transportation increase. Similarly, approximately 80% of all vessel receipts by Michigan facilities originate at Lake Erie ports and must either use harbors in southeastern Michigan or pass through connecting channels in these regions in the transport of coal. Potential vessel impacts such as shore erosion could therefore be expected to be concentrated in and around southern ports and in channels such as the Detroit River and the St. Clair River.

END USE OF COAL

Data collected concerning the end use of coal in Michigan clearly shows that the great majority of all coal receiving facilities in the state use their coal in power generation. Consequently, annual receipts of coal by Michigan utilities is six times that of Michigan industries.

Further examination of actual facility tonnage throughput by region shows that receipts are especially concentrated in certain parts of the state. The three primary regions using coal for utility purposes consume about 65% of all coal received in the coastal zone, while the three regions using the most coal for industrial purposes other than power generation use about 13%. In total, almost 80% of all "coastal coal" is used in four specific areas within the ten coastal areas used for discussion purposes, and this fact again contains implications for the identification of areas of possible environmental impacts within Michigan. Table further defines these regions.

CURRENT FACILITY USE AND FUTURE EXPANSION

The last area examined concerned the possibility of coal facility expansion or tonnage throughput increases. Two questions were important here. First, does the facility have the capability to expand its plant or increase its throughput, and second, do they intend to or plan to increase their throughput or expand their facility in the future.

A study of current throughput capacity among those coastal facilities responding showed that about 85% of these facilities are currently operating at below capacity. When their current versus indicated maximum throughputs are compared, the current throughput of these facilities is about 40% of what they indicate they are capable of handling. About 70% of facilities responding indicated they are capable of expanding their facilities if needed. Those two facts would tend to support the conclusion that Michigan's coastal coal unloading facilities could conceivably handle at least a doubling in coming years if the demand for commodities such as power increased or other factors made it desirable.

In contrast to the above indications of increased coal use in Michigan's coastal zone were the responses to inquiries concerning expected throughput increases. Only 36% of the facilities contacted expect to increase their annual use of coal, while almost 42% expect to remain at or near current levels and almost 14% anticipate tonnage throughput decreases. Actual increases in coal movement through the Michigan coastal zone may not therefore increase at the rate at which they are capable of increasing in the coming years.

TABLE C-1
ORIGIN DATA

Regional Origin

Eastern	89.5%
Western	0
Both	10.5%

Tonnage

• Receipts by facilities receiving only eastern coal	10,600,148
• Receipts by facilities receiving both eastern and western coal	10,948,518

Facility Expansion

• Total number of facilities indicating expected tonnage increases	14

- Of these:
  92.9% currently use only eastern coal
  7.1% currently use eastern/western mix

TABLE C-2
MODE DATA

- 66.7% of all facilities in coastal zone receive coal only by lake vessel
- 14.3% of all facilities in coastal zone receive coal only by rail
- 19.0% of all facilities in coastal zone receive coal by both vessel and rail
- Of Facilities receiving coal exclusively by vessel
  10.7% are utilities
  89.3% are industries
- Of facilities receiving coal exclusively by rail
  100% are industries
- Of facilities employing both modes
  100% are utilities

Region 1	
Vessel	31.3%
Rail	31.3%
Both	37.4%
Region 7	
Vessel	40%
Rail	40%
Both	20%
Region 9	
Vessel	100%
Region 10	
Vessel	100%
Region 11	
Vessel	100%
Region 12	
Vessel	100%
Region 13	
Vessel	100%
Region 14	
Vessel	75%
Rail	25%

TABLE C-3
POINT OF VESSEL LOADING BOUND FOR MICHIGAN

Toledo	38.2%
Sandusky	21.8%
Conneaut	16.4%
Chicago	7.3%
Superior	7.3%
Ashtabula	5.4%
Other Great Lakes Ports	3.6%

TABLE C-4
USE DATA

Power Generation	59.5%
Manufacturing	16.7%
Heat (Space Heat)	11.9%
Steam (Industrial)	9.5%
Vessel Fueling	2.4%

OFF SITE USE

Coal is moved offsite for use after initial unloading about 13.5% of the time and used at or near the point of unloading about 86.5% of the time.

TABLE C-5

NUMBER OF INDIVIDUAL COAL RECEIPTS

REGION	VESSEL	RAIL
Region 1		
Utilities	354	680
Industry	9	0
Total	363	680
Region 7		
Utilities	39	225
Industry	2	53
Total	41	278
Region 9		
Utilities	0	0
Industry	54	0
Total	54	0
Region 10		
Utilities	18	0
Industry	30	0
Total	48	0
Region 11		
Utilities	0	0
Industry	8	0
Total	8	0
Region 12		
Utilities	109	0
Industry	113	0
Total	222	0
Region 13		
Utilities	unreported	0
Industry	0	0
(represents one utility, 2,275,149 ton annual throughput)		
Region 14		
Utilities	81	150
Industry	1	0
Total	82	150
TOTALS		
UTILITIES	601	1055
INDUSTRIES	217	53
TOTAL	818	1108

TABLE C-6
1979 THROUGHPUT

Region	Utilities (tons)	Industry (tons)
Region 1	8,740,000	302,000
Region 7	2,175,000	15,000
Region 9	---	87,000
Region 10	130,000	263,406
Region 11	---	150,000
Region 12	2,940,000	2,303,111
Region 13	2,275,149	---
Region 14	3,090,000	11,000
TOTAL	19,350,149	3,305,517
COMBINED TOTAL	22,480,666	

TABLE C-7
THROUGHPUT CAPACITY DATA
(20 responses)

Of these 18, or 84.6%, indicated that their current throughput is below capacity.

	Amount of Capacity Utilized	
	Current	Maximum
	8,000	100,000
	0	200,000
	11,000	800,000
	72,406	124,000
	140,000	250,000
	0	150,000
	2,073,369	10,000,000
	36,000	90,000
	11,000	2,000,000
	377,000	1,705,000
	3,800,000	4,400,000
	80,000	800,000
	2,600,000	3,000,000
	526,000	680,000
	332,000	640,000
	175,000	320,000
TOTAL	10,241,775	25,259,000

APPROXIMATELY 40.5% OF CAPACITY

TABLE C-8

REGIONS OF GREATEST COAL USE

- Top utility regions and some major use points

Region 1	Region 12	Region 14
Detroit	Marquette	Grant Haven
Monroe	Gladstone	Muskegon
Wyandotte		West Olive
Erie		

- Top industrial regions and some major use points

Region 1	Region 10	Region 12
Monroe	Manistee	Marquette
Marine City	Petoskey	Munising
Detroit	Charlevoix	Gladstone
		Escanaba
		Menominee

TABLE C-9

PROJECTED TONNAGE CHANGES

(36 responses)

Expect to increase throughput	36.1%
Expect to decrease throughput	13.8%
Expect to remain stable	41.6%
Uncertain	8.3%

Percentage of Facilities Indicating Expected Increase by Region

Region 1	20 %
Region 7	50 %
Region 9	0 %
Region 10	40 %
Region 12	37.5%
Region 13	0 %
Region 14	75 %

Expansion Capabilities

(Facilities Answering Yes or No)

27 responses	Yes 70%	No 30%

TABLE C-10

MICHIGAN FACILITY REVIEW

ORGANIZATION	ORIGIN OF RECEIPTS	TRANSPORT MODE	POINT OF LOADING	FINAL DESTINATION AND USE	NO. OF RECEIPTS PER YEAR	1979 THROUGHPUT (TONS)	MAXIMUM THROUGHPUT CAPACITY (TONS)	MAXIMUM STORAGE CAPACITY (TONS)	PROJECTED FUTURE TONNAGE	POSSIBILITY FOR FACILITY EXPANSION	CATEGORIES OF CHANGES, SPECIAL PROBLEMS, NOTES
REGION 1 Industry											
Koenig Fuel & Supply											Information not forthcoming
Detroit, MI											
Ford Motor Company Metal Stamping Division											
Monroe, MI	Eastern	Lake Vessel	Toledo, OH	Monroe, MI; Steam	3	36,000 to 40,000			None expected	Yes	
McClouth Marine Yards											
Marine City, MI	Eastern KY, W.VA, OH	Lake Vessel	Toledo, OH	Marysville (16 mi. by truck)	1	8,000	100,000/yr	15,000		Yes (see note)	Could expand to maximum throughput, but would have to eliminate stone cargoes.
Detroit Lime Co.											
Detroit, MI	Eastern KY <1% sulfur	Lake Vessel	Toledo, OH	Detroit; Heat	4-5	<10,000		40,000	98,400/yr as of 1981	Yes	
*American Motors Corp.**											
Detroit, MI	KY	Rail				6,000					
Great Lakes Steel											
Detroit, MI	Eastern W.VA	Lake Vessel 90% Rail 10%	Toledo, OH	Zug Island, MI	150 Vessel loads	2,631,365			None expected	Yes	
*Marblehead Lime Co.**											
River Rouge, MI	KY, W.VA, EasternVA	Rail				100,000					
*Diamond Crystal Salt Co.**											
Detroit, MI		Rail				140,000					
Utility											
Consumers Power											
Erie, MI	Eastern KY, IL, OH W.VA <1% sulfur	Rail Detroit & Toledo Shoreline Route		Erie, MI; Power Generation	80-130	800,000		180 day supply			
Detroit Public Lighting											
Detroit, MI											No longer have coal burning units, all oil. Receiving no coal & have no plans to receive coal in future.
Wyandotte Municipal Service Commission											
Wyandotte, MI	Eastern KY <0.75% sulfur	Lake Vessel	Toledo, OH	Wyandotte, MI Power Generation	5-7	60,000 to 70,000		45,000	None at this time	No	Have tried to get a 150' extension onto storage area but so far the request has been denied.

* Keystone Coal Industry Manual.

MICHIGAN FACILITY REVIEW (Cont.)

ORGANIZATION	ORIGIN OF RECEIPTS	TRANSPORT MODE	POINT OF LOADING	FINAL DESTINATION AND USE	NO. OF RECEIPTS PER YEAR	1979 THROUGHPUT (TONS)	MAXIMUM THROUGHPUT CAPACITY (TONS)	MAXIMUM STORAGE CAPACITY (TONS)	PROJECTED FUTURE TONNAGE	POSSIBILITY FOR FACILITY EXPANSION	CATEGORIES OF CHANGES, SPECIAL PROBLEMS, NOTES
Detroit Edison Trenton, MI	Appalachian Coal (low sulfur)	25% Vessel 75% Rail	Vessel-Sandusky, OH Rail-Eastern origin	Power Generation	Vessel-31 Rail-150	Estimated 1980 377,000	1,705,000	500,000	No increase expected	Yes, additional mobile equipment could increase throughput	Ship capacity is currently fully utilized.
Detroit Edison St. Clair, MI	Western Coal	98% Vessel 2% Rail	Vessel-Superior, WI; Ashtabula, Toledo, OH Rail-Eastern origin	Power Generation	Vessel 58 Rail-not available	Estimated 1980 3.8 million	4 million	3.1 million	Up to 4 million	Not needed	Ship unloading capacity is restrained by the capacity of a central hopper.
Detroit Edison River Rouge, MI	Appalachian Coal (low sulfur)	6%-Vessel 94%-Rail	Vessel-Toledo, Sandusky, OH Rail-Eastern origin	Power Generation	Vessel-8 Rail-138	Estimated 1980 80,000	800,000	500,000	No increase expected	Not needed	Ship unloading capacity is restrained by the capacity of a central hopper.
Detroit Edison Pennsalt	Appalachian Coal (low sulfur)	100% Vessel	Toledo	Power Generation	8	Estimated 1980 160,000		70,000	No increase expected	Not needed	1980 was estimated as the peak year for the dock. Ship capacity is currently fully utilized.
Detroit Edison Monroe, MI	Appalachian Coal (low & high sulfur)	41% Vessel 59% Rail	Vessel-Ashtabula, Toledo, Sandusky, OH; Rail-Eastern origin	Power Generation	Vessel-176 Rail-287	Estimated 1980 2.6 million	3 million	2.3 million	Uncertain	Yes, additional mobile equipment could increase throughput	Ship capacity is currently fully utilized.
Detroit Edison Marysville MI	Appalachian Coal (low sulfur)	97% Vessel 3% Rail	Vessel-Toledo, Sandusky, OH; Rail-Eastern	Power Generation	Vessel-39 Rail- not available	Estimated 1980 526,000	680,000	191,000	625,000 tons for 1981, increasingly lower volumes after	Yes, additional mobile equipment could increase throughput	Ship unloading capacity fully utilized.
Detroit Edison Conners Creek MI	Appalachian Coal (low sulfur)	77% Vessel 23% Rail	Vessel-Sandusky, Toledo, OH; Rail-Eastern origin	Power Generation Heat	Vessel-28 Rail-not available	Estimated 1980 332,000	640,000	260,000	No increase expected could increase throughput	Yes, additional mobile equipment	20,000 tons per year is trucked off-site. Ship unloading capacity fully utilized.
Detroit Edison China Township, MI	MT	Lake Vessel	Duluth-Superior	Power Generation		None			4,000,000 - 1984		

* Keystone Coal Industry Manual.

MICHIGAN FACILITY REVIEW (Cont.)

ORGANIZATION	ORIGIN OF RECEIPTS	TRANSPORT MODE	POINT OF LOADING	FINAL DESTINATION AND USE	NO. OF RECEIPTS PER YEAR	1979 THROUGHPUT (TONS)	MAXIMUM THROUGHPUT CAPACITY (TONS)	MAXIMUM STORAGE CAPACITY (TONS)	PROJECTED FUTURE TONNAGE	POSSIBILITY FOR FACILITY EXPANSION	CATEGORIES OF CHANGES, SPECIAL PROBLEMS, NOTES
REGION 7 Industry											
Hercules Powder Co. Harbor Beach, MI	Eastern KY, VA, W.VA	Rail		Harbor Beach Power Generation	1	4,000			None	Yes (see notes)	The need for coal has been small. The boilers are too big for their purposes, therefore they are switching over to natural gas. It is possible to expand the facilities but there is no need. Only one boiler will remain on standby for coal. If they increased coal movement they would have to expand the plant and dredge the harbor which is currently 10-11 feet deep.
Wirt Stone Dock Bay City, MI	Eastern KY	Lake Vessel	Toledo, OH	Michigan Sugar Co. (10 mi. by truck); Steam Generation	2	None	200,000/yr		Uncertain	Yes	
Chevrolet Saginaw Grey Iron Foundry Saginaw, MI	Eastern KY	Rail Chessie RR		Saginaw; Steam Generation	Once/wk. from Oct. to Apr. 1, 3-4 cars load	11,000	100 tons/hr.		some expected but nowhere near capacity	No	
Wirt Saginaw Stone Dock Saginaw, MI											No longer receiving any coal.
Robert Gage Ready Mix Bay City, MI											No longer receiving any coal.
Utility											
Consumers Power Co. Essexville, MI	Eastern KY, IL, OH W.VA <1% sulfur	Lake Vessel & Rail	Chicago, IL Toledo, Sandusky, OH	Essexville Power Generation	10-30 by vessel 170-280 by train	300,000 by Lake Vessel 1,700,000 by Rail (C & O)		180 days supply		No	
Detroit Edison Harbor Beach, MI	Appalachian Coal (Low sulfur)	100% Vessel	Toledo, Ashtabula, Sandusky, OH	Power Generation	19	Estimated 1980 175,000	320,000	165,000	Up to 245,000 tons	Yes, additional mobile equipment could increase throughput	
REGION 8 Industry											
Dow Chemical Ludington, MI											All boilers have been converted to oil. There are no plans to convert back to coal.

* Keystone Coal Industry Manual.

MICHIGAN FACILITY REVIEW (Cont.)

ORGANIZATION	ORIGIN OF RECEIPTS	TRANSPORT MODE	POINT OF LOADING	FINAL DESTINATION AND USE	NO. OF RECEIPTS PER YEAR	1979 THROUGHPUT (TONS)	MAXIMUM THROUGHPUT CAPACITY (TONS)	MAXIMUM STORAGE CAPACITY (TONS)	PROJECTED FUTURE TONNAGE	POSSIBILITY FOR FACILITY EXPANSION	CATEGORIES OF CHANGES, SPECIAL PROBMLEMS, NOTES
REGION 9 Industry											
Huron Cement Division											
Alpena, MI	Eastern	Lake Vessel	Sandusky, Conneaut, OH	Cement Manufacturing	40-50	450,000			No increase expected	Storage pile could be expanded	
Abitibi Corp.											
Alpena, MI	Eastern	Lake Vessel	Toledo, OH	Power Generation, Heat	9	75,000-85,000			No increase expected		
Michigan Limestone											
Rogers City, MI		Lake Vessel		Heating & fueling of vessels		7,000			Currently decreasing	Will probably contact	
GEPS Marine Terminal											
Cheboygan, MI	Eastern KY	Lake Vessel	Cleveland, OH	1/2 mile inland; process heat	1	30,000			None Expected	No	
REGION 10 Industry											
Hardy Salt Co.											No longer receiving any coal.
Manistee, MI											
Morton Salt Division											
Manistee, MI	Eastern KY	Lake Vessel	Toledo, OH	Power & steam heating of buildings	6	50,000	Current is not max.		10% increase over next 5 yrs unknown after that		1979 tonnage figure may not be representative due to a strike. Expect an increase in movement, but no facility changes anticipated
Penn-Dixie Cement											
Petosky, MI	Eastern	Lake Vessel	Conneaut, OH	Manufacturing	10-12	72,406	124,000		No increase expected	No, too costly	In 1978 they received 123,497 tons. The sharp 1979 drop was the result of production variations.
Medusa Cement Co.											
Charlevoix, MI	Eastern	Lake Vessel	Sandusky, Conneaut, OH	Used to manufacture cement	10-15	140,000	250,000		Want to decrease	Possibly (see notes) consumption	There is no current need to expand facilities. They have recently modernized in order to use less coal.
Northern Michigan Electric Corp.											
Boyne City, MI	KY S. IL	Lake Vessel	Sandusky, OH Chicago, IL	Power Generation	13-15	106,000 (1 unit down)			Expect Decrease	No, permits to expand are not likely to be granted	COE have plans to deepen and straighten the channel at Charlevoix, but they have been postponed. The channel work may be a factor as to whether they get coal at all. Need access to bigger newer ships.

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MICHIGAN FACILITY REVIEW (Cont.)

ORGANIZATION	ORIGIN OF RECEIPTS	TRANSPORT MODE	POINT OF LOADING	FINAL DESTINATION AND USE	NO. OF RECEIPTS PER YEAR	1979 THROUGHPUT (TONS)	MAXIMUM THROUGHPUT CAPACITY (TONS)	MAXIMUM STORAGE CAPACITY (TONS)	PROJECTED FUTURE TONNAGE	POSSIBILITY FOR FACILITY EXPANSION	CATEGORIES OF CHANGES, SPECIAL PROBMLEMS, NOTES
REGION 10 Utility											
Traverse City Light & Power											
Traverse City, MI	KY	Lake Vessel	Toledo, OH & Lake Erie Ports	Power Generation	2-5	24,000		20,000	1981-1993 60,000/yr	Township is opposed to expansion	Beyond 1993, no plans to expand coal facilities. Probably will purchase power from other utilities after that. Dredging will be required to handle existing needs due to low water problems near dock.
REGION 11 Industry											
C. Reiss Coal Co.											
Sault Ste. Maire, MI	Eastern	Lake Vessel	Toledo, OH	Power, Heat used by Abitibi Corp & St. Prison	7-8	None	>150,000/yr		Expect increase in in 1980	Current facility still underutilized	Indicate possible use of excess capacity.
REGION 12 Industry											
LS & I Railroad											
Marquette, MI	Eastern Lower GL's Western MT	Lake Vessel	Superior, WI & Lower Great Lake Ports	Power Generation for utilities & mining companies. Moved to these destinations by unit trains.	100	2,073,369	10 million		1 million tons	Yes	This facility differs from a loading dock or transshipment facility in that coal does not come here directly from the mine and has already been "transshiped."
Munising Paper Div.											
Munising, MI	W.PA Eastern KY	Lake Vessel		Paper Manufacturing	3	35,775	Current		No increase expected		
Delta Coal & Dock											
Gladstone, MI	PA	Lake Vessel	Conneaut, OH	Paper Mills	3-5	36,000	80-100,000		Anticipate increase	Yes, approx. 70 acres of land available.	This facility differs from a loading dock or transshipment facility in that coal does not come here directly from the mine and has already been "transshiped". It differs from the other industries in that no coal is used on-site.
C. Reiss Coal Co.											
Escanaba, MI	KY, OH, W.VA, PA	Lake Vessel	Toledo, OH	Moved offsite in a radius of about 80 miles by truck		91,967	Depends on tonnages stored for later shipment		1980 - 60,000 ton increase		This facility differs from a loading dock or transshipment facility in that coal does not come here directly from the mine and has already been "transshipped". It differs from the other industries in that no coal is used on-site.

* Keystone Coal Industry Manual.

MICHIGAN FACILITY REVIEW (Cont.)

ORGANIZATION	ORIGIN OF RECEIPTS	TRANSPORT MODE	POINT OF LOADING	FINAL DESTINATION AND USE	NO. OF RECEIPTS PER YEAR	1979 THROUGHPUT (TONS)	MAXIMUM THROUGHPUT CAPACITY (TONS)	MAXIMUM STORAGE CAPACITY (TONS)	PROJECTED FUTURE TONNAGE	POSSIBILITY FOR FACILITY EXPANSION	CATEGORIES OF CHANGES, SPECIAL PROBLEMS, NOTES
Menominee Paper Co.											
Menominee, MI	PA, S. IL, <1.5% sulfur	Lake Vessel		Paper Manufacturing	6	66,000	About current tonnage		No increase expected at this time	Yes	
Marquette Board of Light & Power											
Marquette, MI	Western PA <1.5% sulfur content	Lake Vessel	Conneaut, OH	Power Generation	6-7	128,000		75,000	After 1982 expect to use 250,000 -300,000 tons/yr due to the addition of a new unit.	Currently adding new unit, will be on time by 1982	Must dredge channel annually to maintain 20 ft. depth. Usually in the spring. Also will have to install a conveyor belt to handle anticipated coal increases.
Gladstone Light Utility											
Gladstone, MI	W.PA <1.5% sulfur content	Lake Vessel	Coneaut, OH	Power Generation	1-2	12,000		60,000	Unknown	Yes	Air emissions tests are currently being conducted on two units. One has passed. If the other does not pass the plant will be closed down.
Upper Peninsula Generating Co.											
Marquette, MI	W.MT, WY, W.VA, VA, KY	Lake Vessels	Superior, WI Toledo, Sandusky, Conneaut, OH	Power Generation	99 Usually try for 100/yr	2,800,000			No increase expected		
REGION 13 Utility											
Upper Peninsula Power Co.											
Houghton, MI	1. PA 2. PA 3. PA, W.VA, VA, KY, MT	Lake Vessel	Eastern: Sandusky Toledo Conneaut, OH Western: Superior, WI	1. Escanaba 2. Houghton 3. Marquette Power Generation		2,275,149 1. 58,207 2. 84,538 3. Eastern 902,404 Western 1,230,000		1. 75,000 2. 100,000	Same as 1979	Not at Marquette	No foreseeable growth in future.
REGION 14 Industry											
Verplank's Coal & Dock Co.											
Ferrysburg, MI	S. IL	Lake Vessel	Chicago, Il	Rockford, MI Paper Manufacturing	1	11,000	2,000,000		1981 - 24,000 tons	Yes	This facility differs from a loading dock or transshipment facility in that coal does not come here directly from the mine and has already been "transshiped". It differs from the other industries in that no coal is used on-site.
S.D. Warren Co.											
Muskegon, MI											No longer receives coal.

* Keystone Coal Industry Manual.

MICHIGAN FACILITY REVIEW (Cont.)

ORGANIZATION	ORIGIN OF RECEIPTS	TRANSPORT MODE	POINT OF LOADING	FINAL DESTINATION AND USE	NO. OF RECEIPTS PER YEAR	1979 THROUGHPUT (TONS)	MAXIMUM THROUGHPUT CAPACITY (TONS)	MAXIMUM STORAGE CAPACITY (TONS)	PROJECTED FUTURE TONNAGE	POSSIBILITY FOR FACILITY EXPANSION	CATEGORIES OF CHANGES, SPECIAL PROBLEMS, NOTES
Utility											
Grand Haven Board of Light & Power											1983 unit will burn higher sulfur coal. Coal will probably come from Indiana. The unit will include a scrubber.
Grand Haven, MI	KY	Lake Vessel	Conneaut, OH	Power Generation	5-6	90,000		50,000	Now-1983 75,000 - 90,000 tons/yr After 1983 about 150,000 tons/yr due to new unit	No, too costly	
Consumers Power											
Muskegon, MI	KY, IL, OH W.VA	Lake Vessel	Chicago, IL Toledo, OH	Power Generation	75	1,500,000		180 days supply	1983 - 1,500,000 will probably be distributed to other plants also.	No	
Consumers Power											
West Olive, MI	KY, IL, OH W.VA	Rail		Power Generation	more than 150	1,500,000		180 days supply	1,500,000 increase in 1980 by unit train.	No	

* Keystone Coal Industry Manual.

COAL TRANSSHIPMENT FACILITIES

The feasibility of establishing a coal transshipment facility at Escanaba is being examined at the University of Michigan. At this time, it is not clear that such a facility is economically feasible nor what companies would use the facility. The reasons for proposing such a facility to avoid the Sault Ste. Marie Locks in winter because of ice cover and potential capacity limits at the Locks and provide for the possibility of using large vessels on the Lakes Michigan, Huron, and Erie to transport western coal to large coal users located on those lakes. No other information concerning this facility is available at this time.

GREAT LAKES STATES

A review of current coal using facilities in the Great Lakes States other than Michigan was also conducted in an attempt to gain a better understanding of regional coal movement and facility development. The information gathered is presented in two tables. Table B-1 presents data for coal using industries and utilities and Table B-2 displays information gathered regarding coal transshipment facilities within the coastal zones of Great Lakes states other than Michigan.

TABLE C-11

OTHER LAKE STATE FACILITY REVIEW

ORGANIZATION	ORIGIN OF RECEIPTS	TRANSPORT MODE	POINT OF LOADING	FINAL DESTINATION AND USE	NO. OF RECEIPTS PER YEAR	1979 THROUGHPUT (TONS)	MAXIMUM THROUGHPUT CAPACITY (TONS)	MAXIMUM STORAGE CAPACITY (TONS)	PROJECTED FUTURE TONNAGE	POSSIBILITY FOR FACILITY EXPANSION	CATEGORIES OF CHANGES, SPECIAL PROBLEMS, NOTES
LAKE STATES											
MINNESOTA Industry											
C Reiss Coal Co. Duluth, MN			Various locations & uses by moved within a 100 mile radius by truck & rail		213,800	800,000		5% +/yr. increase			This facility differs from a loading dock or transshipment facility in that coal does not come here directly from the mine and has already been "transshipped". It differs from the other industries in that no coal is used on-site.
Reserve Mining Co. Silver Bay, MN	Eastern W.VA, E KY % sulfur	Lake	Vessel		3-4	50,000	300,000			No need. Want to reduce stockpiling.	1978-100,000 tons. Annual tonnage depends on availability of other fossil fuels and amount stockpiled. Government regulations are the major factors forcing coal conversion. This industry would prefer to continue using natural gas.
Erie Mining Co. Taconite Harbor, MN	Eastern <1.9% surfur	Lake Vessel	Toledo, Conneaut, OH	Schroeder; Steam generation	30	600,000	Current tonnage		None expected	No	
WISCONSIN Industry											
C. Reiss Coal Co. Ashland, WI	Eastern	Lake Vessel	Toledo, Conneaut, OH	Various locations, shipped out by rail & truck (85% rail)		266,000	300,000*		None at this time, but hopeful about future	Yes (see notes)	A second dock facility can accommodate 200,000 tons more throughput. Constraints on coal receipts imposed by winter-ice breaking is required, poor rail service, & unreliable gov't. dredging of channel. This facility differs from a loading dock or transshipment facility in that coal does not come here directly from the mine and has already been "transshipped". It differs from the other industries in that no coal is used on-site.
Fort Howard Paper Co. Green Bay, WI	Eastern			Various locations & uses. Usually coal is moved within a 100 mile radius by truck or rail		518,800	700,000		5% +/yr. increase		This facility differs from a loading dock or transshipment facility in that coal does not come here directly from the mine and has already been "transshipped". It differs from the other industries in that no coal is used on-site.

* Keystone Coal Industry Manual.

OTHER LAKE STATE FACILITY REVIEW (Cont.)

ORGANIZATION	ORIGIN OF RECEIPTS	TRANSPORT MODE	POINT OF LOADING	FINAL DESTINATION AND USE	NO. OF RECEIPTS PER YEAR	1979 THROUGHPUT (TONS)	MAXIMUM THROUGHPUT CAPACITY (TONS)	MAXIMUM STORAGE CAPACITY (TONS)	PROJECTED FUTURE TONNAGE	POSSIBILITY FOR FACILITY EXPANSION	CATEGORIES OF CHANGES, SPECIAL PROBLEMS, NOTES
C. Reiss Coal Co. Manitowoc, WI	Eastern					62,000	175,000		5% +/yr. increase		This facility differs from loading dock or transshipment facility in that coal does not come here directly from the mine and has already been "transshipped." It differs from the other industries in that no coal is used on-site.
Marinette Fuel & Dock Co. Marinette, WI	Eastern KY, W.VA	Lake Vessel	Toledo, OH S. Chicago, Il	Industry & residences; Heating (moved 50-60 mi. by truck)	Variable	Still using coal from 1977 shipment	125,000 expected,	13 acres market	some but not in excess of 75,000 tons	Yes, but conditions do not require it.	Expressed need for increased dredging. Channel has not been dredged for eleven years and this could be a problem if more coal is moved.
Hometown, Inc. Milwaukee, WI	Eastern W.VA, approx. 4% sulfur content	Lake Vessel		Milwaukee; used to make coke		240,000	Current		None Expected	Yes	Amount of coal used is directly connected to demand for the product; they cannot make coke without coal.
Schneider Fuel & Supply Co. Milwaukee, WI	VA	Rail & Truck		Private homes home heating	15-20	1000-1500		100-120		Yes, but no need to	Shipments of coal leave this facility nearly every day during the winter & less often during warmer months, by truck.
Milwaukee Solvay Coke Co. Milwaukee, WI	Eastern	Lake Vessel		Making coke		240,000	Current			Yes	
Utility											
WI Public Service Comm. Green Bay, WI	Eastern W.PA, W.KY average sulfur content 2.5%	Lake Vessel			60	935,000	1,200,000		Expect on increase & are in the process of planning facility improvements & expansion	In the planning stages	Working with Green Bay Harbor Commission on future harbor development and the possibility of future transshipment at the site.
WI Electric Power Co. Port Washington, WI	Eastern E. PA & OH	Lake Vessel	Ashtabula or Conneaut, OH	Port Washington, Power Generation	50-70	700,000	No firm limit		Expect an increase, but no numbers available	Yes	Draft restrictions impinge on vessel size.

* Keystone Coal Industry Manual.

OTHER LAKE STATE FACILITY REVIEW (Cont.)

ORGANIZATION	ORIGIN OF RECEIPTS	TRANSPORT MODE	POINT OF LOADING	FINAL DESTINATION AND USE	NO. OF RECEIPTS PER YEAR	1979 THROUGHPUT (TONS)	MAXIMUM THROUGHPUT CAPACITY (TONS)	MAXIMUM STORAGE CAPACITY (TONS)	PROJECTED FUTURE TONNAGE	POSSIBILITY FOR FACILITY EXPANSION	CATEGORIES OF CHANGES, SPECIAL PROBLEMS, NOTES
WI Electric Power Co. Oak Creek, WI	Eastern IL & KY Western WY	Rail		Oak Creek; Power Generation	260	2.5 million*	No firm limit	1,300,000	Expect an increase, but no numbers available	Yes	Unusually low tonnage for this plant 1978 tonnage was 3.2 million
WI Electric Power Co. Milwaukee, WI	Eastern PA, OH, IL W.KY	Lake Vessel	Ashtabula or Conneaut	Milwaukee Power Generation	66	660,000	No firm limit		Expect an increase, but no numbers available	Questionable	Draft restrictions impinge on vessel size.
NEW YORK Utility											
Niagara-Mohawk Power Co. Tonawanda, NY	Eastern PA & KY	Lake Vessel 10% Rail 75% Truck 15%	Conneaut & Ashtabula Ohio	Power Electric Generation	20 by vessel 4 trains per week	150,000 by vessel 1.25 million by rail 360,000 by truck			None Expected	Yes	

* Keystone Coal Industry Manual.

APPENDIX D

MICHIGAN POWER PLANTS

This appendix lists power plants in Michigan by operator, location, status, years in operation, fuel, size, cooling system, and cooling water source.

TABLE D-1
MICHIGAN POWER PLANTS[a]
(OPR & STN)[b]

OPERATOR	CITY	PLANT NAME	STATUS	YEAR	FUEL	MEGAWATTS	COOLING SYSTEM	PRIMARY (SECONDARY)
Coldwater Bd. Public Utility	Coldwater	Coldwater 4-6	OPR	1940	Coal	11	Closed Cycle Cooling Tower Mechanical Draft	Well
Consumers Power Company	Muskegon	BC Cobb 1-5	OPR	1948	Coal	510	Once through, fresh	Lake Muskegon [M] (Muskegon River [D], Great Lakes)
Consumers Power Company	Comstock	BE Morrow 1-4	OPR	1939	Oil	186	Once through, fresh	Kalamazoo River
Consumers Power Company	Charlevoix	Big Rock Point 2	OPR	1963	Nuclear BWR	72	Once through, fresh	Lake Michigan (Great Lakes)
Consumers Power Company	Essexville	DE Karn 1 & 2	OPR	1959	Coal	530	Once through, fresh	Saginaw River (Lake Huron, Great Lakes)
Consumers Power Company	Essexville	DE Karn 3	OPR	1975	Oil	605	Closed Cycle Cooling Tower	Saginaw River (Lake Huron, Great Lakes)
Consumers Power Company	Essexville	DE Karn 4	OPR	1977	Oil	632	Closed Cycle Cooling Tower	Saginaw River (Lake Huron, Great Lakes)
Consumers Power Company	Essexville	JC Weadock 1-8	OPR	1940	Oil Coal	615	Once through, fresh	Saginaw River (Saginaw Bay, Great Lakes)
Consumers Power Company	West Olive	JC Campbell 1 & 2	OPR	1962	Coal	652	Once through, fresh	Pigeon Lake [I] (Lake Michigan [D])
Consumers Power Company	Erie	JR Whiting 1-3	OPR	1952	Coal	325	Once through, fresh	Lake Erie (Great Lakes)
Consumers Power Company	Covert	Palisades 1	OPR	1971	Nuclear BWR	668	Closed cycle Cooling Tower Mechanical Draft	Lake Michigan (Great Lakes)
Detroit Edison Company	Detroit	Conners Creek	OPR	1934	Oil Gas Coal	570	Once through, fresh	Detroit River (Great Lakes)
Detroit Edison Company	Detroit	Delray	OPR	1929	Oil Gas	375	Once through, fresh	Detroit River (Great Lakes)
Detroit Edison Company	Newport	Enrico Fermi 1	OPR	1960	Oil	150	Once through, fresh	Lake Erie [I] (Swan Creek Dis. Only, Great Lakes)
Detroit Edison Company	Avoca	Greenwood 1	OPR	1979	Oil	800	Closed cycle Spray Canal Helper Pond	Municipal Water [M] (Black River [B])
Detroit Edison Company	Harbor Beach	Harbor Beach	OPR	1968	Coal Oil	121	Once through, fresh	Lake Huron (Great Lakes)

[a] SOURCE: *Atomic Industrial Forum, Inc., May 1980.*
[b] OPR = Operating status, STN = Standby status

MICHIGAN POWER PLANTS[a] (Cont.)
(OPR & STN)[b]

OPERATOR	CITY	PLANT NAME	STATUS	YEAR	FUEL	MEGAWATTS	COOLING SYSTEM	PRIMARY (SECONDARY)
Detroit Edison Company	Marysville	Marysville	OPR	1942	Coal Gas	200	Once through, fresh	St. Clair River (Lake St. Clair)
Detroit Edison Company	Monroe	Monroe	OPR	1971	Coal Oil	3150	Once through, fresh	Raisin River (Lake Erie [D])
Detroit Edison Company	Riverview	Pennwalt	OPR	1926	Coal Oil	37	Once through, fresh	Detroit River (Lake Erie, Great Lakes)
Detroit Edison Company	Port Huron	Port Huron	OPR	1938	Coal	7	---	St. Clair River [I] (Black River [D], Great Lakes)
Detroit Edison Company	River Rouge	River Rouge	OPR	1955	Coal Oil Gas	842	Once through, fresh	Detroit River (Lake Erie, Great Lakes)
Detroit Edison Company	Belle River	St. Clair	OPR	1953	Coal Oil Gas	1620	Once through, fresh	St. Clair River (Lake St. Clair, Great Lakes)
Detroit Edison Company	Trenton	Trenton Channel	OPR	1949	Coal Gas Oil	738	Once through, fresh	Detroit River (Lake Erie, Great Lakes)
Detroit Public Lighting	Detroit	Mistersky 1-6	OPR	1927	Coal Oil	175	Once through, fresh	Detroit River (Lake Erie, Great Lakes)
Detroit Public Lighting	Detroit	Mistersky 7	OPR	1979	Oil	60	Once through, fresh	Detroit River (Lake Erie, Great Lakes)
Dow Chemical	Ludington	Ludington 2 & 13	OPR	1944		14	---	---
Ford Motor Company	Wayne	Power House One 1-7	OPR	1931	Coal Gas	345	Once through, fresh	River Rouge (Lake Erie, Great Lakes)
Gladstone Light Utility	Gladstone	Gladstone 1 & 2	OPR	1955	Coal	6	Once through, fresh	Little Bay DeNoc (Lake Michigan)
Grand Haven Board of Light and Power	Grand Haven	JB Sims 1 & 2	OPR	1961	Coal Oil	20	Combination, once through Helper pond, 24 acres	Grand River (Great Lakes)
Holland Board of Public Works	Holland	James DeYoung 3-6	OPR	1951	Coal Gas Oil	83	Once through, fresh	Lake Macatawa (Lake Michigan, Great Lakes)
Huron Cement		Alpena 3-7	OPR	1920	Coal	43	---	---
Indiana & Michigan Electric Company	Bridgman	DC Cook 1	OPR	1975	Nuclear PWR	1054	Once through, fresh	Lake Michigan (Great Lakes)
Indiana & Michigan Electric Company	Bridgman	DC Cook 2	OPR	1978	Nuclear PWR	1054	Once through, fresh	Lake Michigan (Great Lakes)

[a] SOURCE: Atomic Industrial Forum, Inc., May 1980.
[b] OPR = Operating status, STN = Standby status

MICHIGAN POWER PLANTS[a] (Cont.)
(OPR & STN)[b]

OPERATOR	CITY	PLANT NAME	STATUS	YEAR	FUEL	MEGAWATTS	COOLING SYSTEM	PRIMARY (SECONDARY)
Lansing Board of Water & Light	Lansing	Eckert 1-3	OPR	1954	Coal	375	Combination, once through fresh, helper tower Mechanical draft	Grand River (Lake Michigan)
Lansing Board of Water & Light	Lansing	Eckert 4-6	OPR	1954	Coal	375	Combination, once through fresh, helper tower Mechanical draft	Grand River (Lake Michigan)
Lansing Board of Water & Light	Lansing	Erickson 1	OPR	1973	Coal	160	Closed cycle, cooling tower, mechanical draft	Grand River (Lake Michigan)
Lansing Board of Water & Light	Lansing	Ottawa Street 1-5	OPR	1939	Coal	82	Once through, fresh	Grand River
Marquette Board of Light and Power	Marquette	Shiras 1 & 2	OPR	1967	Coal Gas	36	Once through, fresh	Lake Superior (Great Lakes)
Michigan State University	East Lansing	Shaw Lane 1	STN	1958	Coal	6	Closed Cycle Cooling Tower Mechanical Draft	Well
Michigan State University	East Lansing	Sixty-Five 1 & 2	OPR	1965	Coal Gas	26	Closed Cycle Cooling Tower Mechanical Draft	Well
Northern Michigan Electric Coop.	Boyne City	Advance 1-3	OPR	1967	Coal	37	Once through, fresh	Lake Charlevoix (Lake Michigan)
Traverse City Light and Power	Traverse City	Bayside 1-4	OPR	1949	Coal Gas	33	Once through, fresh	Grand Traverse Bay (Great Lakes)
University of Michigan	Ann Arbor	University of Michigan	OPR	1930	Gas	27	Closed cycle Cooling Tower Mechanical Draft	Municipal Water
Upper Peninsula Generating Company	Marquette	Presque Isle 1-4	OPR	1955	Coal Oil	175	Once through, fresh	Lake Superior (Great Lakes)
Upper Peninsula Generating Company	Marquette	Presque Isle 5 & 6	OPR	1974	Coal	160	Once through, fresh	Lake Superior (Great Lakes)
Upper Peninsula Generating Company	Marquette	Presque Isle 7-9	OPR	1978	Coal	240	Once through, fresh	Lake Superior (Great Lakes)
Upper Peninsula Power Company	Escanaba	Escanaba 1 & 2	OPR	1957	Coal	29	Once through, fresh	Lake Michigan (Great Lakes)
Upper Peninsula Power Company	Lanse	JH Warden 1	OPR	1959	Coal	18	Once through, fresh	Lake Superior (Great Lakes)
White Pine Copper Company		White Pine 1-4	OPR	1953	--	58	---	---

a SOURCE: Atomic Industrial Forum, Inc., May 1980.
b OPR = Operating status, STN = Standby status

MICHIGAN POWER PLANTS[a] (Cont.)
(OPR & STN)[b]

OPERATOR	CITY	PLANT NAME	STATUS	YEAR	FUEL	MEGAWATTS	COOLING SYSTEM	PRIMARY (SECONDARY)
Wolverine Electric Coop.	Dorr	VanDyke 6	OPR	1968	Oil Gas	23	Closed Cycle Cooling Tower	Little Rabbit River (Big Rabbit River)
Wyandotte Department Municipal Service	Wyandotte	Wyandotte 2-5 & 7	OPR	1939	Gas Oil	50	Once through, fresh	Detroit River (Lake Erie, Great Lakes)

[a] SOURCE: Atomic Industrial Forum, Inc., May 1980.
[b] OPR = Operating status, STN = Standby status

MICHIGAN POWER PLANTS[a] (Cont.)
(CON, PLN & I/P)[b]

OPERATOR	CITY	PLANT NAME	STATUS	YEAR	FUEL	MEGAWATTS	COOLING SYSTEM	PRIMARY (SECONDARY)
Coldwater Board Punlic Utility	Coldwater	Coldwater 7	PLN	1982	Coal	25	Closed Cycle Cooling Tower Mechanical Draft	Well
Consumers Power Company	Hersey	Hersey 1	I/P	1983	Wood	25	Closed Cycle Cooling Tower Mechanical Draft Fresh	Well [M]
Consumers Power Company	West Olive	JH Campbell	CON	1980	Coal	800	Once through, fresh	Pigeon River [I] (Lake Michigan [D], Great Lakes)
Consumers Power Company	Midland	Midland 1	CON	1985	Nuclear PWR	504	Closed Cycle Cooling Pond 880 acres	Tittabawassee River
Consumers Power Company	Midland	Midland 2	CON	1984	Nuclear PWR	852	Closed Cycle Cooling Pond 880 acres	Tittabawassee River
Detroit Edison Company	China Township	Belle River 1	CON	1984	Coal	697	Once through, fresh	St. Clair River (Lake St. Clair, Great Lakes)
Detroit Edison Company	China Township	Belle River 2	CON	1985	Coal	697	Once through, fresh	St. Clair River (Lake St. Clair, Great Lakes)
Detroit Edison Company	Newport	Enrico Fermi 2	CON	1982	Nuclear BWR	1154	Closed Cycle Cooling Tower Natural Draft	Lake Erie (Great Lakes)
Grand Haven Board of Light & Power	Grand Haven	JB Sims #3	PLN	1983	Coal	100	Combination Once through, Helper Pond, 24 acres	Grand River (Grand River, Great Lakes)
Marquette Board of Power & Light	Marquette	Shiras 3	PLN	1983	Coal	43	Once through, fresh	Lake Superior (Great Lakes)

[a] SOURCE: Atomic Industrial Forum, Inc., May 1980.
[b] PLN = Planned, CON = under construction, I/P = Indefinitely Postponed

APPENDIX E

FACTORS AND POLICIES AFFECTING FUTURE COAL USE

A. FACTORS AND POLICIES ENCOURAGING COAL USE

1. State

a. Government

The State of Michigan has no official policies, laws, or regulations which encourage coal use the state. The Department of Natural Resources, Division of Land Resource Programs worked with congresspeople and the Federal Office of Coastal Zone Management to obtain amendments to the Coastal Zone Management Act (PL 93-457) that recognize coal as a major fuel moving to and through the coastal zone and therefore eligible for additional planning, construction and impact mitigation funds for its use, transport or storage. This federal act became law in October, 1980.

The Michigan Energy and Resources Research Association (MERRA), a partnership of Michigan state government, industry, and universities, has made four recommendations related to coal to state government which await action (MERRA, 1980): (1) establish a Michigan coal advisory council as "an independent government environmental-industry group dealing with all aspects of coal use in Michigan", (2) review state environmental laws affecting coal use to establish "a reasonable balance between environmental needs and the need to produce coal", (3) use a "total systems approach" for coal development "to analyze the interaction of many constraints inhibiting rapid coal production expansion, and to ascertain the feasibility of given rates of expansion", and (4) develop a coal transportation system "in anticipation of ... future coal expansion transportation needs." If these recommendations were carried out, they would serve as the base of a state policy that could encourage the use of coal in Michigan.

b. Private

(1) Electric Utilities

The major utility company planners indicate that their companies are seeking to use coal as much as possible and reduce the use of oil and natural gas. Several steps in this process tend to work against a immediate big boost in coal use. For example, the Detroit Edison Company purchases about 10 percent (net) of its power from other utility companies in the interconnected electrical grid. Making these purchases as needed reduces the current need for additional "swing" or intermediate power plants. However, when demand increases reserve capacity will be reduced and additional plants will likely be needed, possibly coal-fired plants.

TABLE E-1

COAL-CAPABLE UTILITY PLANTS IN MICHIGAN
BURNING OIL OR GAS AS OF JANUARY 1980[a]
ACCORDING TO THE U.S. DEPARTMENT OF ENERGY

Utility	Plant[b]	Unit
Consumers Power Co.	Weadock *	4 5 6
	Karn *	3 4
	Morrow *	1 2 3 4
Detroit Edison	Delray	11 12 12 14 15 16
	St. Clair	5
	River Rouge	1
	Conners Creek	8 9 10 12 13 14
Wyandotte Dept. of Municipal Service	Wyandotte	4

[a] This list covers plant ordered to burn coal under the Energy Supply and Environmental Coordination Act (PL 93-139) and the Powerplant and Industrial Fuel Use Act (PL 95-620).

[b] All plant except Morrow and Wyandotte are located in coastal counties of Michigan.

* NOTE: In the review of this report before final publication, the Consumers Power Company indicated that:

(1) Weadock units 1-6 were converted from coal firing to oil firing a number of years ago. The coal handling and processing equipment was removed and disposed of. Weadock 1-6 are no longer capable of burning coal.

(2) Karn units 3 & 4 were designed and built to burn crude oil. They are now burning residual oil. Company studies indicate that a derate from 600 to 300 megawatts each would result, due to the furnace design, if the burning of coal was attempted. For this and other reasons, these units are not capable of burning coal.

(3) Morrow units 1-4 were converted from coal burning to oil burning several years ago. More recently the units were placed on gas fuel which is the situation today. The coal handling and processing equipment was removed and disposed of. These units are no longer capable of burning coal.

Twenty-four units currently burning oil or gas at plants of the Detroit Edison Company, Consumers Power Company and the Wyandotte Department of Municipal Service are capable of being converted to coal (Table E-1 p. D-17) and are under government order to convert. While these units collectively have considerable capacity, their age and technology might otherwise preclude conversion to coal. Some of them (e.g., River Rouge 1) are not regularly used because of the cost of oil. Furthermore the capital cost of a new coal-fired boiler plant is about two to three times that of a gas or oil-fired plant (MERRA, 1980, p. 126). If conversion orders are carried out on these units, coal use would be increased. The latest technology would reduce costs of operation. Eighty-three percent (20 out of 24) of the units ordered to be converted in Michigan under the Energy Supply and Environmental Coordination Act are located in coastal counties. If these units were placed in regular service due to increased demand for electricity, utility company long-term contracts for coal will encourage coal transportation and unloading in Michigan's coastal areas.

A recent report of the World Coal Study suggests that future pollution control technology will be capable of meeting stringent environmental controls for coal emissions (World Coal Study, 1980). The availability of this technology will encourage the use of coal, particularly at large plants which will benefit from economies of scale.

(2) Other Industries

Currently, thirty-one manufacturing, chemical, and cement firms with forty-seven plants in Michigan use coal. Eight of these plants are also set up to burn oil or natural gas. The Powerplant and Industrial Fuel Use Act prohibits the use of oil or natural gas in new industrial boilers without an exemption from the U.S. Department of Energy (DOE). The law also requires industrial plant capable of using coal or coal-oil mixtures to convert. Administration of this latter requirement will determine future coal use by industry. A recent study of industrial conversion potential suggests that conversion by industry other than utilities will be limited. The principal changeover to coal will take place in the electric utility industry.

Pollution control technology is available. While this technology is expensive, relative costs are dropping. The efficiency of sulfur dioxide scrubber technology has increased substantially since the early 1920's (Academy for Comtemporary Problems, 1977). As the price of other fuels rises, this technology will be more attractive; thus, in the short-run, coal use will not rise rapidly by industry, but in the long-run coal use is expected to expand considerably.

A major factor affecting increased use of coal in the state is the application of coal use and conversion technologies. The Department of Energy does not project low-BTU coal gasification facilities in southeast Michigan by the year 2000 (See Table E-2). Low to medium BTU gasification as well as high BTU gasification and synthetic oil production is expected to be insignificant in the state through 1985 (MERRA, 1980). Also, fluidized bed and combined cycle technologies which increase energy efficiency and reduce emissions problems may also encourage coal use in the process. The technologies are expected to be applied by 2000 (Table E-2).

MERRA projects that "... 67 million tons is considered the most probable amount of coal that will be consumed in Michigan during 2000 AD. This is 2.3 times the current amount. The effective range of variation is considered to be between 53-80 million tons. Similar to the national coal consumption scenarios, the attainment of this 67 million ton Michigan consumption level assumes that major breakthroughs will be achieved within the next several years in regard to the constraints now impeding coal production and consumption.

The use of coal for electrical generation in Michigan will most likely range between 37-47 million tons per year in 2000 AD (about 1.8-2.2 times the current level). The industrial use of coal in Michigan will most likely range between 10-20 million tons per year in 2000 AD (about 2.5-5.0 times the current level)." (MERRA, 1980)

2. Regional

a. Government

Future use of coal and its transportation through or to Michigan is partly affected by policies and actions in surrounding states and the nation. Illinois, Minnesota, New York, and Ohio have policies supporting and encouraging coal research and development, including (1) coal gasification and liquification, (2) fluidized-bed combustion, and (3) reduction of pollution (Great Lakes Basin Commission, 1980). The mining policies of Illinois, Indiana and Ohio are designed to reduce environmental problems with coal extraction, thereby making the mining of coal more environmentally attractive (Great Lakes Basin Commission, 1980). The policies will encourage the use of coal and its transportation throughout the region. Michigan will benefit from the research results obtained in other states. A conference to examine the prospects of exporting Indiana coal to foreign users was held in July 1980. While export of coal through the Great Lakes was not a major focus of the meeting, other organizations and firms have considered this possibility.

A review of capacity at Michigan ports and docks as well as other U.S. Great Lakes ports shows sufficient collective capacity to accomodate a doubling or tripling of coal movement through them. Some individual ports and docks may not have capacity to double or triple throughput.

TABLE E-2

DEPARTMENT OF ENERGY PROJECTED

EMERGING ENERGY TECHNOLOGIES IN THE GREAT LAKES BASIN[1]

(by major lake basin to the year 2000)

TECHNOLOGY	LAKE BASIN							
	SUPERIOR	NW MICHIGAN	SW MICHIGAN	E MICHIGAN	HURON	W. ERIE	E. ERIE	ONTARIO
Hydroelectric								
Small-scale/low-head	X	X	X	X	X		X	X
Pumped Storage				X			X	
Coal gasification - low BTU			X					
Enhanced Oil Recovery			X	X	X	X	X	
Solar								
Solar Thermal	X	X		X	X	X		
Comm./res. heating/cooling	X	X	X	X	X	X	X	X
Ind. process heating	X	X	X	X	X	X	X	X
Biomass								
Urban Residue	X	X	X	X	X	X	X	X
Agric/Silvi.	X	X	X	X	X	X	X	X
Advanced Coal Combustion								
Fluidized Bed	X	X	X	X	X	X	X	X
Combined Cycle	X	X	X	X	X	X	X	X

[1] SOURCE: U.S. Department of Energy, Interim Draft Energy Technology Scenarios for Use in Water Resources Assessments under Section 13a of the Federal Non-nuclear Energy Research and Development Act, Washington, D.C., September 1980.

Should iron ore production level or only slightly increase due to less demand for steel in smaller cars, the locks at Sault Ste. Marie would have sufficient capacity well beyond the year 2000, even with an extended winter season on the upper Great Lakes (U.S. Army Corps of Engineers, 1980). The locks on the Welland Canal would not be able to accomodate additional coal expansion beyond the mid 1980's (U.S. Army Corps of Engineers, 1980). The St. Lawrence Seaway has adequate capacity for substantial shipments of coal to foreign destinations. (U.S. Army Corps of Engineers; St. Lawrence Seaway Development Corporation, 1980).

Western Coal Movement - Argonne National Laboratory studies (Argonne National Laboratory, 1979) concluded that by 1999 western coal delivered to the east would be competitive due to the expectation of rising eastern rail rates because of financial difficulties of eastern rail roads. Conversion to low-sulfur coal by small industries already using coal would not be costly. Factors of the existing transport network most affecting potential industrial and utility users of western coal are: (1) the capacity at the Sault Ste. Marie locks, (2) the closing of the lakes during the winter ice, and (3) the age of the Great Lakes fleet. However, if winter navigation continued, Argonne Labs concluded that it could potentially reduce the area needed to stockpile coal along coastal locations which depend on western or eastern coal delivered by lake vessel. In the long run, the cost difference between eastern and western coals delivered to midwest utilities is small enough that limitations on western coal movement could be reversed depending on the implementation of the new source performance standards and the lowest achievable emission rate for non-attainment areas. While the Argonne Lab study saw no immediate need to greatly expand port facilities, air quality regulations and transportation diregulation could change this situation by 1985. That study concluded that lakeshore utilities would be more likely to use western coal.

Another study (ICF Incorporated, 1978) examining the demand for western coal subject to key uncertainties concluded that: (1) higher priced coal (due to severance taxes, etc.), (2) higher rail rates in the west, and (3) higher labor rates in the west would reduce the potential demand for western coal in the east but not elminate this demand. Higher oil prices would obviously increase western coal demand. If the new source performance standards for sulfur emissions required only partial scrubbing would reduce the incentive to use western coal but not eliminate it. One problem with the models used in this study of western coal demand as well as other national studies of coal use previously done is that they have assumed that the world price of oil would rise much more slowly than it has (e.g., $30/barrel by 1985). If these models were rerun with current prices, coal demand may be projected to be much greater in the future.

b. Private

Shipping companies are actively seeking coal export contracts, but not necessarily through the Great Lakes. The major conclusions concerning coal transportation through the Great Lakes are that: (1) In the short-run the Great Lakes could pick up traffic due to the congestion at coal-shipping docks on the east coast. This would be temporary because the Norfolk and Baltimore facilities will be expanded (Lake Carriers' Association; Federal Commerce and Navigation, Inc., 1980), (2) The St. Lawrence Seaway and Great Lakes ports currently serving eastern and western coal on the Great Lakes will receive this increase in traffic only until east coast ports can handle the traffic. The reason for this is the increased cost of shipping coal through the Great Lakes to foreign destinations. Increases in costs are due to several factors: use of smaller lake vessels (30-33,000 deadweight tons (DWT) versus 60-100,000 DWT for oceangoing vessels) with higher unit transport costs, tolls on the Seaway, and if the coal on smaller vessels is transshipped to larger vessels at some point along the St. Lawrence River, transshipment costs to consolidate shipments, and rail rates which discriminate against Great Lakes ports (Federal Commerce and Navigation, Inc.; St. Lawrence Seaway Development Corporation, 1980). The advantage of moving coal through the Great Lakes-Seaway system during this time of east coast congestion is that waiting time and demurage costs would be reduced.

Federal Commerce and Navigation, Inc., a bulk commodity shipping company with offices in Chicago, is building four vessels of 36,000 DWT for general cargo and coal trade. These are sized to serve Great Lakes and overseas trade (Federal Commerce and Navigation, Inc., 1980).

Any transport of western coal in the near future through the Great Lakes would probably originate in Superior Wisconsin and pass through the Sault Ste. Marie Locks and St. Marys River and then through the St. Clair River, Lake St. Clair and Detroit River. Eastern coal would likely move out of an Illinois, Indiana, Ohio, Pennsylvania or possibly New York Great Lakes port. The Pennsylvania Governor's Energy office has considered the possibility of serving some New England plants forced to convert to coal out of the Port of Erie and through the St. Lawrence Seaway.

Electric utility companies usually obtain long-term (e.g., 20 years) contracts for coal to be delivered at their plants so that they have a reliable fuel supply. As new growth in demand and conversions to coal take place, long-term contracts will be made with coal companies and transportation companies. This activity will ensure that more coal can be supplied in the future. It also provides incentive rail lines and shipping lanes. Table E-3 shows the plants in the Great Lakes states ordered to convert to coal. Twenty-one percent of these units are located along the shoreline of the Great Lakes basin and will receive all of their coal supplies by water or rail transport through the coastal zone. Long-term contracts will result in delivery of coal in the coastal zone for many years.

As industrial and utility coal conversion progresses and greater demand for the fuel materializes, transshipment facilities in the state of Michigan could develop. Such facilities could serve as a type of "coal broker" to coal users in areas such as southeastern Michigan when the large amounts of storage space necessary for extensive coal use can be problematic. Southern Michigan may in fact contain likely sites for such transshipment facilities; which would operate basically by receiving coal from vessels and unit trains, storing this coal at their site until needed, and then supplying space constrained users by way of local transportation connections. In this way, greater use of coal as an energy source may be realized in facilities currently unable to afford the commitment of many acres to coal storage.

While coal as a fuel for vessel transport has received renewed interest nationally, in the Great Lakes region it is not clear what the future of coal is as a fuel for the commercial water sector. Several aspects of future coal use by vessels need attention, including (1) future availability of oil for the maritime industry, (2) possible use of coal-oil mixtures, (3) steam power plants which can alternate between coal and oil, (4) whether overboard flyash disposal would be permitted, and (5) methods to control smoke emissions from vessels burning coal. (Cleveland-Cliffs Iron Company, 1980).

The concept of tug-barge transport and delivery of coal could expand the number of locations which could receive coal by water due to substantially less draft required by barges (12 feet or less). Whether this will actually result in more coal use of increased water delivery of coal in the near future is speculative.

3. National

a. Government

The federal government has enacted several laws over the last seven years intended to increase the use of coal while protecting the environment. These laws include (1) the Energy Supply and Environmental Coordination Act of 1974, (2) the Powerplant and Industrial Fuel Use Act of 1978, (3) the Federal coal Leasing Amendments Act of 1975, (4) the Energy Reorganization Act of 1974, and (5) the Energy Tax Act of 1978. These laws are reviewed in detail in Appendix C. The research and development programs for coal use in the U.S. Department of Energy and the Environmental Protection Agency also are directed toward increasing coal use in an environemntally acceptable way. Most recently, the synthetic fuels legislation will provide greater emphasis to convert coal to liquid and gaseous fuels at locations distant from coal mines and where water availability is adequate. This latter factor suggests increased coal conversion in the Great Lakes basin as noted in Table E-2.

From a regulatory standpoint, ordered coal conversions under the Energy Supply and Environmental Coordination Act and the Powerplant and Industrial Fuel Use Act will also increase the use of coal by electric utilities and industry. Conversion orders are for existing plants burning oil or natural gas that are capable of burning coal to convert to coal. Also, new plants must be designed to burn coal. The burden is on the company to prove why it should not convert its coal-capable plants(s) to coal. See Table E-3.

Current abandonment policies of the U.S. Department of Transportation for rail lines give priority to fossil-fuel (essentially coal) lines to be maintained and subsidized. Current and potential fossil-fuel transport is considered in these decisions. This policy encourages coal use and the maintenance of coal supply lines.

Official federal transportation policy does not address water transport of coal in terms of maintain shipping lanes or giving preference to shipments of coal in navigable water or through locks. The Coastal Energy Impact Program under the Coastal Zone Management Act (as amended) does provide grants to states (1) for the study of and planning for any economic, social, or environmental effects of the transportation and storage of some fuels, but not necessarily including coal and (2) to assist in the prevention, reduction, or amelioration of unavoidable loss to the coastal zone of valuable environmental or recreational resources resulting from (among other coastal energy activities) the transportation, transfer or storage of coal. Thus, the Coastal Zone Management Act (CZMA) provides possibilities for closely examining coal transport, unloading and transshipment in the coastal zone but does not raise coal as a priority national fuel as do the other recent federal energy laws. The extent to which coal can be examined and its transportation effects mitigated is subject to funds available to states under a formula that favors outer continental shelf (OCS) oil and gas. While the nation must diversify its fuels sources, the thrust of the CZMA is to increase dependence on fuels of relative lesser abundance rather than assisting in an evolving national policy that places priority on using the nation's abundant coal resources. Therefore, the CZMA passively and indirectly encourages coal use by providing ways to ameliorate the effects of its use, but through implementation does not assist in promoting an even-handed comprehensive, enironmentally and economically balanced approach to coal use that will affect many communities in the country due to the need for transportation to coal-using locations. Many communities in which coal will be used or expanded in use, or through which coal will be transported, are located in the coastal zone of the Great Lakes and other coasts.

TABLE E-3

COAL-CAPABLE UTILITY PLANTS BURNING OIL OR GAS IN THE GREAT LAKES STATES AS OF JANUARY 1980[a,b] ACCORDING TO THE U.S. DEPARTMENT OF ENERGY

STATE	UTILITY	PLANT	UNIT
Illinois	Central Illinois Public Serv.	Hutsonville	1 2
	Commonwealth Edison	Collins	4 5
		Ridgeland (GLB)	1 2 3 4
	Illinois Power Co.	Wood River	1 2 3
		Havana	1 2 3 4 5
	Iowa Illinois Gas & Electric	Moline	5 6 7
	Union Electric	Venice #2	1 2 3 4 5 6
	University of Illinois	Abbott	1 2 3 4 5 6 7
Indiana	Indianapolis Light & Power	Stout	3 4
		Pritchard	1 2
Michigan	Consumers Power Co.	Weadock (GLB)*	4 5 6
		Karn (GLB)*	3 4
		Morrow (GLB)*	1 2 3 4
	Detroit Edison	Delray (GLB)	11 12 13 14 15 16
		St. Clair (GLB)	5
		River Rouge (GLB)	1
		Conners Creek(GLB)	8 9 10 12 13 14
	Wyandotte Dept. of Municipal Service	Wyandotte (GLB)	4
Minnesota	Austin Utilities	Austin	1 2 3 4 5
	Interstate Power	Fox Lake	1 2 3
New York	Central Hudson Gas & Electric	Danskammer	1 2 3 4
	Consolidated Edison	Waterside	4 5 6 7 8 9 14 15
		East River	5 6 7
		59th Street	13 14 15
		74th Street	3 9 10 11
		Hudson Avenue	5 6 7 8 10
		Arthur Kill	2 3
		Astoria	1 2 3 4 5
		Ravenswood	1 2 3
	Long Island Lighting Company	Barrett	1 2
		Far Rockaway	4
		Glenwood	4 5
		Northport	1 2 3 4
		Port Jefferson	1 2 3 4
	Niagara Mohawk Power	Albany	1 2 3 4
		Oswego (GLB)	1 2 3 4

STATE	UTILITY	PLANT	UNIT
New York (Con't)			
	Orange & Rockland Utilities	Lovett	1 2 3 4 5
Ohio	Dayton Power & Light	Tait	1 2 3 7 8
Pennsylvania	Philadelphia Electric	Cromby	2
		Delaware	7 8
		Chester	5 6
		Richmond	9 12
		Schuykill	1 3 9
		Southwark	1 2
	West Penn Power	Springdale	7 8

a This list covers plants ordered to burn coal under the Energy Supply and Environmental Coordination Act (PL 93-139) and the Powerplant and Industrial Fuel Use Act (PL 95-620).

b The parenthetical note (GLB) after a plant name indicates plants in the Great Lakes basin (hydrologic area).

* NOTE: In the review of this report before final publication, the Consumers Power Company indicated that:

(1) Weadock units 1-6 were converted from coal firing to oil firing a number of years ago. The coal handling and processing equipment was removed and disposed of. Weadock 1-6 are no longer capable of burning coal.

(2) Karn units 3 & 4 were designed and built to burn crude oil. They are now burning residual oil. Company studies indicate that a derate from 600 to 300 megawatts each would result, due to the furnace design, if the burning of coal was attempted. For this and other reasons, these units are not capable of burning coal.

(3) Morrow units 1-4 were converted from coal burning to oil burning several years ago. More recently the units were placed on gas fuel which is the situation today. The coal handling and processing equipment was removed and disposed of. These units are no longer capable of burning coal.

From a coal export standpoint, no clear federal policy has evolved. However, "the United States will remain one of the world's largest coal exporter and by the 1990's could become the world's balancing supplier of steam coal." (World Coal Study, 1980, p. 117). In order to accomplish this and recognizing that transport costs are a significant factor in the cost of delivered coal, port infrastructure needs will require major attention nationally and internationally (World Coal Study, 1980, p. 38). More ships that can tranpsort dry bulk as well as oil will be needed. "During the 1980's the major part of coal in seaborne international trade is expected to be carried in vessels of about 100,000 - 125,000 DWT. During the 1990's, ships as large as 250,000 DWT may come into use." (World Coal Study, 1980, p.41). Coal ports will have to provide adequate berths and draft depths. With some international ports possibly becoming distribution centers and with the need to reduce long ocean distances by using the international canals, such as the Panama Canal, the mix of vessels used in international trade will probably include smaller ships of 65,000 - 75,000 DWT as well as barges and smaller coastal vessels. (World Coal Study, 1980, pp. 41-42) The vessel size requirements may preclude many Seaway-sized ships entering the international coal trade, except for use in consolidating coal for transport in larger vessels at a port along the St. Lawrence River. Regional-national projects such as the All-American Canal proposal to connect Lake Erie and Lake Ontario with a new canal or a new canal from Lake Erie to the Hudson River will probably be designed to serve vessels similar to those plying the Great Lakes and Seaway currently (Corps of Engineers, Reference). Thus, these proposed canals will continue to reinforce use of the Great Lakes and Seaway as water feeder routes to ports serving larger coal vessels. As noted previously, it appears that the Michigan and Great Lakes ports have adequate capacity to handle substantially more coal.

2. Private

The price of coal relative to other sources of energy will probably be the major factor influencing the future use of coal. If that price is low enough, potential users may be able to justify using it regardless of any constraints in processing or burning it might present. Nationally, three hundred forty-nine electric generating units located at one hundred four powerplants in twenty-four states and the District of Columbia are coal-capable and currently burning oil or gas. The conversion of these units along with coal capable plants in other industries provides impetus nationally to use more coal. This will also place greater demands on the coal transport system.

From an export standpoint, the United States could export more than 20 percent of its coal production and still have adequate reserves to meet domestic demand (World Coal Study, 1980, p. 115). Coal mining companies would want long-term contracts. Currently, U.S. coal priced at \$50/ton is one-third cheaper to import than OPEC oil with equivalent energy content. (Wall Street

Journal, July 25, 1980) These circumstances will encourage future coal production as well as place further demands on the coal transport system. Currently most of the coal being shipped to Western Europe and Japan from east coast coal ports is mined at eastern coal mines. This coal moves by rail to these east coast ports. Already congestion from foreign ships attempting to pick up coal is a major problem. The Great Lakes ports do present a reasonable but more expensive alternative in the near term until east coast ports are expanded.

Factors Increasing the Demand for Electricity.

Electric power generation accounts for about two-thirds of the coal used nationally and 70 percent of the coal used in Michigan. (MERRA, 1980) Increased demand for electricity over the next twenty years will result from a number of factors working together:

1. Increased population - As the population increases in size, a greater demand will exist for the products and services of business and industry. Therefore, residential, commercial, and industrial electrical demand will increase in some proportion to population.

2. Rising standard of living - If the standard of living rises, a greater reliance on appliances which use electricity to do work and entertain can be expected.

3. Appliances - While appliances are being produced to use electricity more efficiently, the utility companies expect the installation of air conditioning equipment in homes and businesses to increase, thus increasing electrical demand.

4. Car production - As domestic auto production and the use of steel and metals increases, the demand for electricity in these plants will increase.

5. Electric Vehicles - Electric utility company projections indicate that the electric car is expected to significantly increase electric demand as soon as the mid-1980's. A combination of reduced operation cost over gasoline driven cars, improved battery technology to reduce battery replacement costs, and the benefit to the auto companies of being able to increase their corporate average fuel economy by producing electric cars, is expected to provide the stimulus to produce and purchase electric cars. The utility companies anticipate that the use of electric vehicles will be the largest factor increasing the demand for electricity in the future. See Table E-4.

6. Mass transportation - While use of mass transit, people movers and light rail/subway systems is expected to increase, the utility companies do not anticipate big increases in electrical demand to result.

TABLE E-4

PROJECTIONS FOR ELECTRIC CARS

Year	Production (Thousands)	Used in Michigan (8%) (Thousands)	Used in SE Michigan (4%) (Thousands)
1985	50-100	4 - 8	2 - 4
1988	2,500-5,000	200 - 400	100 - 200
1990	5,000-10,000	400 - 800	200 - 400
1995	10,000-20,000	800 - 1600	400 - 800
2000	12,500-25,000	1000 - 2000	500 - 1000

NOTES: Corporate average fuel economy equivalent for electric vehicles: 80-100 miles/gal.

Assumed Average Customer Use:

6-7,000 kwh/year/vehicle (1980)
3-4 cents/mile - operation (electricity) (1980)
$3000/battery (1980)
$8-10,000 purchase price of vehicle (1980)

B. FACTORS AND POLICIES CONSTRAINING COAL USE

1. State

a. Government

The State of Michigan is developing and has adopted a number of policies that would reduce expected increases in coal use. These policies (1) encourage conservation (appliance labeling, prohibition of continously burning pilot lights, conservation grants for public buildings, building surveys and audits, restrictions on interior building temperatures, energy education, prohibition of declining block rates, restrictions on lighting levels, restrctions on the use and sale of energy resources, industrial energy audits, encouragement of residential energy audits, establishment of a low-income household weatherization program, and tax credit for heating fuel costs;) (2) ban the sale of decorative lamps which use natural gas; (3) prescribe oil-energy conservation projects for public buildings; and (4) encourage renewable sources (a wood energy program, tax credit for hydropower and solar installations, solar energy education program, tax exemption for solar equipment sales and use, tax exemption for solar installations, tax credit wind energy installations). (Great Lakes Basin Commission, 1980) These policies and programs reduce reliance on fossil-fuel and nuclear energy, the conventional energy sources.

b. Private

Utilities and other industries cannot be converted quickly to coal. The expense will limit conversion to coal from oil or natural gas. Michigan industry will also be affected by factors at the regional and national level. Table E-5 provides an overview of factors constraining conversion to coal by industry. The utility sector uses 70% of the coal in Michigan, and will therefore dominate future use of coal in the state. The large Michigan utilities have revised their average annual growth rates of electricity demand from the 7% figure used in the early 1970's to 2.5% to 2.75% for the period from 1980 to the mid 1990's. The emergence of solar energy is also expected to slow the rate of electricity demand by a small but significant amount. Over the next 15 years, solar energy is expected to provide about 3% of what otherwise would have been demand for electricity in Michigan. Over the same 15 years, incremental conservation by electricity users and improved appliance efficiency are expected to similarly reduce electricity demand.

2. Regional

a. Government

The Great Lakes states have established and continue to develop official policies to provide more energy while reducing oil dependence. These policies would discourage or replace coal by other energy sources.

TABLE E - 5

SUMMARY OF

MAJOR CONSTRAINTS AFFECTING U.S. COAL PRODUCTION EXPANSION

1. Status of air quality laws and regulations, particularly those pertaining to sulfur emissions.
2. Need to find environmentally, technologically, and economically sound methods of using high-sulfur coal.
3. Coal user problems—*i.e.*, the lack of sufficient incentives to switch voluntarily to coal.
4. Rail and barge transportation system limits and the need to expand and improve these systems.
5. Threat of "horizontal divestiture" and its potential effect upon coal industry capital formation.
6. Stability of labor and labor productivity in the coal industry.
7. As yet uncertain effect of federal strip-mining laws.
8. Adequacy of land reclamation technology in the semiarid regions.
9. Need for adequate leasing programs—*i.e.*, putting large blocs of reserves together in the East and accelerating federal and railroad land leasing policies and schedules in the West.
10. Mine productivity problems and the need for better mining techniques and "systems."
11. Coal slurry lines—roadblocks to right-of-way acquisition for potential coal slurry pipeline projects. Railroad opposition to such projects and the need for remedial legislation in this area.
12. Mining equipment problems, lead times for mining equipment delivery.
13. Lead times for opening a sufficient number of new mines to meet anticipated or desired coal expansion schedules.
14. Availability of skilled labor for mining expansion.
15. Establishment of new towns and communities as "support systems" for western strip-mining projects.
16. Availability of water in the West for mining-support communities, mining operations, and any synthetic gas or liquefaction projects.
17. Capital formation for coal-based synthetic gas projects.
18. Waste disposal and acid-mine drainage problems.
19. Recoverable resource appraisal: The real size and availability of recoverable mineable resources should be reevaluated. A new and thorough look at the current "proven" resource figures is needed.
20. The need to find better and quicker legal and regulatory means of certifying large-scale energy projects while giving fair consideration to all reasonable environmental issues.

Source: Michigan Energy and Resources Research Association.

The capability of the region's transportation system to continue to supply coal needs to be examined. If rail cars are not available due to competition for their use by other regions, for coal export, or for other commodities, coal delivery could be constrained and coal use discouraged. A study for the state of Michigan recommends a transportation system analysis to assess future coal transportation needs.

b. Private

As the private sector applies other technologies which conserve energy or use renewable energy sources, demand for coal will be reduced. As application of these technologies becomes more widespread and the technologies become more refined and less expensive, an increasingly larger portion of industry will more toward their application.

The postponement of certain coal-fired facilities due to a decrease in demand for electicity, primarily from conservation, has the effect of constraining future growth in coal use.

3. National

a. Government

Federal pollution control laws (particularly for SO_2 emissions), laws encouraging other energy sources, and mining laws do work to discourage the use of coal. However, after a period of relative decline in the importance of coal in the nation's energy economy, coal use is increasing in spite of these laws because the cost of producing it is competitive with oil.

However, the original survey done in 1977 for the Power Plant and Industrial Fuel Use Act found that of the 6,200 industrial boilers covered by the act, 780 were coal capable and 752 would be exempted under some provision of the act. Thus, private industry conversion in response to this act will probably be law.

b. Private

Several factors will affect industry. Price and availability of coal and other fuels will be most important. A factor limiting expanding coal use is that coal is now "demand constrained" (MERRA, 1980). That is, in comparison to the amount that could be supplied at existing prices, current demand is low. This market factor results from costly conversion from other fuels to coal, capability of the transportation system, the relatively low cost of other fuel given the high cost of converting plants to coal, the uncertainty of the future use of coal, the design, investment and construction of coal plants cannot occur immediately, and environmental considerations which may be regulated in the future thereby increasing the cost of using coal.

Table E-6 shows expected coal development production stages related to supply and demand.

TABLE E-6

Coal Production Development Stages

INITIAL PERIOD Now through 1985 Coal production limited primarily by the lack of demand.	EQUILIBRIUM PERIOD About 1992 Deliverable coal supply and demand are essentially balanced for several years.
TRANSITION PERIOD After 1985 Demand starts expanding as energy shortages develop in other sectors. Demand starts catching up to supply-delivery capacity.	SUPPLY-CONSTRAINED PERIOD After 1992 Coal demand greater than the readily deliverable supply because of environmental restrictions and constraints on mining, labor, transportation, and delivery.

Other environmental problems of burning coal and the challenge of meeting them could cause a much slower movement toward expanding coal use than previously anticipated. Environmental hazards of coal consumption include "emission of sulfur dioxide, nitrogen oxide, trace elements (including arsenic, cadmium, mercury, lead, fluroine, and beryllium), and carbon dioxide into the atmosphere, thermal and chemical discharges into water and the solid-waste disposal problems of coal ash." (Stobaugh and Yergin, 1979) the process of sulfur dioxide removal also generates a sludge; however, only new sources of sulfur dioxide emissions must have scrubbers to remove this pollutant, so only new plants will be affected by this problem.

The cost of pollution control for SO_2 control from burning coal constrains coal use. However, the efficiency of the technology has improved substantially and the relative cost has dropped.

Potential labor strikes in coal fields similar to those of the 1970's present obstacles to expanded use of coal by industry. These strikes present fuel supply interruptions which the companies must be prepared to respond to by spending capital for stockpiles or by using alternative, and higher cost, fuel sources (Stobaugh and Yergin, 1979). Companies may plan to rely on a mix of fuels to have "some protection against monopoly pricing, strikes, embargoes, weather effects." (Stobaugh and Yergin, 1979)

Table E-7 summarizes major factors affecting U.S. industrial boiler conversion to coal.

Due to the high costs of converting to coal from other fuels (noted earlier), coal will be economically attractive only for large industrial boilers operating at high load factors and where economies-of-scale and fuel costs offset higher annualized operating costs. (U.S. Environmental Protection Agency, 1980)

TABLE E-7

FACTORS AFFECTING INDUSTRIAL BOILER CONVERSION TO COAL

1. Capital cost are double for coal technologies than for oil and gas

2. Coal cannot be burned in boilers designed for liquid or gas fuels (the boilers must be rebuilt for coal combustion)

3. Coal-based technologies require more space for boilers, pollution control equipment, coal handling and residual disposal

4. Operating and maintenance costs are 2 - 5 times greater for coal than for oil and gas units

5. Unit costs are high for small users

6. Incremental boiler needs will not be meet by coal because of high capital, operating,and maintenance costs

7. 45 to 90 day supply of coal reserve requires 5 - 10 additional acres of land

8. Flyash transport and disposal adds extra cost

9. Coal use usually requires access to rail connections or shoreline

10. Transport costs for coal are higher, more uncertain, less predictable for coal than for oil and gas

11. For small users, single car shipment cost can be double unit train costs

12. Unit trains require large land area and often plant redesign for coal delivery

13. Coal producers can lose money on long-term contracts with small users

14. Variations in coal fuel quality can cause boiler operating problems

15. Coal has supply reliability problems due labor strikes and inclimate weather which require plant redundancy

16. Long-term coal contracts lock industrial users in on technology, plant location, and size of investment

17. Coal-fired boilers and pollution control equipment require shutdowns for cleaning and parts replacement

18. Coal will probably not be used as a redundant or back-up system because of installation capital cost.

19. Advanced pollution control requires added technical personnel

TABLE E-7 (CON'T)

20. Investment in conversion to coal will be less productive and will create an opportunity cost

21. The quality of some products may be affected because of the varying coal fuel quality

22. Fludized bed combustion of coal is cost competitive for large boilers, provdes efficient heat transfer, suppresses sulfur emissions, but results in large solid waste volume to dispose of.

ABSTRACTED FROM: U. S. Environmental Protection Agency, Industrial Boiler Technologies to the Year 2000, 1980

Factors Reducing Demand for Electricity

As noted earlier, the electric utility industry accounts for over two-thirds of all coal use. Factors which might work to reduce demand for electricity over the next 20 years include:

1. Conservation - Conservation in all sectors is making a real difference in electrical demand. Large reductions in the rate of increase in demand have been made. Utility companies expect these reductions due to conservation to gradually reduce to zero by the late 1980's.

2. Alternative sources - Alternative sources of energy, such as solar or biomass, will reduce the demand for electricity from large central generating plants. Some of the sources will be used to produce electricity at smaller decentralized locations, but reduce the demand for fossil and nuclear fuels. Utility companies do not expect solar or wind power to significantly reduce electrical demand.

Generally in the United States and in Michigan the annual growth rate of electric demand fell from about 7 percent to 3 to 4 percent. Detroit Edison and Consumers Power Companies are currently using a range of 2 to 3 percent for projections in the 1980's.

Factors Perpetuating The Status Quo

1. Industry capital problems - In Michigan, industry has had capital formation problems due to business conditions. The capital that is available is put into priority production items, like retailing, and will not be put into conservation measures as it would be otherwise.

2. Car production - electricity is used in the production of cars. The effect of the reduction in size of cars is expected to be offset by an increase in the number of cars sold. This, however, assumes that as the price of gasoline rises and people drive cars less, the increase in population will support the demand for more small cars.

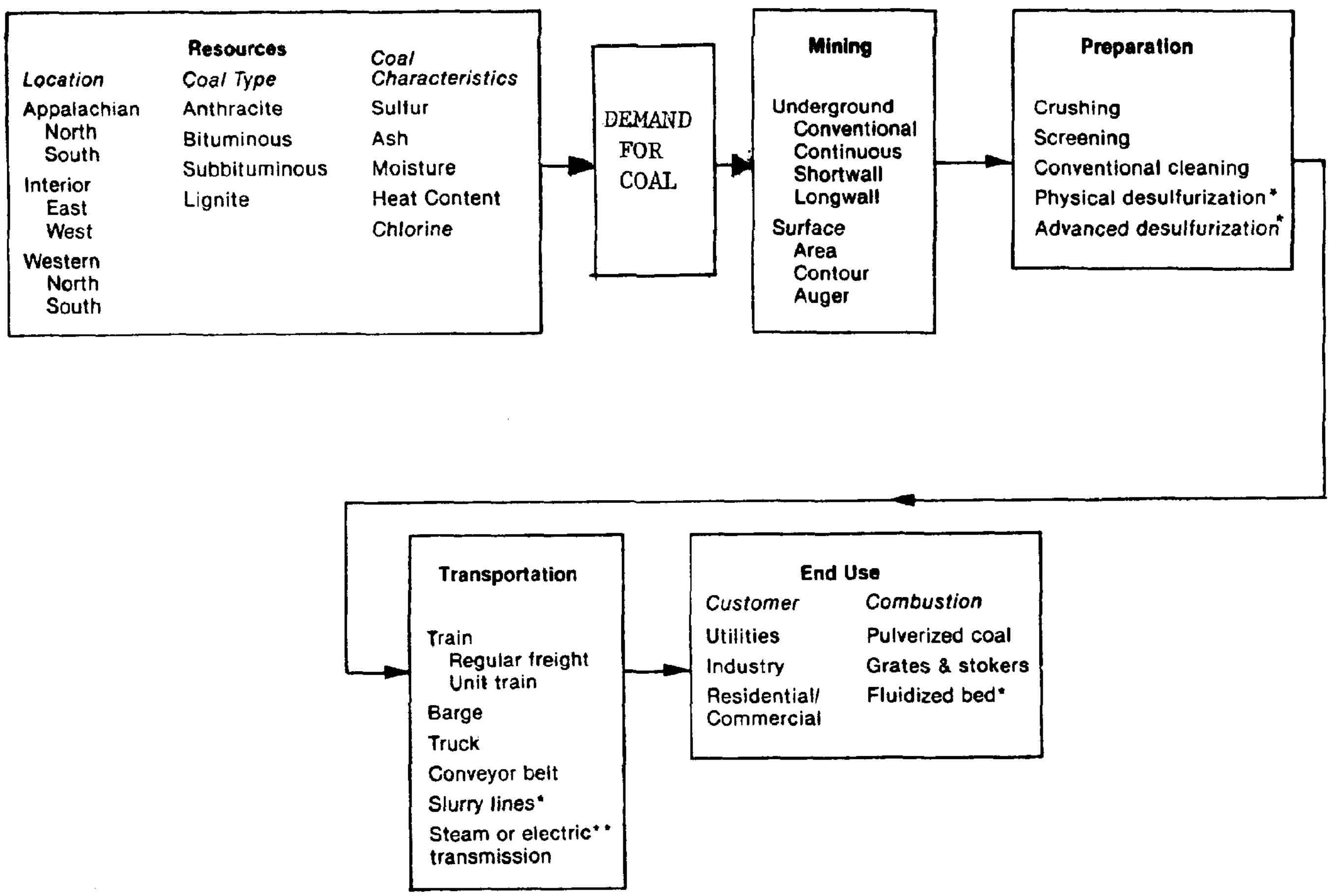
APPENDIX F

THE COAL PRODUCTION-CONSUMPTION CYCLE

Although this study focuses on the effect of coal unloading and transshipment on Michigan's coast, other aspects of the coal production-consumption cycle may constrain coal movement. The total energy system--available resources, mining/extraction, transportation, energy conversion and consumption-end use--must be examined to identify impacts on coal unloading and transshipment. This section describes that larger energy system. Figure F-1 gives an overview of this system.

FIGURE F-1

THE COAL PRODUCTION-CONSUMPTION CYCLE



*This system undergoing research and development in the U.S.

**Can be considered an alternative to coal transportation in getting the energy to the final point of use.

SOURCE: *Office of Technology Assessment.*

Demand for Energy

Future energy demand is difficult to ascertain. Several variables interact to establish energy demand forecasts of the total quantity of energy demanded uncertain. To project a range of energy demand it is necessary to speculate on the future level of economic growth, the actions of consumers, rate of population growth, anticipated prices of various fuels, and the levels of energy efficiency and conservation. The level of aggregate demand, the sum of residential/commercial, industrial, and transportation energy demand must be determined in order to establish the demand for coal.

The aforementioned variables and the level of aggregate demand are the driving forces behind the coal production-consumption cycle. Coal unloading and transshipment are part of the cycle and as such are affected by changes in the variables. Although the relationship may not be completely obvious, basic understanding of the entire cycle may illuminate some of the major factors encouraging or constraining coal use in Michigan, and therefore affecting coal unloading and transshipment.

Mining of Coal

The two general methods of mining coal are surface mining and underground mining. Surface mining exposes the coal seam by removal of the overburden (soil and rock). Four basic methods of surface mining are used: area, open-pit, auger, and contour mining (Office of Technology Assessment, 1979).

Underground mining is more difficult than surface mining. Instead of stripping the overburden and trucking the coal away from within the mine, underground mining is conducted under thick overburden by means of shafts and passageways. Due to the nature of underground mining, pillars of coal must be left in the shafts to support the overburden roof. The deeper the mine, the larger the pillars must be relative to the mined-out areas. In some cases, less than 50% of the coal seam can be removed.

Coal production in the Appalachian region has annually supplied 60% or more of total national production since mining began in the United States. Surface mine reserves are insufficient to support present production rates for more than a decade. The remaining recoverable underground reserves are large but substantial portions may remain unmined due to the high cost of mining than in comparison to the price of other fuels. This coal is generally the highest grade bituminous but it often has a high sulfur content (Office of Technology Assessment, 1979).

Eastern interior regional coal is produced in a number of small mines with relatively high annual production rates. Indiana, Western Kentucky, and Illinois have annually supplied from 20-25% of total national production for several years. The greatest portion of the total remaining recoverable reserves for underground mining occurs in beds underlying previously mined-out areas. Illinois has very large underground reserves remaining. Surface mine production has remained essentially constant in this region for a number of years and present production rates are expected to be maintained for several years. The heat content of this coal tends to be slightly lower than Appalachian coal and the sulfur content can be quite high (Office of Technology Assessment, 1979).

Underground mining has virtually ceased in the western interior region which includes the states of Arkansas, Kansas, Oklahoma, and Iowa. Surface production has remained relatively constant in these areas but the amount produced is insignificant. Generally, the coalbeds are thin. Production in this region is unlikely to increase significantly in the near future (Office of Technology Assessment, 1979).

The western states contain approximately 67% of the national, recoverable, surface-minable reserves. The reserves are relatively undisturbed. The beds are the thickest in the nation except for Pennsylvania anthracite beds. The western states of Colorado, Utah, Montana, and Wyoming contain approximately 43% of recoverable underground reserves. The most productive portions of the coal fields of Utah, Colorado, and Wyoming have undergone substantial depletion, yet many relatively unmined areas remain. Increases in underground production are expected in Utah, Colorado, Wyoming and Montana; however, underground recovery of as much as 50% of the thicker beds may be difficult with present technology. Most western coal is subbituminous or lignite. It has a substantially lower heat content (aproximately 10%-15%) (MERRA 1980) and higher moisture and ash content than eastern coal. The sulfur content is low (Office of Technology Assessment, 1979).

Until recently, the eastern Appalachian region has been the primary source of coal for Michigan. This is largely because it has been readily accessible, economical, transportable, and environmentally acceptable. Legislation concerning sulfur emissions has prompted the use of low sulfur western coal by some Michigan utilities. Michigan's situation in the Great Lakes basin offers an economical method of transporting western coal once it has been moved to the western end of Lake Superior. Given this advantage, it is anticipated that Michigan will be capable of using a greater percentage of low sulfur western coal to meet the demand for coal. Recent trends appear to support this assumption. In 1978, 12.3% of Michigan's coal supply came from the West compared to 4% in 1975 (MERRA, 1980).

Periodically, attention is given to Michigan's remaining coal reserves. Coal production began in the state in the 1860's and continued until 1952. A total of 46,316,580 tons was mined during this period. The remaining known bituminous reserves total 126.5 million tons and are located in the central part of the lower peninsula. The coal seams are thin, discontinuous, and high in sulfur. The quality of the coal is significantly lower than that of the Appalachian region or the eastern interior region, the major sources of coal for the state (MERRA, 1980). The risks by the economic and technical problems associated with mining the coal discourage serious consideration of this option at the present time.

Table F-1 indicates projected national coal production by region. Table F-2 indicates the sources of coal for Michigan.

TABLE F-1

PROJECTED U.S. COAL PRODUCTION BY REGION
(Million Tons)

REGION	1975		1985										1990					
			NCA*		KEYSTONE*		DOE/LPDO **						DOE/LPDO **					
	Million Tons	% of Total	Mill. Tons	% of Total	Mill. Tons	% of Total	Mill. Tons	% of Total	Mill. Tons	% of Total	Mill. Tons	% of Total	Mill. Tons	% of Total	Mill. Tons	% of Total	Mill. Tons	% of Total
APPALACHIA	395	61	399	38	455	34	426	43	435	38	451	38	401	36	441	29	464	25
MIDWEST	162	25	200	19	254	19	247	25	279	25	286	24	356	32	411	27	445	24
WEST	91	14	452	43	630	47	317	32	402	36	451	38	356	32	669	44	947	51
TOTAL	648	100	1051	100	1339	100	990	100	1116	100	1188	100	1114	100	1521	100	1856	100

* Production estimates are based upon announced new mine surveys by the National Coal Association and Keystone Coal Industry Survey; they do not project to 1990.

** DOE Leasing Policy Development Office (LPDO) projects a range of production estimates. Numbers may not add due to rounding.

SOURCE: COAL: A DATA BOOK

The President's Commission On Coal p. 95

Assumptions and factors affecting the projection of coal production include:

1) Coal Consumption is expected to be about 1 billion tons in 1985 and 1.1 - 1.3 billion tons in 1990.
2) Western coal production is expected to increase from 250% to 600% during the period 1975-1985.
3) Medium economic growth of 3% per year will occur; energy will be available at medium levels with constant real oil prices; no change in the national energy policy will not change.
4) Regional market shares will depend upon such factors as transportation costs, demand for low-sulfur coal, and changes in EPA sulfur emission standards.
5) Low sulfur Western coal will lose much of its advantage over Eastern coal after 1985 if EPA regulations mandate stack gas scrubbing for plants coming on line.

TABLE F-2

SOURCES OF BITUMINOUS COAL AND LIGNITE FOR MICHIGAN

	1976		1978		1979	
Source (District)*	1000 Tons	% of Total	1000 Tons	% of Total	1000 Tons	% of Total
Eastern Kentucky	9,220	30.9	10,402	37.7	13,867	42.8
Ohio	8.141	27.4	5,248	19.0	4,567	14.1
Northern W. Virginia	5,382	18.1	4,056	14.7	4,843	15.0
Montana	2,887	9.7	3,407	12.3	4,359	13.5
Western Kentucky	1,354	4.5	422	1.5	476	1.5
Southern W. Virginia	1,189	4.0	1,014	3.7	1,242	3.8
Pennsylvania	787	2.6	2,094	7.6	2,080	6.4
Various	845	2.8	965	3.5	950	2.9
Total	29,805	100.0	27,608	100.0	32,385	100.0

*Bureau of mines Bituminous Coal and Lignite Production Districts

Source: 1) Michigan Statistical Abstract. David I. Verway (editor). Division of Research, Graduate School of Business Administration, Michigan State University. 1979.

2) Energy Information Administration. U.S. Department of Energy. Energy Data Reports, 1979.

Coal Transportation

Once the coal is mined and processed, it is moved to another site for combustion. "Minemouth" facilities are served by trucks and belt conveyors. Long distance transport is by highway, railroad, waterway and slurry pipeline. Transportation cost is a major determinant of the specific mine source or combustion site. Table F-3 presents projected coal transportation for the nation.

Truck Transport

The fastest growing mode of coal transportation is by truck. During 1975, 79 million tons or 12% of all coal produced nationally was moved from mine to market by truck. In 1976, 89.8 million tons or 13% was transported by truck. Projections suggest that 12% of all coal produced nationally in the year 2000 will be moved by truck. This projection is equivalent to a tonnage increase of approximately 50% over 1975 levels (U.S. Department of Transportation, 1978).

There are significant regional variations in movement of coal by truck. During 1975, for example, 81% of truck transported coal was loaded in the Appalachian region. An additional 14% originated from other eastern areas, with the remainder, approximately 5% loaded in all other producing regions combined (U.S. Department of Transportation, 1978).

Trucks the collection and distribution functions of mine-to-market movement. Trucks operate in short haul situations rather than as long distance carriers since trucking costs more than other modes for long hauls. The average highway shipment of coal is 50-75 miles compared to an average haul of 300 miles by rail and 480 miles by barge (Office of Technology Assessment, 1979). Locally, highway capacity and vehicle weight restrictions further limit opportunities for truck transport.

Truck transportation of coal is limited in Michigan. The only significant truck transport of coal in Michigan occurs at Traverse City where the municipal utility receiving docks are several miles from the generating plant. Coal is delivered to the docks by water and then trucked to the plant.

Railroad Transport

Railroads transported approximately 420 million tons or two-thirds of total U.S. coal production in 1975. Projected coal tonnage transported by railroads in the year 2000 expected to increase by 1.4 to 2.4 times the 1975 tonnage (U.S. Department of Transportation, 1978).

Railroads generally load the coal at or near the mine and deliver the coal directly to the destination point; this is particularly true for eastern rail transport. The continued development of western low sulfur coal production is also projected to significantly increase the frequency of coal transport by rail to the western Great Lakes port facilities for transshipment (U.S. Department of Transportation, 1978).

The average hopper car carries about 75 tons of coal. Older cars carry approximately 55 tons, compared to the newer hoppers which carry 100 tons at capacity. The complete cycle of loading, hauling to the unloading point, unloading and returning for another cargo averages 13 days for each car. The size of the hopper cars that can be accomodated depends on road

TABLE F-3

PROJECTED NATIONAL COAL TRANSPORT MODES*, 1985

MODE	Million Tons by Mode Percent of Total Moved						
	1975	1976	1985			2000	
			EEI	BOM	NEP	EEI	BOM
RAIL	418 65%	431.1 63.5%	503 64.5%	637 64.5%	780 65%	608 64.5%	1,023 64.5%
MOTOR VEHICLE	79 12%	89.8 13.2%	95 12.2%	120 12.2%	144 12%	115 12.2%	193 12.2%
MINE-MOUTH GENERATING PLANTS	74 11%	79.2 11.7%	89 11.4%	113 11.4%	132 11%	107 11.4%	181 11.4%
WATER***	69 11%	69.6 10.3%	83 10.7%	106 10.7%	132 11%	101 10.7%	170 10.7%
OTHER**	8 1%	8.9 1.3%	9 1.2%	12 1.2%	12 1%	11 1.2%	19 1.2%
TOTAL	648	678.6	779	988	1,200	942	1,586

NEB - National Energy Plan
BOM - Bureau of Mines
EEI - Edison Electric Institute

* Primary Transport mode used to move coal from mine to final destination.
** Includes coal used at mine, taken by locomotive tenders at tipple, used at mine for power and heat; coal transported from mine to point of use by conveyor or tram; coal made into behive coke at mine; all other uses at mine; and coal shipped by slurry pipeline.
*** Includes barge transport on inland rivers and lake vessel transport on the Great Lakes.

SOURCES: Coal: A Data Book
The President's Commission on Coal, p. 195. 1980

National Energy Transportation, Volume III-Issues and Problems, report prepared by the Congressional Research Service, March 1978, p. 58.

The assumptions for projected coal transport to the year 2000 include:

1) Railroads are expected to remain the dominant transport mode through 1985 since long haul movement of coal will increase. By 1985 total rail transport of coal will increase by approximately 2/3 over current levels.

2) Western rail transport is expected to increase 300 to 400 percent by 1985. Increases in unit train movements are expected, particularly in the West.

3) Western coal may move by water after it is railed to ports on the Great Lakes and the Mississippi River. Increased tonnage will be shipped to Detroit via the Great Lakes, Chicago via the Illinois waterway, and the South and Southwest via the Mississippi, Tennessee and other rivers.

4) No critical problems in terminal/transfer capacity, fleet expansion, or equipment supply are anticipated through 1985.

5) Major constraints to growth of coal traffic on traffic on inland water-ways are inadequate lock capacity, limited channel depth and the age of the Great Lakes fleet.

6) Percent shares of coal transported by primary mode (i.e. moving the coal most or all of the way from mine to final destination) will remain virtually constant through 1985: rail = 65%; highway = 12%; water = 11%; mine-mouth generating plant consumption - 11% and slurry pipelines and other = 1%.

conditions and the weight the track can support. Western coal unit trains tend to use 100-ton hopper cars; Eastern shipments often require 55-ton hoppers.

The growth of western coal production has encouraged the use of unit trains. The unit train is designed to take advantage of economics of scale. It generally carries a single commodity in dedicated service between two points is sufficient volume to achieve cost savings. A typical coal unit train consists of six 3,000 horsepower locomotives and 100 hopper cars with carrying capacities of 10 tons each. Roughly two such trains per week are required to deliver approximately one million tons of coal per year (Office of Technology Assessment, 1979). Unit trains are most used as frequently east of the Mississippi River because eastern coal generally originates from smaller mines and travels shorter distances. Also the weight capacity of eastern tracks is limited (U.S. Department of Transportation, 1978). Many experts believe that rail transport of coal nationally is presently close to physical capacity. Expansion of coal production has to be accompanied by expansion of the railroads' ability to handle the shipments. Substantial investments will be necessary to accommodate the expected increase in coal tonnage transported by rail (MERRA, 1980). Investments include between $5 and $7 billion to purchase and replace rail cars, $4 - $5 billion to upgrade and build new track, and $300 million for new right-of-way for access to coal reserves (U.S. Department of Transportation, 1978; President's Commission on Coal, 1980).

Water Transport

Water transportation of coal, including barge and lake vessel, accounted for 69 million tons or 11% of all coal shipments loaded during 1975. Projected tonnage for the year 2000 is expected to be between 115 to 193 million tons, representing approximately 10.7% of national production (Congressional Research Service, 1978).

During 1975, 39 million tons of coal were shipped via the Great Lakes. This represents approximately 18% of the total tons of coal shipped through the inland waterways. Exports to Canada accounted for approximately 45% of the 1975 total tonnage for the Great Lakes. The 1978 tonnage was 37.7 million reflecting a general downward trend in Great Lakes tonnage since the mid 1960's (Lake Carriers Association, 1978).

Single self-propelled bulk cargo carriers are used on the Great Lakes. The average lake carrier capacity is 20,000 tons (Office of Technology Assessment, 1979). The Detroit Edison Company of Michigan currently uses three 1000 feet long vessels with an average capacity of 62,000 tons of coal each. They are self-unloading vessels which deposit the coal directly unto the dock or into dock hopper. On its first run, one of the ships - the Belle River, carried 66,550 tons of coal (National Academy of Sciences, 1979).

The projected increase for Great Lakes coal traffic in 1985 is an additional 5.6 million tons amounting to approximately a 14% increase over 1975 tonnage. This figure represents domestic coal movement only; it does not include exports to Canada (U.S. Department of Transportation, 1978).

The general consensus is that terminal/transfer capacity for all waterborne coal traffic is adequate to 1985. Within the Great Lakes region, the Duluth-Superior and Conneaut, OH transshipment facilities are expected to experience the greatest growth in coal handling (U.S. Department of Transportation, 1978).

However, several constraints on future transportation of coal via the Great Lakes have been cited. The most frequently cited are lock capacity and the limited water navigation season. (President's Commission on Coal, 1980). The question of whether these are coal-specific constraints has not been adequately addressed. Some investigation of the benefits and costs of increasing coal storage capacity as compared to expanding lock capacity or extending the navigation season may be warranted.

Slurry Pipelines

Coal slurry pipelines are expected to function in the coal transportation system by the year 2000. The major current economic and technical difficulties inhibiting slurry pipeline development are expected to be overcome by that time. Legal difficulties ensue over the issue of eminent domain for slurry pipelines right-of-way across railroad routes. Environmental and legal issues surface in the acquisition of water required to transport the coal by pipeline. The major coal slurry projects involve transporting large volumes of coal from the western states where water resources are limited. The potential water restrictions to slurry pipeline development has led to technical innovations such as water recycling through looped pipelines. Currently, the economic costs of recycling outweigh the benefits. Another frequent suggestion to remedy the water problems is the use of an oil-coal slurry mix (WOCOL, 1980). A major resurgence in the demand for coal has not yet materialized. Significant pressure to develop slurry pipelines is not likely to occur until the present delivery systems become strained under strong increases in oal demand (MERRA, 1980). However, it should be noted that lobbying efforts are underway in support of the Coal Pipeline Act of 1979 which is currently in the House Committee on Public Works and Transportation (personal conversation, Slurry Transport Association, June 1980). Table F-4 and Figure F-2 describe existing and projected coal slurry pipeline systems.

TABLE F-4

COAL SLURRY PIPELINES

Pipeline System	Length (Miles)	Annual Capacity (Million Tons)	Date Operational	Current Status
Existing				
1. Black Mesa Pipeline— From Peabody Coal Co's Black Mesa Mine in northeastern Arizona to the 1,580 MW Mohave generating station in Nevada.	273	4.8	In operation since 1971.	
2. Ohio Pipeline— From Cadiz, Ohio to Lake Erie.	108	1.3	Closed.	Built and operated by Consolidation Coal Co. for 6 years from 1957 to 1963. The pipeline closed following reduction of rail rates.
Planned or Under Study				
3. Allen-Warner Valley Energy System Consisting of two independent pipelines.				Environmental Impact Statement in process. No additional Legislation required for right-of-way acquisition.
a. From Alton coal field, Southern Utah to the 2000 MW Harry Allen plant near Las Vegas, Nevada.	183	9.1	1985-1988	
b. From Alton coal field, Southern Utah to the 500 MW Warner Valley plant near Arizona/New Mexico Border.	73	2.5	1984	
4. ETSI Pipeline— From Wyoming's Powder River Basin to a barge terminal at Penton, Mississippi, with an optional extension of the pipeline from Arkansas to southern Louisiana.	1,355	25.0	1984	Environmental Impact Statement in process. Pending completion of the EIS. Energy Transportation Systems, Inc. is conducting a coal slurry marketing program, preparing coal evaluation facilities and securing rights-of-way. (In the past two years, ETSI filed and won 65 different suits against various railroads to secure crossings beneath their tracks. Three of those victories, challenged in higher courts, have been confirmed on appeal).
5. Florida Pipeline— Two gathering systems are under consideration to serve utilities in Georgia and Florida. One system would originate in the coal fields of Kentucky, West Virginia and Virginia; the other in Illinois, Tennessee and Indiana.	1,500	40-55	1986	Continental Resources (formerly Florida Gas Company), working with six Southeastern utilities, has determined that a coal pipeline to Georgia and Florida would reduce substantially coal transportation costs to that area. Water requirements are minimal compared with available supplies in the originating areas, but enactment of eminent domain legislation is necesary for right-of-way acquisition.
6. Snake River Pipeline— From Wyoming and Montana to the Pacific Northwest and Idaho.	1,100	10.0	Indefinite	Proposed in 1974 by Northwest Energy Company and Gulf Interstate Engineering Company on the basis of anticipated coal demand that has not developed, this project is being held in abeyance, pending development of a demand for coal.

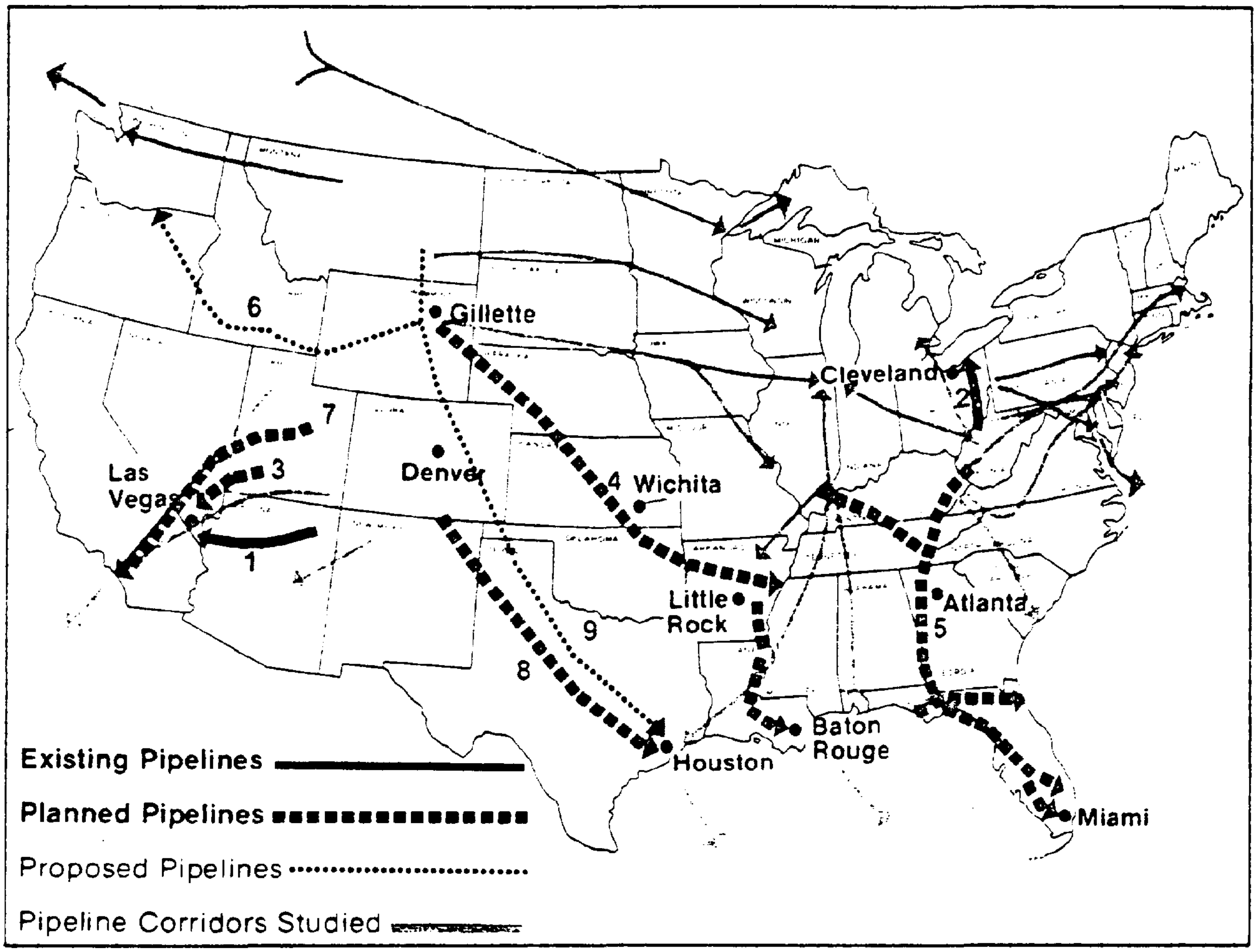
TABLE F-4 (Con't)

Pipeline System	Length (Miles)	Annual Capacity (Million Tons)	Date Operational	Current Status
7. Pacific Bulk Transportation System— From Emery, Utah to Port Hueneme, California.	645	10.0	Indefinite	Proposed by Boeing Engineering and Construction Company to transport coal to the West Coast and export it to the Far East.
8. San Marco Pipeline— From Southern Colorado to Houston, Texas.	900	15.0	1985	The San Marco Company, a partnership of Houston Natural Gas Company and Rio Grande Industries (parent company of the Denver Rio Grande Western Railroad), is awaiting adjudication in the Colorado Water Court of its request for the use of water. A pretrial hearing date has been set in late 1980. Since most of the pipeline route would be in Texas, which approved eminent domain for coal pipelines in 1977, right-of-way acquisition is not considered a major problem.
9. Texas Eastern Pipeline— Southern Montana and northern Wyoming to Texas Gulf coast	1,260	25.0	Indefinite	Texas Eastern Transmission Company proposed this pipeline in 1979, and the company is investigating possible water sources. A water development project, approved by the Wyoming legislature, was dropped when the State's governor declined to enter into a feasibility study required by the legislation.

SOURCE: 1979 Coal Traffic Annual National Coal Association, 1980.

FIGURE F-2

COAL SLURRY PIPELINE SYSTEMS



1. Black Messa
2. Ohio
3. Allen-Warner Valley Energy System
4. ETSI
5. Florida
6. Snake River
7. Pacific Bulk Transportation System
8. San Marco
9. Texas Eastern

Source: Slurry Transport Association

SOURCE: 1979 Coal Traffic Annual National Coal Association, 1980.

Coal Consumption

The consumption of coal depends on such variables as the price relative to other fuels, cost attractiveness of conversion from other fuels, environmental controls, and national policy for synthetic fuels and alternative energy sources. The most widely used national projections are from the first and second National Energy Plans (NEP-I and NEP-II). Which supposedly reflect current energy policies. The projections of fuel use in the second National Energy Plan are shown below, along with the main economic assumptions.

A discussion of these projections and energy projections for the state of Michigan is provided elsewhere in this report and will not be repeated here.

APPENDIX G

ENVIRONMENTAL EFFECTS

This Appendix is a concise statement of the potential environmental effects of activities related to coal transshipment and unloading. First, an overview of the chemical and physical aspects of coal is given. Effects on soils, water quality, air quality, animal and plant communities and aesthetics are surveyed. At the end of the appendix are tables that give a brief description of the major activities related to coal transshipment and unloading.

AN OVERVIEW OF THE CHEMICAL AND PHYSICAL CHARACTERIZATION OF COAL

Coal can be defined as a sedimentary rock consisting mostly of compounds of carbon, hydrogen, oxygen, and a large portion of volatile matter. (Neavel et al 1977) Most of this volatile matter is composed of hydrocarbons and water. As the rank (state of metamorphosis) of the coal increases the percentage of volatile matter decreases and the percent of fixed carbon increases. (Carlson et al 1979)

During formation, coal undergoes a continuous series of alterations given by: living plants -- peat -- lignite -- subbituminous coal -- bituminous coal -- anthracite. Each step results in an increase in the relative amount of carbon present, with up to 93% to 98% carbon for anthracite coal. (Carlson et al 1979)

For practical purposes, coal is categorized by "proximate" analyses, which are empirical tests. A proximate analysis of coal involves determination of four constituents: 1) moisture; 2) ash; the residue from complete combustion, 3) volatile matter, consisting of gases or vapors driven off when coal is heated (960^{o} for 7 minutes) and 4) fixed carbon, the solid residue that remains after the volatile matter is driven off, less its ash content. (Szabo, 1978)

Moisture, sulfur, and ash, are undesirable constituents of coal. Volatile matter and fixed carbon produce most of the energy when coal is burned.

The rank of coal increases as the amount of fixed carbon increases and as the amounts of inherent moisture and volatile matter decrease. The great variation in composition of coals is apparent in the following analysis (ash-free basis) of a typical Lignite & Anthracite in % :

	Lignite	Anthracite
Fixed Carbon	33	92
Volatile matter	26	5
Moisture	41	3
Total	100	100

(Szabo, 1978)

Coal is composed not only of those elements usually considered to be organic (C, H, N, O) but also contains significant quantities of inorganic elements. (Gluskoter et al 1977)

The organic matter is a complex mixture of various macromolecules which varies according to the rank. The inorganic material in coal including major, minor, and trace elements is difficult to measure but may account for 3% to 31% of the coal matter (Gluskoter et al 1977). The study of inorganics in coal (mineral matter) has intensified since the 1960's because several elements and minerals such as berylium, mercury, and asbetsos have been recognized as hazardous to human health, and others have been suspected of being detrimental to the environment. (Dvorak et al 1978)

Mineral matter is incorporated into coal in two ways: (1) deposition from water percolating through decaying vegetation in early stages of coal formation and (2) infiltration of cracks and fissures in the formed coal during subsequent stages. (Braunstein et al, 1977)

Knowledge of the background concentrations of these inorganics, (major, minor, and trace elements in the environment) is important for assessing the possible threat from anthropogenic sources. Natural levels are found in the soil, water, and atmosphere, but the forms and concentrations in each medium are different. (Braunstein et al, 1977)

The following sections contain in depth discussions of the major effects of transportation to, and construction and operation of, a coal unloading and transshipment facility.

EFFECTS ON SOILS

The effects of coal dust in soils will be important primarily in areas along transport corridors and areas adjacent to coal storage piles.

- Coal Dust - Coal dust may cause changes in the chemical properties of the soil, and may affect aboveground portions of the plants intercepting the coal dust. (Dvorak, et al 1978) The degree to which soils are altered is dependent on the buffering capacity of the soil. The buffering capacity of soils originating from carbonaceous sedimentary parent materials is high, but it is low for soils formed from granites and quartzites. (Dvorak et al, 1978) A lowering of the soil pH causes a decrease in the cation exchange capacity of the soil, and cations such as Mn^{2+}, Ni^{2+}, Fe^{3+} and Ca^{2+} are leached from the soil profile. Also, increased acidity may result in increased availability of zinc and aluminum, (such that these elements become toxic to plants) and decreased availability of phosphorus. (Dvorak et al, 1978) The effects of acidity on the soil can be ameliorated by applications of lime.

  In humid regions where soils are generally acid, additions of alkaline coal dust (western coal) may lead to an increase in soil pH. If such increases exceed the pH range of tolerance of native plant species, changes in vegetation can occur. Also, raising the pH of the soil changes the availability of nutritive elements such as phosphate, iron, and manganese, possibly leading to deficiencies in these ions. (Dvorak et al, 1978)

Coal dust may also liberate small amounts of trace elements to the soil. For plants, the potential toxicity of trace elements in coal within the soil depends largely on whether or not the element is available (present in the soil in a form that can be absorbed and assimilated by growing plants).

Availability is dependent upon the interactions of many factors including the properties of the trace elements, the soil, and the plants, the biological characteristics of the soil, and environmental parameters such as temperature and precipitation. (Dvorak et al 1978) All of the interrelationships of these factors are unknown.

The major impact on the soil from construction and transportation is fugitive dust generation from unprotected earth surfaces. Fugitive dust can clog the interstitial spaces of the soil and prevent downward movement of precipitation, resulting in an increased runoff. (Dvorak et al, 1978)

EFFECTS ON WATER QUALITY

Coal and coal dust may be important in waterbodies adjacent to coal transport lanes and nearshore operating areas including loading/unloading, storage, and handling operations.

- Coal Dust - Coal is essentially an insoluble solid. When coal is in the ground aquifers run through the seams and leach virtually all of the soluble material from the coal long before it is mined. Hence, all of the soluble constituents of coal are lost in a historical sense. When raw coal (usually in the form of dust) enters a body of water it tends to adsorb rather than release organic pollutants. (Communication, W. C. Sonzogni) Therefore, few organic constituents of coal should be liberated in water and should not be significant even in local areas. Also, no extreme toxics or heavy metals are expected to be released from coal in a waterway. Depending on the hardness of the water, the rank (stage of metamorphosis) of the coal, and the coal seam and basin, small amounts of elements such as aluminum and boron may be released to a waterway. (Communication, R. M. Carlson) Neither of these elements are considered extremely toxic or dangerous in water at low concentrations, and hence should not present a significant problem with regard to coal.

- Resuspension of Sediments - (caused by; dredging, dredge material disposal, and vessel movement)

  Resuspension of bottom sediments by dredging and ship traffic is an important secondary source of turbidity in a waterway. (Sydor et al, 1980) Suspended solids due to resuspension average about 5 times the usual concentration of suspended solids in a waterway. The major concerns of resuspended sediments are the possible release of toxic materials from the sediments, and increased turbidity, causing the disturbance and destruction of benthic organisms and habitat resulting in changes in species composition, distribution, and abundance. (Corps of Engineers, 1974)

- Increased Turbidity - (caused by; coal dust and fugitive dust in suspension, erosion, dredging, dredge material disposal, and construction)

  Turbidity is primarily a matter of aesthetic impact rather than biological impact. (Corps of Engineers, 1979) However, increased turbidity may lower the overall biological productivity in a waterway by contributing to a decrease in light penetration. This lowers the suitability of the area for aquatic vegetation because of a decrease in photosynthetic activity.

  Also, turbidity may impact fish spawning grounds and habitat and cause the temporary out-migration of motile aquatic species which utilize the water near the site. (Corps of Engineers, 1979) Increased turbidity may also contribute to the displacement and destruction of benthic organisms by clogging respiratory and feeding surfaces, and changes in the chemical equilibrium at the sediment - water interface. (Commerce Division, Long Beach Harbor Department, 1978)

- Change in pH - (caused by increased coal dust in the waterway)

  Changes in pH in a waterway may occur locally due to increased coal dust. Eastern coal has a high sulfur content and may lower the pH of the water slightly. Western coal has a high carbonate base and may raise the pH of the water slightly. It is generally believed that raw coal in a waterway will not influence the pH significantly except possibly in areas where the coal to water ratio is high, such as around docks. (Communication, R. M. Carlson) The major concerns of pH changes are the possible adverse effects on aquatic vegetation, benthos, and fish.

- Reduction or Change in Aquatic Vegetation - (caused by; increased turbidity, coal dust, and change in pH)

  The suitability of an area to support aquatic vegetation will be reduced due to a decrease in light penetration resulting from increased turbidity. (Roy F. Weston, Inc. 1974) The reduction in light penetration reduces the photosynthetic capabilities of the plant. Some species of algae might benefit from increased turbidity due to decreases in dissolved oxygen levels. (Commerce Division, Long Beach Harbor, 1978) Zooplankton populations could be secondarily affected owing to decreased amounts of vegetation.

- Reduction or Change in Benthic Communities (caused by; dredging, dredge material disposal, turbidity and change in pH)

  The importance of benthos to the entire food-web of an aquatic environment has been well recognized for many years. They are important ecologically because they serve as food for fish and other benthic organisms and are essential in the decomposition of organic sediments. (Commerce Division, Long Beach Harbor, 1978) After displacement, benthic organisms will recognize the bottom areas, although possibly in reduced numbers.

  Turbidity associated with coal related activities may damage or kill organisms on the bottom, on sheet pilings, and in the water column, by clogging respiratory and feeding surfaces. Also, benthic organisms may be eliminated by toxic effects either directly through exposure to the toxic material, or indirectly by limited algal food supplies. (Commerce Division, Long Beach Harbor, 1978)

- Reduction or Change in Fish Populations - (caused by; dredging, dredge material disposal, turbidity, change in pH, and change in water chemistry)

  The most extensive studies on aquatic impacts from coal facilities have been on fish. Acidity is an important water quality parameter when discussing fish survival and productivity in an area. The mechanisms involved in acid-induced effects will vary depending upon the levels of acidity and interactions with other components. (e.g., metals and CO_2)

  In the pH range of 4 to 5 (more often encountered in waterways affected by acid rain) fish mortality occurs due to he disturbance of normal ion and acid-base balance. (Dvorak et al, 1978)

  The pH range of 4.5 to 4.7 will have adverse effects on lake herring, yellow perch, lake chub, carp, and salmonid eggs and fry. A pH of 4.7 to 5.2 is harmful to brown bullhead, white sucker, and rock bass. A pH of 5.2 to 5.5 is harmful to lake trout, and trout-perch, and a pH of 5.5 to 6.0 is harmful to small mouth bass, walleye, and burbot. A pH of between 6.0 and 9.0 is harmless to most fish. (Dvorak et al, 1978)

  Coal related activities will impact fish populations in other ways as well. Fish populations and growth rates might be reduced due to lowered amounts of food items. Reproductive success among fish spawning in the area might be diminished as a result of increased turbidity. Behavioral patterns of fish could change due to mechanical disturbances associated with vessel loading and unloading, and increased turbidity. Finally, the flesh of fish caught near the facility could potentially be higher in concentrations of some heavy metals. (Corps of Engineers, 1974)

EFFECTS ON AIR QUALITY

Although the major air quality concerns are with the burning of coal, the transportation and storage aspects also contribute to various atmospheric impacts. The major ones are:

- Emissions - (caused by; vessels, trains, trucks, construction equipment, and spontaneous combustion)

  The major atmospheric contaminants associated with vehicular emissions and spontaneous combustion are nitrogen oxides, sulfur oxides, hydrocarbons, and carbon monoxide. The main concern with regard to these pollutants are their effects on human health, flora, and fauna. Most of the information on the effects of these pollutants are derived from toxilogical and epidemiological studies of human and wildlife populations.

  These pollutants affect primarily the lower respiratory tract, by irritating the respiratory passageways and other muscosal tissues with which they come in contact. (Dvorak, et al, 1978) Animals with higher rates of ventillation or more exposed mucosal tissues relative to their body size would be more sensitive to exposure than others.

Native plant species tend to be more tolerant of these pollutants than crop or ornamental species. (Dvorak et al, 1978) These pollutants enter the plant primarily through the leaf stomata and pass into the intercellular spaces of the mesophyll, where it is absorbed on the moist cell walls. If concentrations become toxic, damage will occur as a result of chlorophyll destruction and cell collapse. (Dvorak et al, 1978)

- Coal Dust - (generated by unit train transport, truck transport, vessel transport, coal handling, stockpiling)

  The effects of Coal Dust in the atmosphere may be a major consideration in certain localities. Coal dust may reduce the air quality by releasing volatile substances to the atmosphere. Coal dust may deposit on vegetation plugging the stomates of leaves, lowering photosynthetic activity and causing leaf necrosis. (Dvorak, et al, 1978) Long term exposure to coal dust may cause changes in vegetation community structure. Also, coal dust may cause some cleaning problems for people living nearby, as well as contributing to general aesthetic degradation of an area.

- Fugitive Dust - (generated by truck transport, train transport, construction)

  Fugitive dust from roads may also present some atmospheric problems, but the effects will normally be a matter of aesthetic impact rather than biological impact. However, fugitive dust from roads and land cleared for construction can fall on plant leaves, reducing transpiration through stomata, and decreasing photosynthetic capabilities of the plant. (Szabo, 1978) Fugitive dust including windblown coal dust is subject to the federal standards for air quality.

EFFECTS ON ANIMAL AND PLANT COMMUNITIES

The major effects associated with the transportation and handling of coal to the terrestrial environment are:

- Removal or Change in Vegetation - (caused by; construction, stockpiling, and train and truck operation)

  Removal of vegetation causes various impacts on the environment. It destroys wildlife habitat and brings about the potential for erosion by water and wind. (Missouri River Basin Commission, 1979) Removal of vegetation may also cause some microclimate changes by altering humidity levels, surface heating patterns, and wind fields. (Szabo, 1978)

- Reduction or Change in Animal Populations - (caused by; construction, transportation, coal handling, and stockpiling)

  The establishment of a coal unloading/transshipment facility initially results in losses of wildlife habitat from the site. However, the return of fauna to available habitat should increase rapidly following completion of construction. (Dvorak et al, 1978)

Mobile animal species will seek habitat in areas adjacent to the site, but since these undisturbed areas are generally at their carrying capacity, the total number of individuals of a given species will probably be reduced. (Dvorak et al, 1978)

Generally human activity at the site will cause temporary disruption of existing patterns of visitation by species. Most construction sites are already surrounded by habitat adapted to intrusion, so the temporary disruption caused by construction will have minimal adverse effect on the foraging success of the animals. (Dvorak et al, 1978)

- Noise Effects - (caused by; transportation, construction, dredging, coal handling, and stockpiling)

  The effects of coal related activities on noise levels of the surrounding area may be significant and should be taken into consideration.

  From a community standpoint, noise from the coal unloading/transshipment facility may be undesirable. For local residents, noise may seriously disturb sleep by interrupting dreaming sequences. Sudden noises can increase body tension, adversely affecting blood pressure, heart rate, and the whole nervous system. Even noises that do not disturb normal hearing can be emotionally upsetting. (Porteous, 1977)

  Noise may also have adverse impacts on local wildlife, possibly disrupting breading, nesting, and feeding activities of certain species. Noise generated during loading/unloading and handling operations may affect wildlife in the immediate vicinity. The effects of noise on wildlife can be both auditory (hearing loss) or non-auditory (stress related). (Dvorak et al, 1978)

  Noise can also be expected to interfere with animal behavior of species relying on auditory stimuli for communication. Excess noise levels within 100 meters of the facility may disrupt the normal nesting behavior of passerine birds. Territorial and defense mechanisms may also be adversely affected by excess noise. (Dvorak et al 1978)

  The effects of intermittent noise on animals are less severe than the effects of continuous noise.

AESTHETIC EFFECTS

- Much which will occur during the construction and operation of a coal unloading/transshipment facility may be considered an aesthetic impact. Perhaps the most significant impact might be the reaction of people to changes in the visual nature and character of the site. (Roy F. Weston, Inc. 1974) Aesthetic appreciation is very subjective, and clearly varies between cultures. The value of attitude, perception, and preference studies becomes evident when dealing with industry official, designer, and general public relationships.

Strong feelings against a proposed or existing facility will often be voiced and can be considered aesthetic disapproval. The degree of aesthetic disapproval will vary from individual to individual and the significance of the aesthetic impact will be dependent upon the attitudes of the people of the area toward the proposed or existing facility. (Corps of Engineers, 1974)

TABLE G-1

COAL UNLOADING

	ACTIVITIES					
MODE OF TRANSPORT	MOVEMENT OF COAL THROUGH COASTAL ZONE	POSITIONING VEHICLES FOR UNLOADING	UNLOADING COAL	ON SITE MOVEMENT OF COAL TO STORAGE/USE AREAS	POSITIONING OF COAL FOR STORAGE	RELOADING OF COAL FOR LOCAL DISTRIBUTION
RAIL	Unit Train on Rail Line 100 ton payload per car	Train on site next to unloading equipment length may extend beyond site	Rotary Car Dump	Hopper to conveyor to transfer house; to crushers or stockpile	Conveyor to radial stacker put into place by bulldozers	Rotary feeder to loading station to loadout chute
WATER	Vessel or Barge	Vessel in dock next to unloading equipment	Ship unloader a) on board b) on shore	Receiving bin to conveyor to transfer house; to crushers or stockpile	Conveyor to radial stacker put into place by bulldozers	Rotary feeder to surge bin to shiploader
TRUCK	30 to 200 ton payload	Truck on site next to unloading equipment	Unloading bin	Rotary feeder to conveyor to transfer house; to crushers or stockpile	Conveyor to radial stacker put into place by bulldozers	Rotary feeder to surge bin to shiploader

TABLE G-2

COAL TRANSSHIPMENT

	ACTIVITIES				
MODE OF TRANSPORT	MOVEMENT OF COAL FROM SITE TO TRANSFER FACILITY	POSITIONING VEHICLES FOR UNLOADING	UNLOADING COAL	MOVEMENT OF COAL TO STORAGE AREA	RELOADING COAL
RAIL	Unit Train on Rail line 100 ton payload per car	Train on site next to unloading equipment; length may extend beyond site	Rotary Car Dump	Hopper to Conveyor to radial stacker; put into place by bulldozers	---
WATER	Vessel or Barge	Vessel in dock next to unloading equipment	Ship unloader a) onboard b) onshore	Receiving bin to conveyor to radial stacker; put into place by bulldozers	Rotary feeder to surge bin to shiploader
TRUCK	20 to 200 ton payload	Truck on site next to unloading equipment	Unloading Bin	Rotary feeder to conveyor to radial stacker; put into place by bulldozers	---

TABLE G-3

FACILITY OPERATION

	ACTIVITIES					
MODE OF TRANSPORT	UNLOADING OF COAL	TRANSFER TO CONVEYOR BELT	ON SITE USE	TRANSFER TO STOCKPILE	RELOADING OF COAL	DUST CONTROL LOCATIONS
RAIL (Unit Train)	Rotary Car Dump	Rotary Car Dump Hopper to Conveyor	Conveyor to a) transfer house to b) conveyor to c) crusher	Conveyor to radial stacker/telescopic chute to stockpile	Stockpile to a) rotary feeder b) loading station c) loadout chute	a) Rotary Car Dump-dust controlled with bag house collector b) Conveyor system enclosed c) Transfer points-dust controlled with sprays or bag house collectors d) Radial stacker-dust controlled with bag house collector or sprays e) Stockpile-dust controlled by spraying
WATER (Vessel)	Ship Unloader a) on board	Ship unloader to receiving	Conveyor to a) transfer house to b) conveyor to c) crusher	Conveyor to Radial stacker/telescopic chute to stockpile	Stockpile to a) rotary feeder b) surge bin c) ship loader	a) Ship unloader-dust controlled with sprays b) Conveyor system enclosed c) Transfer points-dust controlled with sprays or bag house collectors d) Stockpile-dust controlled by spraying
TRUCK	Unloading Bin	Unloading bin to rotary feeder to conveyor	Conveyor to a) transfer house to b) conveyor to c) crusher	Conveyor to radial stacker/telescopic chute to stockpile	Stockpile to a) rotary feeder b) loading station c) loadout chute	a) Bottom of unloading bin dust controlled with sprays or bag house collectors b) Conveyor system enclosed c) Transfer points-dust controlled with sprays or bag house collectors d) Radial stacker-dust controlled with bag house collector or sprays e) Stockpile-dust controlled by spraying

TABLE G-4

STOCKPILING

	ACTIVITIES						
	SITE PREPARATION	MOVEMENT OF COAL TO PILE	GROOMING/COMPACTING	DUST SUPPRESSION	RECLAIMING	BERMING	MOVEMENT OF COAL FROM PILE
Vehicles and Equipment	a) Bulldozer b) Front-end loader c) Grader	a) Conveyor b) Receiving bin c) Radial stacker/telescopic chute	a) Bulldozers b) Front-end loader	a) Dozer equiped sprayers b) Hoses	a) Bulldozers b) Front-end loader	a) Bulldozers b) Front-end loader	a) Front-end loader b) Hopper c) Conveyor belt

TABLE G-5

FACILITY CONSTRUCTION

	ACTIVITIES						
	LAND CLEARING	GRADING	LAYING ACCESS ROADS & SPUR LINES	MATERIALS DELIVERY & STORAGE	CONSTRUCTION	SITE CLEAN-UP	LANDSCAPE REHABILITATION
VEHICLES AND EQUIPMENT	a) Bulldozers b) Front-end loaders	a) Bulldozers b) Front-end loaders c) Graders	a) Graders b) Bulldozers c) Front-end loaders	a) Trucks b) Trains c) Bulldozers d) Front-end loaders	a) Cranes b) Bulldozers c) Front-end loaders d) Trucks e) Trains f) Fork lifts g) Cement mixers	a) Trucks b) Trains c) Bulldozers d) Front-end loaders	a) Bulldozers b) Front-end loaders c) Graders d) Trucks e) Trains

APPENDIX H

COMPREHENSIVE MITIGATION STRATEGY

After environmental and socio-economic effects related to coal movement and storage in the coastal zone have been identified and evaluated, a comprehensive mitigation strategy may be necessary to help ameliorate anticipated adverse effects. The mitigation strategy is an idealized approach to addressing effects associated with coal unloading/transshipment facilities, because it can often be implemented without changes in present policies and regulations.

Presented here is a strategy for the most extreme case, a case where all possible effects will be encountered and must be dealt with. Specific projects will not evidence all anticipated effects; each situation will be different. In some cases, the effects will be insignificant and no action will be needed, so not all the elements of the mitigation strategy may be required. Further, since this is a generic study and very little information on mitigation costs has been published, no attempt is made to suggest which measures would be most cost-effective. This will vary by location, type and scale of the proposed facility.

Some of these mitigation techniques may be important enough to be incorporated into project proposals. This may or may not require changes in regulation or legislation depending on the situation. This comprehensive mitigation strategy delineates possible ways to ameliorate adverse effects in the following areas of concern:

(A) Vessel Operation
(B) Dredging
(C) Dredge Material Disposal
(D) Construction
(E) On-Site Handling Coal
(F) Storage of Coal
(G) Transportation
(H) Economic Growth
(I) Employment
(J) Housing
(K) Local Government Administration

(A) Mitigation Techniques for Vessel Operation Impacts

(1) Movement Impacts

- Establishment and enforcement of speed limits can assist in reducing shore erosion, resuspension problems, and risk to structural damage resulting from effects of waves and/or collisions with vessels.

- Modification of channels is often used as a technique to reduce ship induced shoreline losses. Modification of channels may present an economically justifiable technique for reducing movement effects. However, modification of channels may also aggrevate ship movement impacts depending on local conditions and the nature of the project.

- The selective use of dredged material might help to dissipate some of the energy of passing vessels, via small subsurface features. Selective placement of dredged material also may help to limit near shore sediment transport and release into the channel.

- Shoreline Protection - A number of shoreline protection methods have been used to help alleviate ship-induced shoreline effects, the major ones are:

  (a) Gabion Shoreline Protection - Gabions are wire baskets filled with rocks and wired together to form a wall or a lining. Gabions are stable on steep slopes. They have low maintenance requirements and a long life in the absence of destructive forces.

  There are some disadvantages to gabions as well. Gabion tear resistance may not be high enough to withstand heavy ice movement during the spring ice break-up. Also they can be expensive to install.

  (b) Rip-Rap Shoreline Protection - Rip-rapping involves the realignment of shoreline by selective filling and armament with stone or concrete. Where proper shoreline conditions exist, rip-rap is an economical way of checking shoreline erosion. It also provides good wave energy dissipation.

  However, rip-rap needs a shelf to rest on and in many areas the existing shoreline slopes are too steep to place rip-rap upon. Also, the maintenance requirements of rip-rap protection are very high.

  (c) Sheet Pile Shore Protection - Anchored bulkheads constructed of flexible steel sheet piles restrained by tiebacks are often used to protect a shoreline. They have a long expected life, have small maintenance requirements, are aesthetically consistent, and provide recreational access for fishing and boating.

  The major drawback of anchored bulkheads is the high cost for materials and installation.

  (d) Vegetation - Establishment of vegetative plantings is often the most inexpensive, effective and environmentally sound technique for protection of shoreline. The major drawback to vegetative stabilization can be difficulty of establishing and retaining vegetative cover.

(2) Discharge Impacts

- Pumping noxious bilge waste into onshore recepticles, as required by law will eliminate discharge impacts.

- Separating noxious from nonnoxious bilge waste prior to pumping of bilge, can reduce the effects of overboard discharge.

(B) Mitigation Techniques for Dredging

- Schedule dredging operations to avoid environmental impacts during periods which appear to be susceptible to stress (i.e. fish spawning seasons)

- Scheduling dredging operations to avoid recreational impacts. For instance, dredging in the fall when recreational boating activities have subsided below summer levels.

- Simple equipment maintenance and efficient operation can improve the sediment removal efficiency and reduce turbidity in surrounding waters.

- Develop guidelines for use of floating turbidity curtains (diapers) to help reduce turbidity. Turbidity curtains are effective in still water, but will be ineffective in areas where currents exceed 1 knot.

- Use of a different type of dredge, (mechanical or suction-mechanical) can at times reduce overall turbidity.

- Specific on-site evaluations should be made on a case-by-case basis, taking into consideration all of the environmental impacts (physical, chemical, and biological).

- Bucket dredges, hopper dredge, bottom-dump scows, and pipelines should be well maintained to reduce material losses.

- Operating practices and maintenance standards for delivery machinery should be established to ameliorate potential impacts.

(C) Mitigation Techniques for Dredged Material Disposal

- Evaluation of dredged material disposal options - all practical alternatives to the discharge of materials to the waters of the Great Lakes should be considered.

- If a confined disposal site is to be constructed it must be designed, built, and operated in such a way as to achieve maximum effective capacity and satisfactory effluent quality. For example, surface trenching has proved to be a cheap and effective way of providing natural drainage.

- The regulated discharge of disposal area effluent through a natural marsh can be effective in removing nutrients.

- Dredge material (particularly dewatered dredge material) has value for land filling or in construction. Use of dredge material for road construction and dike raising should not be overlooked when considering alternatives.

- Wetland vegetation, soils, and hydrology should not be altered by dredging or filling in order to insure that the water retention, and ecologically productive functions of the wetlands will not be diminished.

- Dredge spoils can be treated with flocculents to reduce the time it takes for sediments to settle. This treatment also will minimize the release of pollutants absorbed by the sediments.

For a site specific review of dredge disposal operations the following elements should be looked at.

- Evaluate existing information - an overview of past dredging and disposal activities, sediment quality history, and known environmental sensitivities of the area should be of assistance in identifying disposal options.

- Physical characterization of sediments - the physical characteristics of a sediment provide an identification of the potential for chemical contamination and assist in the identification of possible uses of the dredged material. (i.e. beach nourishment).

- Chemical characterization of sediments - the chemical characteristics of the sediment when compared to open lake bottom conditions provide a relative indication of sediment quality, and the potential for the dredged material to degrade the substrate at an open lake disposal site.

- Bioassessment of sediments - to determine the effects of dredging and dredge disposal on biota. This would involve exposure of specified aquatic organisms to sediments and measuring lethal (acute toxicity) and sublethal (reproductive impairment) responses.

(D) Mitigation Techniques for Construction Related Impacts

- Dust control implementation. Spray critical construction areas and temporary roadways to help keep dust levels low.

- Carefully manipulate drainage from the site. Use of impoundments will help remove suspended solids introduced by erosion from construction areas.

- Construction impact on vegetation and associated wildlife will be minimized by proper selection of construction areas, replanting selected trees, and by new planting of native plant species affected by construction.

- Rapid stabilization of disturbed areas will help reduce dust and erosion problems. For instance, the disturbance caused by construction of a proposed coal facility could be rectified by sodding, or by importing topsoil and reseeding (fast cover crop such as rye grass). Such action would reduce the environmental impact of construction and would serve to stabilize the soil.

Also, trees could be planted to restore the attractiveness of the area.

- Transplanting trees from construction areas to other areas will help screen the area by reducing dust and noise. Also, limiting off-road vehicular traffic will help prevent needless destruction of vegetation in non-construction areas.

- Locating the structures in areas where vegetation is in early or mid-successional stages (fields and young wood-lots) will help hasten the natural revegetation process.

- Reduce the area for equipment laydown and access roads to lessen the impact on wildlife.

- Actively manage the area for wildlife. For instance, stationary equipment can create increased roosting and nesting sites for gulls, pigeons, and swallows.

- Reclaiming disturbed areas with wildlife in mind. Planting food plants, establishing water holes, and creating nesting sites will help keep wildlife in the area.

- Sound levels during construction activities should be monitored to determine the effects of noise from construction activities, and to identify and control noise from those activities which may significantly affect sound levels.

(E) Mitigation Techniques for On-Site Handling Related Impacts

- Receiving Bins - receiving bins should be designed with a semicircular backstop to help prevent coal spillage from the bin into the waterway, and to help prevent the wind from blowing coal dust out of the bin.

- Conveyor System - the main conveyors should be completely enclosed to reduce dust being blown into the atmosphere. Also, conveyor to conveyor transfer points should be enclosed. Any dust generated during transfer will be ventillated to baghouse dust collectors.

- Unloading Bins - Emissions should be controlled at the bottom with sprays or a dust collector with bags. Scrubbers are sometimes used. Enclosure of the bin on three sides and with a sloping roof will contain the dust in many cases. If supplemental control is required, curtains can be hung to partially close the opening when a truck is dumping. A dust collector (baghouse collector) can then be used. Sprays do not function well at bin locations because the areas are large and the dust generation is violent and intermittent.

- Loading Stations -use of a loadout chute can prevent large amounts of dust and spillage when coal is transferred to cars in high volumes. The chute is a large, vertical, telescopic device that travels to the car bottom with each car, raises with the coal as the car is loaded, stops and crowns the car, stops the flow of coal as cars are changed, and repeats the cycle. This helps prevent the escape of dust because the chute remains in contact with the coal in each car during loading.

- Rotary Car Dump - to mitigate impacts from the rotary car dump, the operation should be enclosed in a building, and dust emissions should be ventilated to baghouse collectors.

- Stacker/Reclaimer - fugitive dust emissions generated during the stacking and reclaiming operations should be ventilated to a baghouse collector or controlled by spraying.

- Dust Control System - the major dust control solution should be through spraying, and should be applied through spray headers at four transfer points where dust generation is most likely to occur. These are: (a) the top of the receiving bin, (b) receiving bin to conveyor, (c) conveyor to radial stacker, (d) head pulley radial stacker (transfer house).

- Noise - sound levels during facility operation should be measured and documented to insure that State, Federal, or local guidelines have been met.

- Vegetation - precautions designed to minimize spillage of coal will assist in minimizing adverse effects on vegetation.

(F) Mitigation Techniques for Storage Related Impacts

Methods for control of dust from coal storage piles are limited in effect or are very expensive. However, there are a number of methods that will at least partially alleviate the impact of dust from a coal storage pile.

- As a minimum, coal piles should be capped with larger sized coal to prevent the loss of fines due to wind.

- Bituminous coal should be tightly packed to prevent fires (spontaneous combustion).

- Some installations use concrete silos, which hold up to 10,000 tons and control dust effectively.

- An earthen impoundment can help to contain and control coal dust from a coal pile.

- All semi-permanent storage capacity should be established on the periphery of the storage pile. The exterior face should then be treated for aesthetic considerations. The peripheral reserve storage will act as a windbreak completely surrounding the storage pile.

- The effects of grooming of the coal pile by large bulldozers should be closely examined. All dozers should be equipped with wet suppression systems.

- The design of the fans on bulldozers should be changed to minimize the blowing of coal dust into the air.

- Spraying techniques should be used on all active portions of the pile. A major portion of these particulates can be controlled by water sprays.

- Settling basins should be used to mitigate the adverse impacts of runoff.

(G) Mitigation Techniques for Transportation Related Impacts

(1) General

- For controlling wind losses of coal dust, wind guards (30 cm high) are partially effective for uncovered trucks or rail cars.

- Coal should be wet down before transport. Washed coal retains much of its moisture, which aids in reducing wind losses.

- Sealing the surface of each load of coal with a latex-polymer or an asphalt emulsion has been effective in reducing wind losses. Also dustproofing the coal with oil or calcium chloride is a common practice. Application of dust suppressants is most efficient while the coal is in the air, as during loading. The use of properly designed hoods will help prevent waste of the dustproofing materials.

- Organic sealants help reduce wind losses but not spillage. Proper covering is the only way to contain the coal totally during transit.

- Revegetation of reclaimed areas should be done as soon as possible.

(2) Rail

- Mufflers on the exhause system can greatly reduce the noise from diesel locomotives. In addition, modified casing with acoustical absorbent material around the engine can successfully reduce overall engine noise. The use of continuous welded rail can achieve noise reductions greater than 5 decibels. It may be possible to incorporate this type of rail for use in urban areas. Otherwise, proper maintenance of the rail and bed will keep noise from this source sufficiently.

- Locomotives should be equipped with the latest designs in spark retention arrestors and non-sparking brake shoes. Control of fires will reduct the amount of wildlife habitat and vegetation destroyed by rail transport.

- Chemicals are used on rights-of-way to control the growth of vegetation for both safety and aesthetic reasons. Control of weeds and brush improves visibility, reduces fire hazards, and provides for a safer working enviornment. The chemicals that are used, should be effective in controlling vegetation, but also nontoxic and nonpersistent.

- Abandonment - a few abandoned rail beds have been turned over to the public as paths for hiking or bicycling, where this cannot be done the right-of-way is often graded and revegetated to encourage reestablishment of native flora and fauna

(3) Truck

- During construction of the roads, topsoil should be saved and banks seeded. Culverts will be needed wherever the road crosses natural surface drainage channels. Settling basins (sediment traps) should be constructed downstream from the culvert crossing, the collect material that may wash from the haul road.

- Watering the roads throughout the work day with truck mounted spray equipment will help reduce wind blown dust.

- Better designed trucks with covered aluminum bodies would help reduce wind loss and spillage. Spillage and dust will remain a problem with older uncovered trucks. One solution would be to use removable tarpaulin covers.

- Noise reduction - emphasis should be placed on reducing noise at the source rather than on the use of shields or covers as secondary noise - reduction devises. However, enging covers and pannels have proved to be the most successful short-term approach to reducing noise.

- Mufflers have been effective in reducing noise levels. and research on new types of mufflers is being conducted in an effort to reduct noise even further. Possible innovations include placing a resonator close to the exhaust manifold, exhaust pipe wraps, and double wall or laminated exhaust pipes.

- Road damage - forbid operations of coal trucks on roads not designed for their use. Assess a tonnage tax for use of country roads. Put an export tax on coal.

- Assess a ton/mile tax specifically for the coal handler. More permanent haul and access roads should be paved to reduce dust.

- Abandomment - abandoned roads must be reclaimed in a manner that will minimize erosion and encourage the reestablishment of native vegetation and wildlife habitat. Reclamation includes shaping the roadway, adding topsoil as needed, and seeding the surface.

(4) Community Effects

- With regard to the nuisance aspect of truck transportation, public education about the role of coal in the local economy and their well-being can minimize the degree of inconvenience felt by the public.

- Public safety can be enhanced by posting signs indicating which roads are haul routes, cautioning the public to heavy traffic.

- Delivery and dispersal of traffic to and from the transshipment facility can be improved by constructing a new highway interchange which is usually connected with the interstate highway system. This measure would reduce the level of community disruption by routing traffic through the outskirts of the community.

- An additional travel lane can be used at key locations to reduce traffic congestion during peak traffic hours. This can be accomplished by constructing a new lane, or through the reversible land concept. The latter method varies the number of usable travel lands in each direction according to demand (e.g., morning rush hour--three lanes inbound, one outbound). This method is less expensive to build and maintain than additional traffic lanes.

- Communities anticipating increased rail shipment of coal should evaluate the existing rail infrastructure and provide adequate warning equipment at crossings. Switching operations should be updated to eliminate unnecessary delays at crossings that have no trains approaching.

- To the extent feasible, the community should attempt to acquire scheduling commitments with the railroads in order to establish a predictable ro consistent train schedule.

- Railyards and transshipment facilities should incorporate a buffer zone using natural vegetation to reduce adverse aesthetic effects.

- Alternative emergency routes should be planned for communities interrupted by frequent train transportation. The affected community should look into the possibility of using the emergency services of neighboring communities when delays at crossings threaten emergency service delivery.

- When feasible, new rail lines or spur lines should be routed through the outskirts of the community to avoid community disruption.

(H) Mitigation Techniques for Encouraging Desired Economic Growth

- Local governments could work together to encourage growth in areas beneficial to the area as a whole. Increased public revenue could be directed to that end. Industrial parks, downtown renewal, and residential street construction are all activities that could encourage development in desirable areas. Strong land use controls and agricultural loan programs could retain existing land use where it is desired by threatened.

- In cases where required community investments overwhelm local revenues, local governments may wish to consider tax based sharing in the personal, property, and utility classifications, with other communities, or assistance under the Coastal Energy Impact Program.

(I) Mitigation Techniques for Encouraging Employment

- Manpower programs should be organized or expanded to provide technical and practical training for local residents in the areas where labor shortages are expected.

- When economically and practically feasible, phased construction should be instituted to reduce the problems associated with dramatic employment fluctuations.

- Job openings should be advertised locally prior to start-up.

- During the process of evaluating a new transshipment or unloading facility proposal efforts should be made to establish a target level of desired local employment and to identify requirements for non-local labor force.

(J) Mitigation Techniques for Reducing Housing Fluctuations

- Housing relocation problems for in-migrating workers can be minimized by increasing the construction worker's knowledge of available housing. Information on housing can be disturbed to workers through the construction company office or at the construction site. Housing assistance services can be coordinated through the area Board of Realtors.

- The progress of the construction and the state of the housing market should be closely monitored by local planning and community development agencies so that changes in variables such as the size of the construction force, the local/nonlocal workforce composition, the number of in-migrating families, etc., can be accomodated.

- The area planning commission and housing referral services should coordinate efforts to provide housing assistance to low income and fixed income families.

(K) Mitigation Techniques for Asssisting Local Government Administration

Revenues from existing tax structures generally do not cover the costs of furnishing necessary services in a timely manner. Options to generate funds include:

- Advance payments of future taxes, however these may not be readily repayable bby the municipalities in the future.

- New taxes or state legislation relating revenue transfers to community patters.

- Subsidies from commercial companies or real estate developers.

- Federal subisdies in the form of special revenue sharing, or funds appropriated to facility development for energy sources. In particular, coastal energy impact program funds might be used to help communities plan for meeting demands resulting from construction and operation of a coal unloading or transshipment facility.

APPENDIX I

REVIEW OF MICHIGAN AND FEDERAL POLICIES

INTRODUCTION

This appendix reviews Michigan and Federal policies applicable to the demand for, transportation of, and construction of facilities to transport coal. Each policy area contains an overview of major legislation and programs and an evaluation of the effectiveness or actual impact of these policies on coal transshipment related issues. A summary table (Table I-1) at the beginning of this appendix lists all major legislation, its legal citation, and a short description of each piece of legislation.

TABLE I-1

MAJOR LEGISLATION APPLICABLE TO COAL SUPPLY AND DEMAND, TRANSPORTATION, HANDLING, AND FACILITY DEVELOPMENT

FEDERAL LEGISLATION
(*Discussed in greater depth in following sections)

Legislation	Brief Description
• *Energy Supply and Environmental Coordination Act of 1974 P.L. 93-139	• First Federal attempt at legislating coal conversion of powerplants and major fuel burning installations.
• *Powerplant and Industrial Fuel Use Act of 1978 P.L. 95-620	• Expanded provisions of ESECA, placed the burden of proving inability to comply on facility owner.
• *Federal Coal Leasing Amendments Act of 1975 P.L. 94-377	• Sought to discourage speculation by making it more difficult to obtain and cheaply hold leases to coal lands.
• Energy Reorganization Act of 1974 P.L. 93-438	• ERDA required to ensure the environmental acceptability of the energy technologies under development.
• *Energy Tax Act of 1978 P.L. 95-618	• Most importantly, contains provisions concerning tax credits, possibly affecting coal demand
• *Ports and Waterways Safety Act of 1972 P.L. 92-340	• Attempts to prevent damage to structures in, on, or immediately adjacent to the navigable waters of the United States or the resources within these waters.
• *Noise Control Act of 1972 P.L. 92-574	• To protect health and welfare ambient noise levels are recommended; they may become standards for facilities regulated by state and local governments.
• *Railroad Revitalization and Regulatory Reform Act of 1976 P.L. 94-210	• Mandates the establishment of a rail bank, consisting of rail track and other properties, for the purpose of preserving existing services in certain areas of the U.S. in which fossil fuels and other natural resources are located.

Legislation	Brief Description
• Local Rail Service Assistance Act of 1978 P.L. 95-607	• Separate federal program for fossil fuel movements eliminated. Federal assistance funds can still be used to acquire rights of way for the preservation of existing and development of further rail service. Fossil fuel service is now only one of the criteria used in determining whether a state is to receive federal funds for acquisition of subsidy.
• *Clean Air Act as Amended P.L. 91-604 as amended by P.L. 92-157 P.L. 93-15 P.L. 93-319 P.L. 95-95	• Ambient air quality standards have been set for SO_2, TSO, NO_2, CO, HC, and O_x; more are being considered. • New Source Performance Standards (NSPS) apply to coal-fired boilers and regulate SO_2, NO_x and particulates. Lower emission levels are being considered, as are regulations for small particulates. Stricter standards specific to FBC may be established. • Standards for hazardous air pollutants regulate mercury, beryllium, and asbestos. • NSPS and regulations for the prevention of significant deterioration may affect plant siting. • Best Available Control Technology (BACT) may be required when locating in "clean" regions. BACT will be determined on a case-by-case basis. • Lowest Achievable Emission Rates (LAER) may be required when locating in non-attainment regions.+
• *Coastal Zone Management Act of 1972 P.L. 92-583 as amended by P.L. 94-370	• State coastal zone management plans developed with federal financial assistance may affect plant siting and design.+
• *Marine Protection, Research and Sanctuaries Act of 1972 P.L. 92-532	• Permits are required for activities in wetland areas, which may restrict facility siting.+

Legislation	Brief Description
• *Rivers and Harbors Act 33 U.S.C. 401-413	• Permits are required for dredge and fill activities in navigable waters, which may affect facilities siting. • Projects must be integrated with flood control, river, and dam projects.+
• *Federal Water Pollution Control Act Amendments of 1972 P.L. 92-500	• National Pollutant Discharge Elimination System (NPDES) permits are required to control wastewater discharges. • Since effluent guidelines have not been developed for most fossil energy technologies, permit requirements are determined on a case-by-case basis to meet state plans. • A "No Discharge" goal has been set for 1985.+ • Significant non-point source water pollution sources must be controlled under Section 208 planning provisions.
• *National Environmental Policy Act of 1969 (NEPA) P.L. 91-190	• Environmental Impact Statements (EIS's) must be prepared for all major federal actions significantly affecting the quality of the human environment. Environmental Impact Assessments (EIA's) usually done to determine which actions require EIS's.+
• Nonnuclear Energy Research and Development Act of 1974 (Section 13) P.L. 93-577	• Water availability assessments are required for commercial plants and demonstration plants which may have a significant impact on water availability. Assessments are done by Water Resources Council (WRC).+
• Resource Conservation and Recovery Act of 1976 P.L. 89-272	• Solid waste disposal must comply with most stringent air and water standards; monitoring is required. • New regulations will be developed in 1-2 years for a federal hazardous waste handling permit system and state programs for non-hazardous solid wastes.+

Legislation	Brief Description
• National Historic Preservation Act of 1966 P.L. 89-665	• Federally financed, assisted, or permitted projects cannot impact important historic or cultural sites unless no alternatives exist.+
• Endangered Species Act P.L. 93-205	• Identification of endangered aquatic and terrestrial species at a potential construction site is required, which may affect facility siting.+
• *Fish and Wildlife Coordination Act P.L. 85-624	• Any project requiring modification of bodies of water must be reviewed to prevent loss or damage to fish and wildlife.+
• Wild and Scenic Rivers Act P.L. 90-542	• Projects may not degrade the quality of wild and scenic rivers.+

NOTE:

+ indicates that the description of the legislation presented was provided by:

Environmental Development Plan (EDP)
Coal Gassification Program (March, 1978)
Direct Combustion Program (March, 1978)
Coal Liquefaction Program (March, 1978)
U.S. Department of Energy

STATE LEGISLATION

(all discussed in greater depth in the following sections)

Legislation	Brief Description
• Michigan Vehicle Code P.A. 300 of 1949 as amended by House Bill 5675 of 1980 (act number assignment pending)	• Regulations evolved pursuant to this act related to truck weight restrictions.
• Vehicle Noise Control Act P.L. 300 of 1949 as amended by Acts 73 and 492 of 1978 (Part of Michigan Vehicle Code)	• Enacts state noise standards identical to federal regulations, thereby broadening noise control coverage.
• P.A. 198 of 1873 as amended by P.A. 239 of 1966	• Deals with regulation of the allowable duration of rail crossing blockage.
• Michigan Environmental Protection Act of 1970 P.A. 127 of 1970	• Provides litigation guidelines for cases dealing with the state's air, water, and other natural resources; and mandates the consideration of environmental factors in administrative decisionmaking.
• Soil Erosion and Sedimentation Act P.A. 347 of 1972	• Regulates, by permit, development which involves earth changes in certain areas.
• Great Lakes Submerged Lands Act P.A. 247 of 1955	• Regulates, by permit, the use, filling, or sale of submerged lands within state boundaries.
• Inland Lakes and Streams Act P.A. 346 of 1972	• Regulates, by permit, activities including the dredging or filling of bottomland, placement of structures, construction of artificial waterways, and structural interference with the natural flow of an inland lake or stream.
• Geomaere-Anderson Wetland Protection Act P.A. 203 of 1979	• Regulates, by permit, alterations of wetlands, including drainage of surface water, construction, dredging and filling.

(THE PRECEDING THREE ACTS DIFFER PRIMARILY IN AREA OF APPLICABILITY)

Legislation	Brief Description
• Shorelands Protection and Management Act P.A. 245 of 1970	• Regulates land uses and developments within (1) environmental areas, (2) areas prone to high risk erosion, (3) areas within the 100-year floodplain.
• Natural River Act P.A. 321 of 1970	• Provides for designation as Natural River Area for the purpose of preserving historic, aesthetic, ecological, and recreational values.
• City and Village Zoning Act P.A. 207 of 1921 as amended most recently by P.A. 638 of 1978	• Provides for the regulation and restriction of land use and structures by city or village legislative bodies.

NOTE: Only state and federal <u>legislation</u> is included in these tables, Discussion of other policies and programs <u>are</u> included in following sections.

ENERGY POLICY AND COAL

As coal demand in the Great Lakes region will clearly be one of the most important determinants of future movement levels, recent United States energy policy may exert considerable influence on coal transshipment in Michigan's coastal zone. Policy approaches, such as legislating coal conversions in utility and industrial boilers, are direct inducements to coal demand increases. Less direct approaches, such as legislation dealing with coal lands leasing or curtailments and taxes affecting the desirablility of other fuels relative to coal, also may affect coal deman. This section identifies and evaluates both legislation for direct coal conversion and policy related to coal demand in a less direct way.

COAL CONVERSION LEGISLATION

The Energy Supply and Environmental Coordination Act of 1974

The Energy Supply and Environmental Coordination Act of 1974 was the first federal administration of a coal conversion program (P.L. 93-139). Under this act the Federal Energy Administrator was authorized to prohibit any power plant or major fuel burning installation from burning natural gas or petroleum products as its primary energy source if he/she determined that the installation had the capability and necessary plant equipment to burn coal (Section 2, Subsection [a]). Prohibitions of this type could only be made pursuant to the requirements of subsection (b) which included;

- that coal and coal transportation facilities would be available while the order is in effect (subsection [b][1])
- that service reliability would not be impaired (subsection [b][1])
- that environmental regulations did not preclude coal use 9(subsection [b][2]).

The. Act also empowered the Federal Energy Administrator to require any power plant in the early planning stage to be designed and constructed so as to be capable of using coal as its primary energy source unless this would result in an impairment of service or an adequate supply of coal was not expected to be available. Consideration was also to be given to the ability of the owner to recover any investment made as a result of a requirement imposed under this subsection (subsection (c)).

Amendments to Title I of the Clean Air Act were also contained within the Energy Supply and Environmental Coordination Act (Section 3). Most importantly, this section outlines the procedure for issuing emission standards compliance date extensions for facilities which were prohibited from using petroleum products or natural gas by an order from the Energy Administrator under section 2 of the ESECA. This provision allows a grace period for the owner of a facility being forced to convert to coal to obtain and install any necessary equipment needed to comply with emission standards, though he/she must somehow comply with all primary standards during the extension period (e.g., by adjusting level of production). Finally, the Clean Air Act was further amended by requiring the Administrator of the

Environmental Protection Agency to review each state's implementation plan and report to the states on whether the plans should be revised in light of coal conversion orders (Section 4).

The Powerplant and Industrial Fuel Use Act of 1978

The federal coal conversion program which ws initiated under the Energy Supply and Environmental Coordination Act was modified and expanded by the Powerplant and Industrial Fuel Use Act of 1978 (P.L. 95-620). Provisions of this act include:

- prohibition against use of oil or natural gas in new electric facilities or in new industrial boilers without DOE exemption (Section 201).
- restrictions requiring existing coal capable facilities to use coal and to require non-coal capable units to use coal-oil mixtures (Section 301).
- limitation of natural gas use by existing utility powerplants to the proportion of total fuel used during 1974-1976, and a requirement that there by no switches from oil to gas. Complete ban on gas in these facilities by 1990 (Section 401).

Under this law, new facilities may not legally burn oil or gas as a primary energy source and existing facilities may not use natural gas after 1990. Exemptions are provided to facility operators who can demonstrate that they cannot comply with oil or gas prohibitions due to:

- environmental regulations
- site-specific limitations, such as space for handling equipment or waste disposal
- system reliabiity impairment
- the cost of using coal substantially exceeding the cost of using imported oil. (Department of Energy, 1978).

Other provisions of this Act include temporary "public interest" exemptions when using oil or natural gas serves the public interest and allowances of oil and gas fired boilers, in some cases, in peak load generating facilities (DOE, 1978).

Evaluation

The federal coal conversion program initiated in 1974 appears at first glance to provide the tools necessary to dramatically increase coal use and therefore demand, in the coming years. The effectiveness of the program however, is disputed within both the public and private sectors, and the level of actual conversions occurring pursuant to the provisions of the Energy Supply and Environmental Coordination Act of 1974 (ESECA) and/or the Powerplant and Industrial Fuel Use Act (PIFUA) of 1978 does not appear to be compatible with the energy goals of the Carter Administration.

With the exception of non-finalized conversion orders issued under the ESECA, the Powerplant Act of 1978 has generally preempted all federal coal conversion authority. The provisions of the PIFUA, intended to strenghten the regulatory program under ESECA, have, however, been subject to numerous temporary and permanent exceptions, and have not caused a notable increase in actual conversion of previously non-coal burning utilities and industries. Representatives of the National Coal Association, both in personal conversions and in their Third Annual Report to the President, have indicated dissatisfaction with the current coal conversion policy of the federal government.[1] The association feels that exemptions from the PIFUA requirements, such as those issued by the DOE subject to "the public interest," are serving to permit the use of natural gas as a boiler fuel even in cases where coal could be used. Other impediments to coal conversion identified by this group include air quality and other environmental requirements and delays in granting government approvals for conversion.

The congress has also expressed concern that the PIFUA is not forcing coal conversion at an acceptable rate. The proposed Powerplant Fuels Conservation Act, in actuality an amendment to the PIFUA, would create several provisions which are more forceful than those in past statutes. Though this act has not yet become law, it would mandate the conversion of some eighty powerplants and does not contain further pollution control measures, such as those suggested as necessary to deal with acid rain problems. The proposed amendments also would provide federal assistance to plants forced to convert to financially aid in the conversion.[2]

The consensus seems to be that, although current policy may be increasing coal demand through regulation of new powerplant and industrial boilers, the conversion of existing facilities is not being forced by federal policy. The demand of coal, and therefore the amount of coal moved through the Michigan coastal zone, will probably depend on the success of strenghtening amendments to the PIFUA. Unless such amendments are passed, or current legislation is made workable in some other way, the increase in coal demand in this area may not be as large as has otherwise been projected.

[1] Personal Contact:

6/25/80 Counsel for Regulatory Affairs Office
National Coal Association
Washington, D.C.

Publication:

Increasing the Contribution of U.S. Coal In Supplying The Nations Energy Requirements, Third Annual Report of the National Coal Assocation, May 1980.

[2] Personal Contact:

Democratic Policy
Staff of Senator Robert Byrd
Washington, D.C.

OTHER ENERGY LEGISLATION

The Federal Coal Leasing Amendments Act of 1976

The Federal Coal Leasing Amendments Act (30 USC subsection 193(a)) was passed in 1976 to address deficiences in the Mineral Leasing Act of 1920. These amendments sought to discourage speculation by making it more difficult to obtain and cheaply hold leases to coal lands (OTA, 1979). Consequently, several of the provisions have the potential for affecting the availablity of coal by imposing economic and environmental constraints on the coal mining industry.

Provisions of the Act relating to obtaining and holding coal land included:

- that no less than fifty percent of all lands leased must be leased under a system of deferred bonus payment, thereby making it easier for small companies to compete (subsection 201(a)).
- that bids for land shall not be accepted for less than the fair market value of the coal subject to the lease (subsection 201(a)),
- that leases must be developed within ten years of issuance or be terminated (subsection 201(a)(2)(A)).

Sections containing what could be called "environemntal provisions" were included, and sought to address both natural and social environmental impacts. These included:

- that comprehensive land use plans are to be developed by the Secretary of the Interior, taking into consideration proposed coal development in these lands (subsection 201(3)(A)(i)),
- that environmental and community interests are examined and considered in issuing exploration license and leases (subsection 291(a)(c) and 201(b)(1)-(4)), and
- that each coal lease shall contain provisions requiring compliance with the Federal Water Pollution Control Act (subsection 201(a)(E)).

Evaluation

The FCLA can be, and are, perceived in different ways by different interst groups. Environmentalists may feel that these amendments protect against detrimental aspects of activities such as strip or surface mining, while coal industry representatives contacted during this study expressed dissatisfaction with the Act. Coal mining company representatives, though largely reluctant to comment on federal regulations, seem to generally agree that federal leasing policy impedes coal land development on government property.[1] It should be noted, however, that many federally owned coal lands are in the western part of the United States, and federal leasing constraints may not significantly affect the levels of coal movement through the Great Lakes basin unless western coal begins to play a larger role in the supply for this region.

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1. Specific company comments included:
   - that the requirement for land development within ten years of lease issuance is unrealistic due to the extensive administrative processes which often must be contended with before development can occur.
   - that environmetnal requirements are often unrealistic and used by certain interests to block coal land development.
   - that Federal Water Pollution Control Act provisions require large expenses in terms of time and money, and are sometimes unnecessary, at least to the degree that they are often employed.
   - that the current procedure used by the Interior Department for determining "fair market value" of coal lands results in unrealistically high minimum bids, and causes the bypassing of some federal coal.

The Energy Tax Act of 1978 and The Natural Gas Policy Act of 1978

The Energy Tax Act and Natural Gas Policy Act, both parts of the National Energy Act of 1978, contain provisions which may indirectly affect the demand for coal by industrial users. By provisions which will alter the economic desirability of coal relative to other fuels, conversion may be encouraged. Specifically, the Energy Tax Act provides for Business Energy Tax Credits (Section 391) and the Denial of Tax Benefits for New Oil and Gas Fired Boilers (Section 301); while the Natural Gas Policy Act provides for the deregulation of some natural gas (Section 121), incremental pricing of natural gas (Section 301), and emergency authority for the President with respect to natural gas allocation (Section 301).

The Energy Tax Act

A. Business Energy Tax Credits Section 301(a)-(c) provides business tax credits for industrial investment in alternative energy equipment (coal boilers and other supplemental equipment would be included)

B. Denial of Tax Benefits for New Oil and Gas Fired Boilers - Section 301(d)(2) denies investment tax credit for certain property including boilers fueled by oil or gas unless coal use is precluded by air pollution regulations. Denial of rapid depreciation of boilers fueled by oil or gas is provided for in Section 301(d)(3).

Both these provisiosn of the Energy Tax Act could provide incentives to convert to coal while making expanded oil or gas capacity financially undesirable with respect to tax credits.

The Natural Gas Policy Act

A. Deregulation of Some Natural Gas - Section 121 lifts price controls on new natural gas and some interstate gas as of January 1985. All gas prices will not be deregulated; however, those that are will undoubtedly go up, making natural gas a less attractive fuel.

B. Incremental Pricing - This program, described in Section 201 of the Act, endeavors to protect residential users of natural gas by passing increased prices along to industrial users. The incremental price of gas to industrial users would be the new deregulated gas price plus transportation margins.

C. Emergency Authority - Under Section 301 of the Act, the President may declare a natural gas supply emergency and may allocate certain suplies of natural gas during such an emergency to "high priority" users. The group of high priority users would include those involved in maintaining health or physical property and those of residential or small commercial nature. Under such authority, the President may choose not to allocate gas for use in certain gas boilers.

Evaluation

The Natural Gas Policy Act clearly contain implications for the desirability of gas relative to other fuels such as coal. The deregulation of gas prices, incremental pricing of future industrial purchases, and the prospect of presidential curtailment of supplies for certain users may contribute to a decreased industrial demand for gas, perhaps resulting in increased coal demand.

The Energy Tax Act and Natural Gas Policy Act are both recognized as potentially useful in increasing coal demand. The ETA is a useful framework for providing coal conversion incentives and disincentives for gas or oil use, however regulations have not yet been issued pursuent to the provisions to this act. This fact has so far impeded the effects of the act, as which organizations would qualify for benefits under this legislation remains uncertain, and investments based on expected benefits remain tenuous.

The NGPA has somewhat increased the attractiveness of coal with respect to other fuels. Gas however, is still being deregulated at a slower rate than oil, and remains attractive in many sectors. Despite both this act and the incentives of the Energy Tax Act, coal remains a demand-constrained commodity. The long term effects of this legislation on coal demand in our region still seem uncertain, and in the short term these acts do not appear to have the potential of effectively administered direct conversion legislation such as the Powerplant and Industrial Fuel Use Act.

TRANSPORTATION LAWS AND PROGRAMS

The three modes of coal transportation whose impacts are considered here in terms of state and federal policy are waterborne transport, rail transport, and truck transport. The most convenient distinction to be made among these three modes is clearly that of water versus on-land movement. Many impacts of coal transportation through the coastal zone by vessel are unique to this mode, while rail and truck transport share some common impacts. As a result of this distinction, policy to mitigate vessel impacts is often unrelated to programs for the other two modes, and is generally federally administered. On the other hand, many impacts of truck and rail movement of coal are similar, such as noise and fugitive dust generation, and are often dealt with by comprehensive federal and state programs, as well as by mode-specific policies. This section identifies and evaluates the applicability, effectiveness, and range the coverage federal and state policy for dealing with the impacts of coal transportation.

COAL TRANSPORT BY WATER

Environmental impacts of the waterborne transport of coal are primarily of two types: movement impacts and discharge impacts. Movement impacts include land impacts such as shore erosion, impacts resulting from the resuspension of particulates, and structural damage to onshore facilities. The characteristics of ship operation which most directly determine these impacts are vessel speed and nearness of the operation to the shoreline.

With respect to discharge impacts, bilge discharge would probably be most important. Coal vessels do not store their cargo in ballast compartments, so coal dust would not be expelled with ballast discharge. Coal dust may however find its way into the bilges of ships and could, if expelled have an uncertain effect on the marine environment.

Vessel Movement

In the Ports and Waterways Safety Act of 1978 Congress declares that navigation, vessel safety and protection of the marine environment are matters of national importance, and attempts to provide the necessary legislative tools to prevent damage to structures in, on, or immediately adjacent to the navigable waters of the United States or the resources within these waters (33 USC Subsection 1221 [a] and [c][2]). The act also acknowledges that advanced planning is critical in determining proper and adequate protective measures for the nation's ports, waterways, and general marine environment, and recognizes the necessity of continuing consultation among the federal and state governments affected users, and the general public (33 USC Subsection 1221 [d]).

Due to the current assignment of the United States Coast Guard to the U.S. Department of Transportation, the Secretary of Transportation is invested with certain powers and responsibilities under the Ports and Waterways Safety Act. In pursuit of the policy goals set forth in Subsection 1221 of the act, the Secretary may, among other things:

- enact such measures necessary for protecting navigation and the marine environment, including the establishment of routing systems.

- establish vessel size, speed, draft limitations and vessel operating conditions.

  (33 USC Subsection 1223[a])

These broad powers enable the Secretary to establish rules and regulations to protect the waters and coastline of the Great Lakes. To mitigate coal vessel impacts, the Secretary can create rules concerning shore proximity (routing systems), speed, and other vessel operating conditions which influence movement impacts. Water quality impacts, or discharge related impacts, may also be controlled by the Secretary under his board mandate to "Protect the marine environment".

With respect to possible structural damage from vessel operation within the coastal zone, the Act gives the Secretary of Transportation the power to:

(1) prevent damage to, or the destruction of, any bridge or other structure on or in the navigable waters of the United States, or any land structure or shore immediately adjacent to such waters; and

(2) protect the navigable waters and the resources therein from harm resulting from vessel or structure damage, destruction, or loss.

Action taken to prevent such damage may include but is not limited to such measures as establishing water or waterfront safety zones or other measures for limited or controlled access or activity to protect any vessel, structure, waters, or shore area. (33 USC Subsection 1225[a]).

Regulations promulgated by the Secretary of Transportation to implement the Ports and Waterways Safety Act are authorized under Section 1231 and may be found in Title 33 of the Code of Federal Regulations. (33 USC Subsection 1231[a]).

Title 33 of the CFR contains regulations relating in a general way to navigation safety, and enforcement authority. By regulating such variables as vessel speed, channel routes, and vessel size, impacts of coal transportation such as shoreline erosion, resusupension of particulates, and on-shore structural damage may be minimized. Speed limits between specific geographical points and within individual harbors have been established pursuant to the act for many Michigan ports and waterways. These include: The St. Mary's River (Part 92.49); Keweenaw Waterway (Part 162.115); St. Clair River (Part 162.135); Detroit River (Part 162.135); Rouge River and Short Cut Canal (Part 162.140; and various harbors on Lake Michigan (Part 162.120).

In addition to these limitations, part 164.15 of Title 33 has general safety rules concerning the responsibility of vessel owners or masters while underway, including consideration for the nearness to fixed shore and marine structures, the comparative proportions of the vessel and the channel, the density of traffic, possible damage from the vessel's wake, and any local speed limits. All these variables affect shoreline erosion, particulate resuspension and on-shore structural impacts.

Authority for enforcing the rules set forth in Title 33 can be found in Part 160. This part states that the law enforcement responsibilities under the Ports and Waterways Act are held by the United States Coast Guard District Commander, "Captain of the Port", or an authorized representative of one of these. Violation of a regulation issued under the act carries a civil penalty of not more than $10,000 dollars.

Discharge Control

Impacts other than those from vessel movement would most likely be discharge impacts and would be related to water quality protection laws and regulations. The expulsion of coal dust containing liquids from vessels operating in the Great Lakes and connecting channels would have an uncertain impact on the environment, and clearly should be examined. Such discharge would probably occur, if at all, as a result of fugitive dust finding its way into a vessel's bilge, which often serves as a kind of "catch-all" for uncontrolled vessel wastes and seepage.

The discharge of pollutants into the water of the United States if addressed under provisions within the Federal Water Pollution Control Act (86 Stat. 816,868) and will be discussed later. The expulsion of such substances by vessels however, does fall under the jurisdiction of the Secretary of Transportation and the United States Coast Guard, and is addressed by Title 33 of the CFR. The discharge of liquid containing coal dust is not specifically addressed in these regulations, as it may not be perceived a major problem. However, to the extent that coal dust mixes with other bilge that is regulated, it may be indirectly covered.

Parts 155.220, 155,340, 155.350, and 155.360 of the CFR require that vessels may not operate without a system for retaining and controlling disposal of "oily bilge slops." The discharge of such bilge is a violation under the Water Pollution Control Act.

Evaluation

The actual enforceability and impact mitigation provided by the Ports and Waterways Safety Act differs somewhat from the apparent coverage. The interpretation of terminology for the actual enforcement of regulations, geographical constraints on possible mitigating options, and possible policy gaps, all contribute to a potentially less than effective vessel impact mitigation program.[1]

Though the Ports and Waterways Act does enable the United States Coast Guard to issue "Captain of the Port orders" to prevent structural damage to on-shore property, often resulting from vessel wakes, this power is generally used to regulate extremely hazardous conditions. For example, a burning ship or otherwise dangerous vessel could be ordered to anchor, re-route, or behave in another manner if the Coast Guard determined that it threatened persons or facilities on shore. Captain of the port orders, however, are not generally issued to prevent wake damage to on-shore facilities, or to regulate other by products of routine operation. Therefore, damage resulting from day to day ship operation may not in actuality be regulated in a preventative manner. At the same time, wake damage complaints are handled by the Coast Guard after occurring, and action pursuant to these may deter the production of destructive wakes. It should also be noted that vessel wakes from coal transportation will not be different in kind from those of other vessels of similar size.

Environmental problems related to the resuspension of particulates, generally caused by vessel draw down and surge or propellor thrust, are difficult to mitigate under the provisions of the Ports and Waterways Act. Although shore proximity can technically be regulated by the Coast Guard, two factors impede the effectiveness of this power. First, the distance of a ship from shore while underway is not necessarily related to the depth of the water it is in, and the latter is the determining factor in the resuspension of bottom sediments. Coast Guard representatives contacted indicated that it was next to impossible to regulate the closeness of a ship to the bottom of a channel. Secondly, vessels generally use the safest, most direct channels available, and unavoidably pass through shallow, frequently dredged areas which are susceptible to particulate resuspension. This is especially true in and around habors. Therefore the increase in vessel traffic which could be caused by heavier coal related movement in the Michigan coastal zone may cause a corresponding rise in undersirable particulate resuspension problems. Especially in areas which are frequently dredged (and dredging will be required in many areas to accomodate larger vessels), problems such as water turbidity may worsen.

Finally, regulations under Title 33 concerning bilge discharges may not in all cases effectively control expulsion of coal containing liquids. Though discharging oily bilge slops is, oil commonly floats on top of bilge water, and the non-oily water below is not prohibited from being dischareed. If coal dust mixes with this cleaner water, it may be expelled from vessels. The effects of coal on the marine environment, both biologiclaly and aesthetically, are not certain at this time; but if a significant quantity of dust makes its way into bilge water, it may be expelled and cause harm.

NOTES

1. Experts contacted included representatives of:

United States Coast Guard
9th District
Cleveland, Ohio

United States Coast Guard
Office of Marine Safety
Detroit, Michigan

U.S. Army Corps of Engineers
Detroit District
Detroit, Michigan

COAL TRANSPORT BY RAIL AND TRUCK

Environmental impacts from land based transportation fall into three main categories; noise, air emissions, and land impacts. Noise mainly from loading, unloading, and operating trains and trucks, could be substantial for persons or communities exposed to unusually high levels. Air emissions, specifically fugitive dust generation, may affect vegetation, water, air, and various man made structures. Thirdly, land impacts, both on actual structures and community function, may prove costly in terms of economics and community safety as well as environmentally.

NOISE

Coal transshipment related noises in the coastal zone would come from trains, trucks and loading and unloading both types of vehicles. The environmental effects of noise can range from relatively mild problems such as occasional sleep disturbance at low levels, to severe medical and emotional effects at extremely high levels. Members of both human and wildlife communities may suffer such things as increased stress, central nervous system damage (in extreme cases), and disruption of normal behavior patterns. Greatly increased noise levels in the coastal zone, as a result of greater coal movement, could therefore produce significant detremental effects in certain areas. However, coal and other types of commodity transport are already generating noise in many locations.

The Noise Control Act of 1972

The Noise Control Act of 1972 expresses the finding of congress that inadequately controlled noise threatens public health and welfare and that noise from transportation vehicles is a major source of this threat (42 USC Subsection 4901[a]). To promote an environment free from detrimental noise levels, the act provides for coordination of federal research activities and authorizes federal noise emission standards (42 USC Subsection 9401[b]). Responsibility to coordinate all programs under this act lies with the Administrator of the United States Environmetnal Protection Agency (42 USC Subsection 4903[c][1]) and with the United States Deprtment of Transportation to regulate activities with which this study is concerned (42 USC Subsection 4916[b] and Subsection 4917[b]).

Rail Noise

Section 4916 [a][1] of the act mandates that the Administartor of the Environmental Protection Agency, after consultation with the Secretary of Transportation, shall publish regulations and standards for railroads engaged in interstate commerce. The standards are to reflect the noise reduction achievable by applying the best available technology, while taking into account the cost of compliance. Consequently, the Secretary of Transportation, after consultating the Administrator of the EPA, is to evolve regulations to insure compliance with these standards through his powers of enforcement and inspection under other Federal Acts (42 USCS Subsection 4916[b]).

The regulations referred to in Subsection 4916[a][1] of the act can be found in Title 40 Part 201 of the Code of Federal Regulations. These promulgate standrads for both stationary and moving operation of locomotives and the movement of rail cars.[1]

All rail noise standards are in force when the dB(A) level, or A-weighted sound level in decibels, is measured according to the technical requirements of Subpart C of Part 201. It should be noted that these regulations set standards for locomotives and railcars manufactured after December 31, 1976, only, and are not retroactive. Older cars and locomotives would seemingly be exempt. There are no regulations specific to unit-train transport of coal. This activity would be covered under the provisions of law generally.

Motor Carrier Noise

Section 4917 [a] of the act deals with creating standards for noise from motor vehicles in much the same way as Subsection 4916[a] deals with railroad noise. The regulations enacted pursuant to this section can be found in Title 40 CFR Part 202, and took effect on October 15, 1975. They apply only to motor vehicles engaged in interstate commerce, do not apply to auxiliary equipment normally operated when the vehicle is stationary or moving at less than five miles per hour, apply only to motor vehicles wihch have a gross vehicle weight rating or gross combination weight rating of more than 10,000 pounds, and do not apply to warning devices such as horns or sirens. The specific regulations are found in Subpart B of Part 202[2].

Section 4917[c][1] and [2] of the Federal Noise Control Act of 1972 specify that no state or political subdivision of a state may adopt of enforce standards for operating motor carriers engaged in interstate commerce unless they are identical to the standards proposed by the Federal regulations ad the United States Secretary of Transportation has been consulted. The state of Michigan has enacted regulations, under Act 300 of the Public Acts of 1949, as amended by Act 73 and 492, Public Acts of 1978, which are identical to the Federal standards for motor carriers and has thereby broadened noise control coverage within Michigan to include state highways and streets, regardless of the presence of an interstate activity. The Michigan act also broadens the applicability of the standards to include all motor carriers with a gross vehicle weight rating or gross combination weight rating of more than 8,500 pounds as opposed to the federally determined 10,000 pound level. (Act 300, PA 1949, as amended by Act 73 and Act 492, PA 1978, Sec. 707c. [1][a][i][ii][iii]).

Rules establishing test procedures for enforcement of the above sections have been promulgated by the Michigan Department of State Highways and Transportation, (Sec. 707e [1]) and are still being reviewed. There are no rules specific to coal transportation by motor carrier.

Evaluation

The preemption of noise standard setting authority by the federal government has effectively limited state participation in controlling transportation noise. Though the state has enacted truck noise standards identical to those of the federal government, thereby regulating intrastate transport, no action has been taken by the state with regard to rail noise. The Environmental Protection Agency therefore maintains virtually all authority over transportation noise, and new regulations in this area would be expected to come from this source.

Policy gaps, or areas which could possibly benefit from further regulations, seem apparent when comparing our current noise abatement regulation with the various types and levels of environmental noise generated during coal transportation. Foremost among these are inadequacies in the current decibel emission limits for rail and motor carriers and lack of regulation governing noise from loading and unloading vehicles.

Experts[3] agree that current decibel limits on rail and truck equipment are not at an optimal level, although the technology to control these emissions is now becoming available, and new vehicles are quieter. The fact remains that the federal noise control program is relatively new, and much equipment which was in use at its inception is still being used today. For example, if we accept an estimate of twelve to fifteen years as the useful life of a truck, we can clearly see that many trucks made to comply with 1975 standards are still in use, and lowering the acceptable level at this time would adversely affect some truck operators.

In the past, truck emission standards have regulated the allowable emission levels of all operating equipment, and changes in these standards may still be several years aware because of the problem with older equipment. Rail noise, on the other hand, has been regulated by limiting the allowable noise of new equipment. This strategy does not discriminate against existing equipment and tightens emissions limits as control technology develops. The biggest problem with this strategy is its non-retroactive nature.

Another problem has been the lack of regulation of noise producing activities such as loading coal into transport vehicles. The EPA has not in the past been authorized to establish noise standards for processess, only products. Work is being done, however, on Railroad Yard Property Line Standards which could regulate rail yard noise as a whole, and could thereby include coal loading and unloading. Questions still remain concerning the definition of a "rail yard", what activities would be excluded from the standards, and how the location of a given yard should affect the applicability of the standards. Land use around rail yards would influence whether of not the new standards would apply to a given facility, with recreational uses of surrounding areas possibly being considered. Also undetermined at this time is the issue of truck related noise and the applicability of these regulations to facilities which may not clearly qualify as rail yards. Utility spur lines for example, would probably not be included.

NOTES

1. • Locomotives manufactured prior to December 31, 1979 shall not emit sound levels in excess of 93dB(A) [73dB(A) when at idle] while stationary; and 96dB(A) when moving at any time, under any conditions.

• Locomotives manufactured after December 31, 1979 shall not emit sound levels in excess of 87dB(A)[70dB(A) when at idel] while stationary; and 90dB(A) when moving at any time under any conditions.

• Effective December 31, 1976, no rail car or combination of rail cars shall, while in motion, produce sound levels in excess of ff dB(A) at speeds up to 72 km/hr. (45 mph) or 93dB(A) at speeds greater than 72 km/hr. (45mph) (40 CFR 201)

2. • No motor carrier subject to these regulations shall operate any motor vehicle of a type to which this regulation is applicable which at any time or under any condition of highway trade, load, acceleration or deceleration generates a sound level in excess of 86 dB(A) measured on an open site with fast meter response at 50 feet from the centerline of lane of travel on highways with speed limits of 35 MPH or less; or 90 dB(A) measured on an open site with fast meter response at 50 feet from the centerline of lane of travel on highways with speed limits of more than 35 MPH.

• No motor carrier subject to these regulations shall operate any motor vehicle of a type to which this regulation is applicable which generates a sould level in excess of 88 dB(A) measured on an open site with fast meter response at 50 feet from the longitudinal centerline of the vehicle, whén its engine is accelerated from idle with wide open throttle to governed speed with the vehicle stationary, transmission in neutral, and clutch engaged.

• No motor carrier subject to these regulations shall operate any motor vehicle of a type to which this regulation is applicable unless the exhaust system of such vehicle is (a) free from defects which affect sound reduction; (b) equipped with a muffler or other noise dissipative device; and (c) not equipped with any cut-out, bypass, or similar device.

• No motor carrier subject to these regulations shall at any time operate any motor vehicle of a type to which this regulation is applicable on a tire or tires having tread pattern which as originally manufactured, or as newly retreaded, is composed primarily or cavities in the tread (excluding sipes and local chunking) which are not vented by groves to the tire shoulder or circumferentially to each other around the tire. This Subsection 202.23 shall not apply to any motor vehicle which is demonstrated by the motor carrier which operates it to be in compliance with the noise emission standard specified for operations on highways with speed limits of more than 35 MPH ...

3. Experts contacted included representatives of:

Office of Noise Abatement
Environmental Protection Agency
Washington, D.C.

Office of Testing and Research
Michigan Department of Transportation
Lansing, Michigan

Railroad and Port Facility Division
Michigan Department of Transportation
Lansing, Michigan

FUGITIVE DUST

Fugitive dust is produced during the loading, unloading, and transportation of coal and may affect the coastal zone environment. During loading and unloading, dust may be generated by collisions between pieces of coal and/or the impacting of coal on dock surfaces or ship structures following a free fall from equipment such as conveyors. During transportation, wind blowing over uncovered coal being carried in trucks or rail cars may also generate dust. Effects on vegetation, water, air, and man-made structures are all possible by-products, and may be more significant in the coastal zone because of nearness of dust sources to the waters, wind pattern and velocity differences, and higher ground water levels. Specifically, fugitive dust can cause problems with transpiration through plant stomata, aesthetic effects, and other chemical and biological effects.

The Clean Air Act Amendments of 1977

Federal policy on air quality is implemented under the Clean Air Act Amendments of 1977. In this act, Congress directed the United States Environmental Protection Agency to establish primary and secondary National Ambient Air Quality Standards [NAAQS] to protect the public health and welfare, and directed the states to develop and adopt State Implementation Plans [SIP's] to attain and maintain these standards. Part D of Title 1 of the act outlines the necessary provisions of a satisfactory SIP for a non-attainment area.

In August, 1977, the Acting Assistant Administrator for Air and Waste Management of the Environmental Protection Agency issued a memorandum to Regional Administrators concerning Guidance on SIP Development and New Source Review in Areas Impacted by Fugitive Dust. The memo recognizes fugitive dust as a significant contributor to the particulate matter problem within urbanized areas throughout the nation and distinguishes between its impact on rural versus urban areas.

> ... urban areas should receive the highest priority for the development of a comprehensive and reasonable program to control fugitive dust. Rural area control programs at this time should center on the control of large existing man-made fugitive dust sources (i.e., tailing piles, mining operations, etc.) which in themselves are presently causing violations of the NAAQS or are sources of a known toxic or hazardous material (e.g. asbestos).

The memorandum concluded by stating that fugitive dust control measures, reflecting the application of reasonable available controls, should be included in the SIP revisions which were then underway. It was recognized that fugitive dust control programs would be new to many state and local agencies, so time would be required to create effective programs in urban areas.

The State of Michigan Air Quality Implementation Plan Revisions of 1979 contained provisions under the heading of Commitment for Fugitive Dust Regulations, in which the state committed itself to developing fugitive dust regulations for at least the primary nonattainment area in Wayne County and possibly a wider area. Rules have since been made for the entire state adding fugitive dust control to the state implementation plan, and are currently being reviewed. The Department of Natural Resources has committed itself to January 1, 1981, for adoption of these rules into the Michigan SIP. In addition to the statewide rules, Wayne County is evolving its own requirements.

Included in the rules currently under review are sections which would relate directly to fugitive dust created in the transportation of coal (see Appendix). These may be cited as Proposed Rules R.336.1370-R.1372 of the Michigan Administrative Code. Most important are R. 336.1371, Fugitive Dust Control Programs, which describes the requirement for fugitive dust control programs for applicable facility operators including coal transporters; and R. 336.1372, Fugitive Dust Control Program; Required Activities; Typical Methods, which outlines necessary program content and typical control methods.

Evaluation

If adopted, and it appears fairly certain that they will be, the rules currently under review should be effective in mitigating many impacts of the fugitive dust problem as it relates to coal. Specific rules include provisions to deal with coal dust generation problems in storage piles (Rule 372[a][i]), loading and unloading (Rule 372[a][ii]), truck transport (Rule 372[b]), and outdoor conveying (Rule 372[c]).

One policy gap, a potentially important one, exists for dust generated in the transport of coal by rail. Rail transportation is partially covered by the proposed regulations dealing with the general loading and unloading of bulk materials (Rule 372[a][i] and [ii]), but does not receive the attention concerning wind blown dust during transport that truck transportation does. While regulations have been proposed requiring such things as completely covering open bodied trucks, the use of completely closed trucks, and tarping empty trucks containing residue, provisions for similar results have not been suggested for rail cars.

Experts[1] in the Michigan Department of Natural Resources have indicated that rail regulations in the proposed rules were not as extensive as those for trucks for several reasons, foremost of which seemed to be the perception that train movement was not as important a source of fugitive dust as truck transport. Numerous studies have concluded, however, that dust generated by rail transport of coal is significant. A publication of the U.S. Environmental Protection Agency entitled Environmental Assessment of Coal Transportation indicates that:

> Loss of particulates in transit varies with type of coal shipped, condition of the cars, moisture and fines contents of the coal, speed of the train, and wind speed. The estimates of wind losses range from negligible to 1.0 percent of the coal shipped. Some reports place the losses in certain situations at 5 tons per car during a trip over 480 km (300 miles). The losses do vary widely, probably averaging between 0.05 and 1.0 percent of the total coal shipped.[2]

Though coal may not travel great distances by train within Michigan, it appears clear that substantial fugitive dust can be generated by rail movement. The Department of Natural Resources should therefore re-examine the possibility of including explicit coal dust mitigating measures in its State Implementation Plan Revisions to more thoroughly deal with the fugitive dust problem.

NOTES

1. Experts contacted included representatives of

   Michigan Department of Natural Resources
   Air Quality Division
   Lansing, Michigan

2. United States Environmental Protection Agency, Environmental Assessment of Coal Transportation, National Technical Information Service, Springfield, VA. May 1978, p. 77.

OTHER RAIL AND TRUCK IMPACTS

Community Interference

Another impact of coal transportation is coal train interference with the activities of communities through which they pass. Special attention may be warranted for unit trains, which are generally longer and slower moving than other types of rail transport and may cause more disruption than traditional coal trains. A study for the Minnesota Department of Transportation and the North Dakota State Highway Department is currently underway concerning Alternative Solutions to Railroad Impacts on Communities (Ernst and Whinney, 1979), but as of this writing is not complete. This study may have important implications for coal train movement in Michigan since the impacts on Michigan communities should not differ greatly from those in other states.

The most important disruption may be the amount of time for which a train, effectively "divides" a community, perhaps hampering emergency services or endangering and inconveniencing motorists and pedestrians. The State of Michigan Compiled Laws do limit the obstruction of vehicular traffic by a railroad train to five minutes (1970 Michigan Compiled Laws Annotated 466.23). It is also unlawful for successive train movements to obstruct any vehicular traffic on any public streets or highways until all previously delayed traffic has been cleared, or a period of five minutes has elapsed between train movements, and penalties are provided for violation (Secs. 466.24 and 466.25).

Evaluation

Although these laws appear to cover the problem of vehicle disruption quite thoroughly, the average time for which a unit train blocks a crossing ranges between 1.5 and 3.4 minutes (Ernst & Whinney, 1979), and crossings of such a duration are not regulated under the above laws. To efficiently assess and regulate the impact of unit train movement through a community, one must consider factors such as total traffic delay times, which often are more substantial than the actual times of crossing, and do not seem to be currently regulated in Michigan.

Current policy, therefore, seems inadequate to deal with coal train impacts. The relatively recent and more significant development of unit train transport may explain why past policy has not addressed such questions as train interference with communities in a comprehensive manner. However the current community impact of these trains, as well as an expected increase in rail movement of coal, requires a thorough investigation of mitigation strategies.

The study mentioned above which is being conducted for the Minnesota Department of Transportation and the North Dakota State Highway Department, attempts to address the problems of community interference in a comprehensive manner. Potential low cost solutions being examined include the modification of current railroad operating practices, railroad facilities, community transportation facilities, railroad/community communication, community development patterns, community services, and behavior modification (Ernst and Whinney, 1979). Some or all of these potential solutions may be applicable to communities in the Michigan coastal zone, and should be examined if such problems are identified in specific communities.

Road Damage - Truck Weight Restrictions

Michigan Vehicle Code, Act 300, Public Acts of 1949 as amended

The two greatest factors involved in road damage from trucks would be the weight of the trucks and the frequency with which they travel any given roads. Michigan does have Maximum Truck Loadings and Dimensions (Michigan Department of Transportation, Numbered T-1 1/79), regulations pertaining to the operation of trucks and trailers according to Act 300, P.A. 1949 as amended. Truck dimensions in Michigan are not restricted strictly by weight, but rather by number of axles and vehicle configuration. Special permits are issued by the Department of Transportation for the occasional movement of oversize or overweight vehicles or loads which cannot be dismantled, reduced, or otherwise rearranged to come within the legal limits (See Tables in Appendices).

The upper limit under Michigan law for any one axle is 18,000 lbs., with a maximum allowable axle limit of eleven. Vehicle configurations and axle spacings are also regulated. Michigan's truck weight restrictions are considered quite lenient relative to regulations in other states. Highways in Michigan are, however, designed to withstand the 18,000 lb/axle load over a twenty year life span.

Evaluation

Though other states have stricter overall weight limits, they often allow heavier per axle weights. Interstate traffic therefore, may exert a greater negative impact on Michigan highways, although frequency by heavy truck use is also a factor, and because of its location Michigan may not have a lot of interstate traffic.

Experts[1] in the Michigan Department of Transportation feel that the state's truck loading regulations are generally sufficient to protect Michigan's highways from excessive damage. Though some trucks may overload, this practice is illegal, and highway weigh stations are operated in an attempt to enforce state limits. New weighing methods are being developed for more accurate weighing of individual axles.

In short, it appears that the state's policy on truck weight restrictions will be adequate to deal with increased coal movement in Michigan. If there is a potential policy problem, it may be with respect to interstate coal traffic in the state.

NOTES

1. Experts contacted included representatives of

   Michigan Department of Transportation
   Lansing, Michigan

   - Design Division
   - Planning and Programming Division
   - Maintenance Division

TABLE I-2

MAXIMUM OVERALL DIMENSIONS

Width . . . . 96 inches
Height . . . . 13 feet, 6 inches
Length of semi-trailer or trailer . . . . No Restriction
Length of any other vehicle with or without load . . (excluding impact absorbing bumpers) . . . . 40 feet
Units permitted in train . . . . Truck-tractor, semitrailer and trailer or truck and semitrailer or trailer.
Length of a combination of truck-tractor and trailer or semitrailer with or without load . . . . 55 feet
Length of a combination of truck-tractor and semitrailer with or without load, with semitrailer not exceeding 45 feet . . . . 60 feet
Length of a combination of truck-tractor, semitrailer and trailer or truck and semitrailer or trailer with or without load . . . . 59 feet
Projection beyond front of vehicles . . . . 3 feet
Overhang beyond rear of vehicles . . . Any amount is permissible if the legal overall length is not exceeded. But if this overhang is 4 feet or more, there shall be displayed on the extreme rear of such load a 12 inch red square flag in the daytime and a red light or lantern at night.
Axle Limitation . . . . A combination of vehicles shall not have in excess of 11 axles.

TABLE I-3

TABLE OF MAXIMUM ALLOWABLE GROSS AXLE LOADINGS

Spacings Between Axles	Normal Loading When Limitations Are Not in Force (Speed Limit 55 MPH)	Special Designated Highways † SPECIAL NOTE: A truck-tractor and semitrailer transporting flammable liquid in bulk which has a flash point at or below 70 degrees fahrenheit, may be operated (at the gross and axle weights provided for in this column) on all state highways that are designated as "All Season Routes".	Seasonal Load Limitations (Speed Limit 35 MPH)	
			Rigid	Flexible
9 feet or over	18,000 lbs.	20,000 lbs.	13,500 lbs.	11,700 lbs.
More than 3½ feet but less than 9 feet	13,000 lbs.	13,000 lbs. (34,000 lbs. for tandem axle)	9,750 lbs.	8,450 lbs.
When part of a tandem axle assembly	* 16,000 lbs.	34,000 lbs. per tandem	** 12,000 lbs.	*** 10,400 lbs.
When less than 3½ feet the combined weight shall not exceed	18,000 lbs.	20,000 lbs.	13,500 lbs.	11,700 lbs.
Maximum load on any wheel shall not exceed: (pounds per inch of tire width)	700 lbs.	700 lbs.	525 lbs.	450 lbs.

† Gross weight may not exceed the following: An overall gross weight on a group of 2 or more consecutive axles equaling:

$$W = 500 \left(\frac{LN}{N-1} + 12N + 36 \right)$$

where W = overall gross weight on a group of 2 or more consecutive axles to the nearest 500 pounds, L = distance in feet between the extreme of a group of 2 or more consecutive axles, and N = number of axles in the group under consideration; except that 2 consecutive sets of tandem axles may carry a gross load of 34,000 pounds each if the first and last axles of the consecutive sets of tandem axles are not less than 36 feet apart, and the gross vehicle weight does not exceed 80,000 pounds including all enforcement tolerances.

A vehicle or combination of vehicles when utilizing an additional 5 miles from a "Special Designated Highway" for access to or from points of origin or destination, must reduce to the following axle weights when the route being traveled is under seasonal load limitations: Rigid route – 15,000 lbs. on a single axle, 25,500 lbs. per tandem. Flexible route – 13,000 lbs. on a single axle, 22,100 lbs. per tandem.

* On any legal combination of vehicles, only one (1) tandem axle assembly shall be permitted at the gross weight of 16,000 lbs. per axle and no other tandem axle assembly in such combination of vehicles shall exceed a gross weight of 13,000 lbs. per axle. When the gross weight of a combination of vehicles with load, does not exceed 73,280 lbs., two (2) tandem axle assemblies shall be permitted at a gross weight of 16,000 lbs. per axle.

** On any legal combination of vehicles, only one (1) tandem axle assembly shall be permitted at the gross weight of 12,000 lbs. per axle and no other tandem axle assembly in such combination of vehicles shall exceed a gross weight of 9,750 lbs. per axle. When the gross weight of a combination of vehicles with load does not exceed 73,280 lbs., two (2) tandem axle assemblies shall be permitted at a gross weight of 12,000 lbs. per axle.

*** On any legal combination of vehicles, only one (1) tandem axle assembly shall be permitted at the gross weight of 10,400 lbs. per axle and no other tandem axle assembly in such combination of vehicles shall exceed a gross weight of 8,450 lbs. per axle. When the gross weight of a combination of vehicles with load does not exceed 73,280 lbs., two (2) tandem axle assemblies shall be permitted at a gross weight of 10,400 lbs. per axle.

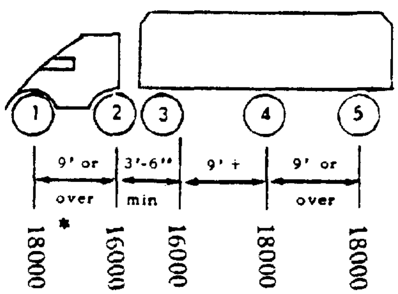
FIGURE I-1

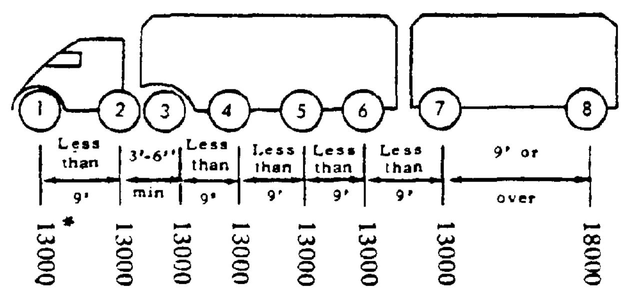
MAXIMUM GROSS AXLE LOADS

The following examples are shown as a guide for figuring the maximum allowable gross axle loads on all State Trunk Lines during all periods of the year.

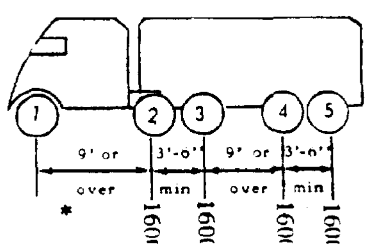
* MINIMUM TIRE REQUIREMENTS: The maximum load on any wheel shall not exceed 700 pounds per inch of tire width.

Illustrations of axle spacings:





Public Act #36, 1965



"When the maximum gross weight of a combination of vehicles with load does not exceed 73,280 pounds, 2 tandem axle assemblies shall be permitted at a gross permissible weight of 16,000 pounds for any such individual axle."

FIGURE I-2

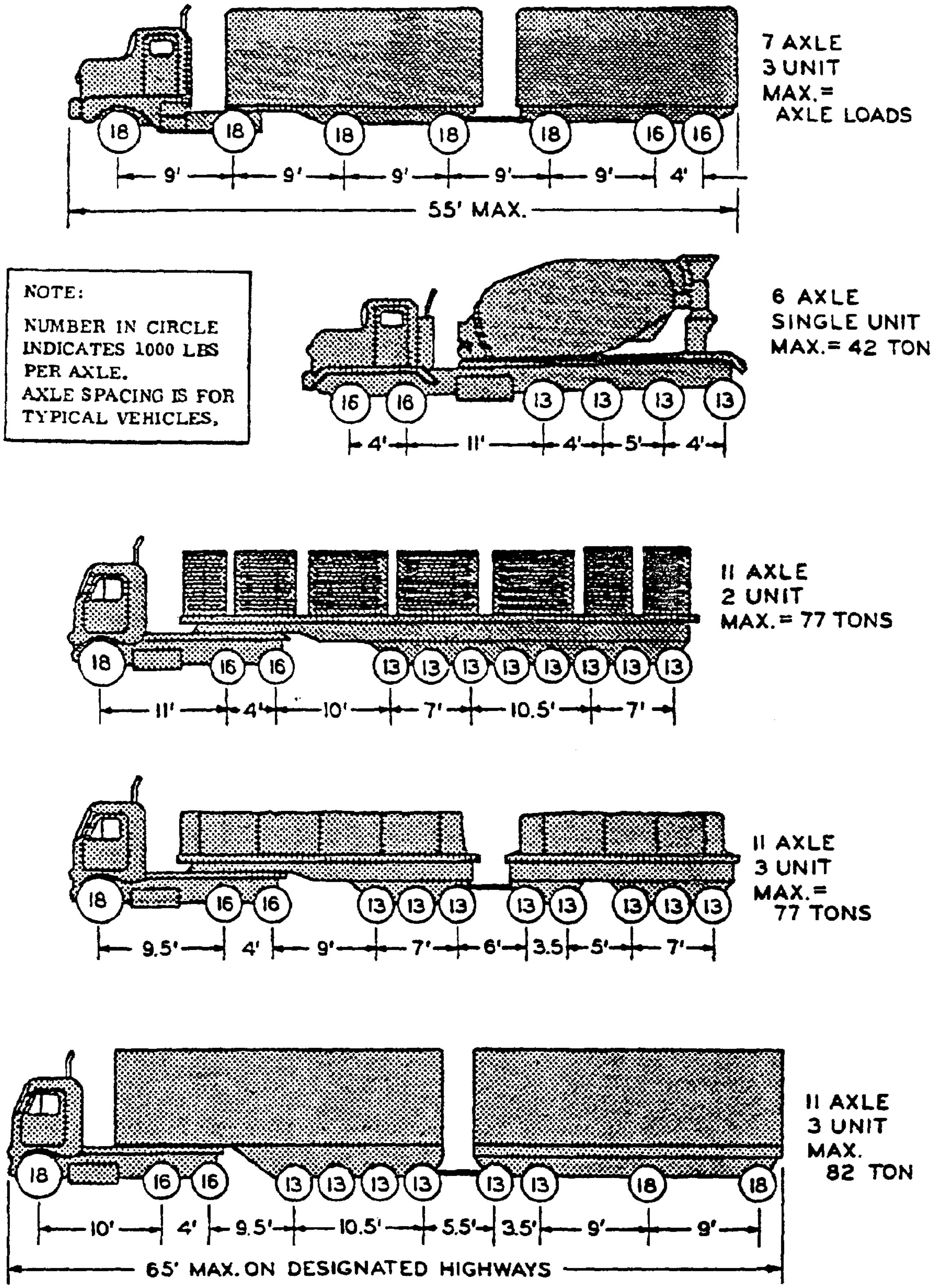


EXHIBIT B

MAXIMUM GROSS VEHICLE WEIGHTS IN MICHIGAN IN 1970

ENVIRONMENTAL LAWS AND PROGRAMS

AIR QUALITY PROGRAMS RELATED TO DEMAND FOR COAL

Introduction

The Federal Clean Air Act, initially adopted in 1970[1] and amended in 1977[2], is a complex piece of legislation. The 1977 Amendments, in particular, illustrates Congressional awareness of the often conflicting demands of environmental and energy policies. To the extent that coal-burning facilities typically have a greater potential for emitting air pollutants than do facilities using other energy sources, the 1977 Amendments may require greater expenditures for pollution control equipment or be subject to stricter siting procedures. On the other hand, provisions of the Act encourage development of coal-fired sources as a means of reducing dependence on other fossil-fuels.

The discussion of the Clean Air Act which has been incorporated into this report represents a bare outline of essential provisions of the Act as related to combustion of coal and the anticipated effects of air quality standards in affecting demand for coal. A separate section will focus specific discussion on implementation of regulatory air quality provisions concerning transportation, handling, and stockpiling of coal.

New Source Performance Standards

One of the central features of the Clean Air Act, provides that the EPA Administration must establish standards of performance for new and modified stationary source of air emissions. For the purpose of formulating those regulations, EPA has identified at least 28 categories of sources which must apply the best demonstrated technological system of continuous emission reduction.[3] In addition, fossil-fuel-fired sources are subject to percentage reductiion in emissions.[4]

Theoretically, complying with federal emissions standards should not be a problem. The EPA Administrator is supposed to set emission standards on the basis of demonstrated "best available control technology" (BACT). Establishment of standards for control of particulates and NO_2 emissions has been relatively noncontroversial. However, the SO_2 emission standards have proven enormously controversial as evidenced by continuing disagreement amongst environmentalists and utility industry spokesmen over whether current standards should be tightened or made more lenient.

Current SO_2 regulations require that new coal-burning utility facilities capable of firing more than 73 MW (250 million BTU/hour) of fossil fuel (a) shall emit sufur dioxide in concentrations not exceeding 1.20 lb/million Btu, and, in addition, shall achieve a 90% reduction in potential concentration; except (b) where sulfur dioxide emissions are reduced to concentrations not exceeding 0.60 lb/million Btu, when only a 70% reduction in potential emissions is required.* Incidentally, the regulations provide that the industry may take credit for any cleaning of the fuel, or reduction in pollutant characteristics of the fuel after mining and before combustion.[5]

In establishing different requirements for emission reduction, one of the principal issues pertinent to coal transportation concerns whether a utility burning low-sulfur coal should be required to achieve the same percentage reduction in potential SO_2 emissions as those burning higher sulfur coal.[6] According to legislative history accompanying the 1977 Amendments, the emission reduction requirement waste be applied uniformly to all types of coal irrespective of sulfur content, unless the Administrator determined that varying requirements would not undermine the intent of the Act to maximize use of locally available coal resources:

> In establishing a national percent reduction for new fossil fuel-fired sources, the (Senate-House conferees agreed that the Administrator may, in his discretion, set a range of pollutant reduction that reflects varying fuel characteristics. Any departure from the uniform national percentage reduction requirement, however, must be accompanied by a finding that such a departure does not undermine the basic purposes of the House provision and other provisions of the act, such as maximizing the use of locally available fuels.[10]

After conducting an extensive investigation, the Administrator issued a determination that a variable sulfur emissions strategy was justified and would not undermine the Act's proposes of encouraging use of locally derived coal. According to the investigation, the non-uniform options considered resulted in only small shifts in regional production of coal, principally involving a potential decline in Great Plains production and a potential increase in western production. Mining production in other areas including the Great Lakes states was expected to remain relatively unaffected by the options.

Table I-4 presents results of EPAs analysis of control options and provides projections of their effect on 1995 coal production. Of particular interest, the EPA analysis indicates that western coal transport under all options will be at least three times higher than 1975 levels.

The results of the analysis also suggest that "variable control" levels with a minimum potential emission reduction set at 90 and 70 percent (represents the adopted option) should result in about 27 million tons more western coal being transported east than uniform standards (the "full control" option represents a uniform standard of 1.2 lb/million Btu emission limit with a 90 percent reduction in potential SO_2 emissions). However, it should be

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* These standards do not apply to existing utility facilities that were designed to use gas or oil fuels and that are modified to burn coal. These standards also do not apply to industrial boilers. EPA is currently developing standards for industrial boilers which it plans to propose in late 1980 or 1981.

specifically noted that only a small fraction of the anticipated 27 million tons of additional western coal transported east would be transported through Great Lakes connecting channels and an even smaller portion would ultimately be utilized in Michigan.

As noted previously, these new source performance regulations pertain only to new and modified electric utility steam generating units capable of firing more that 73 MW (250 million Btu/hour) heat input of fossil fuel. Except for large industrial cogeneration facilities (sales of at least 25 MW of electricity and at least one-third of potential output), industrial boilers are not presently covered by new source performance regulations. However these regulations reportedly are in the process of being developed.[8] Given the precedent established in developing new source performance standards for electrical generating facilities, it can be anticipated that, when promulgated, SO_2 regulations will require less extensive (though still substantial) emissions control possibly in the form of partial scrubbing and/or other continuous control technological systems. In addition, it is reasonable to anticipate that the effects of new source industrial performance standards on regional patterns of coal mining and transportation will be relatively insubstantial compared to the regional demand effects of standards for electrical generating facilities.

TABLE I-4

IMPACTS ON FUELS IN 1995[a]

	1975 actual	Level of control[b] Current standards		Full Control		Partial Control 33% Minimum		Variable Control 70% Minimum	
		Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
U.S. Coal Production (mill. tons):									
Appalachia	396	439	524	463	465	475	486	470	484
Midwest	151	404	391	487	488	456	452	465	450
Northern Great Plains	54	655	630	633	628	622	576	632	602
West	48	230	222	182	180	212	228	203	217
Total	647	1,778	1,767	1,765	1,761	1,765	1,742	1,770	1,752
Western Coal Shipped East (million tons)	21	122	99	59	55	68	59	71	70
Oil Consumption by Power Plants (Million bbl/day):									
Power Plants		1.2	1.2	1.6	1.6	1.4	1.4	1.4	1.4
Coal Transportation*		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total	3.1	1.4	1.4	1.8	1.8	1.6	1.6	1.6	1.6

*Results of EPA analyses completed in May 1979 based on oil prices of $12.90, $16.40 and $21,00/bbl in the years 1985, 1990, and 1995, respectively.

*With 520ng/J maximum emission limit.

*Based on wet SO_2 scrubbing costs.

National Ambient Air Quality Standards

A major feature of the 1970 Clean Air Act Amendment was the requirement that EPA formulate National Ambient Air Quality Standards (NAAQS) defining two types of target levels for ambient concentrations of pollutants: primary standards intended to protect public health; and secondary standards for maintaining public welfare consistent with factors other than human health, including effects of pollutants on vegetation, materials, visibility and weather.

Primary and secondary NAAQS have been promulgated by EPA for seven pollutants known to have potentially adverse effects on public health and welfare: sulfur oxides (SOx), particulate matter, nitrogen dioxide (NO_2), hydrocarbons, ozone, carbon monoxide (CO), and lead. Current standards for SOx, particulate matter, and NO_2, the primary byproducts of coal combustion, are included in Table I-5.

After establishment of NAAQS, the specifics for achieving ambient air quality compliance are to be prescribed by state implementation plans (SIPs). A legally sufficient plan, according to Section 110 (a)(2) must be adopted by the state after reasonable public notice and hearing, and must address:

> (A) attainment of primary standards (as expeditiously as possible but within three years from date of plan approval) and attainment of secondary air quality standards (within a "reasonable time"); (B) emission limitations, schedules and timetables and other measures such transportation control and quality maintenance plans as necessary for achieving air quality standards; (C) monitoring of ambient air quality; (D) administration and enforcement including provisions for pre-construction review of new sources, (E) inspection and testing of motor vehicles to the extent necessary; and (F) authority for plan revision.

The following information on areas of nonattainment and in plans to rectify identified problems is summarized from the State Implementation Plan[9].

A. Particulate Matter

1. Geographic Areas of Nonattainment

As indicated in Figure A, many areas exhibit no significant change in ambient air quality conditions for particulates. However, coastal counties trends data does indicate that suspended particulate air quality is improving (from west to east) in Ontonagon, Marquette, Muskegon, Alpena, Iosco, and Monroe.* Only two counties (Menominee and Mason, both adjacent to Lake Michigan) have experienced worsening air conditions insofar as suspended particulates. Expressing these results in terms of human exposure, in 1967 an estimated five million Michigan residents were exposed to concentrations of total suspended particulates above the health related standard. By 1977, the exposed population had dropped to approximately 600,000, most of when are residents of heavily industrialized Wayne County. Other nonattainment areas

* Eaton is the only inland county where suspended particulate concentrations are reported to be significantly improved.

TABLE I-5

NATIONAL AMBIENT AIR QUALITY STANDARDS FOR PARTICULATE MATTER, SULFUR DIOXIDE, AND NITROGEN DIOXIDE

Pollutant	Averaging time	Primary standard	Secondary standard
Particulate matter	Annual (geometric mean)	75 ug/m^3	60 ug/m^3
	24-hour	260 ug/m^3	150 ug/m^3
	3-hour	--	--
Sulfur dioxide	Annual (arithmetic mean)	80 ug/m^3	--
	24-hour	365 ug/m^3	--
	3-hour	--	1,300 ug/m^3
Nitrogen dioxide	Annual (arithmetic mean)	100 ug/m^3	100 ug/m^3
	24-hour		
	3-hour		

*Based on dry SO_2 scrubbing where applicable.

Source: Federal Register / Vol. 44, No. 113 / Monday, June 11, 1979, pages 33605-9 include Albion, Saginaw and Flint. While this represents substantial progress, it also indicates that additional action is necessary, for achieving compliance with ambient air quality standards for particulates as follows.

As indicated, four areas - Detroit, Saginaw, Flint and Albion, ten counties in all - fail to meet the primary standard for suspended particulates. Sixteen additional counties do not currently meet the more stringent secondary standard for suspended particulates.**

2. Programs for Improving Air Quality

For three primary particulate matter nonattainment areas (Saginaw, Flint, and Albion), the Michigan Air Quality Division believes that it has a sufficient understanding of the causes of nonattainment to provide assurances that the management approach being proposed will be sufficient to achieve ambient air quality compliance.

In Detroit, the sufficiency of the available information necessary for assuring achievement of applicable standards is even more suspect in that numerous establishment and sources are likely causing the nonattainment problem over an extensive region.

In contrast to the other primary nonattainment areas, it has been recognized that sources of the nonattainment are far more numerous, making it more difficult to monitor and manage area sources. Nevertheless, historical ambient monitoring effects (discussed previously) has suggested continued air quality improvements including the Detroit area. Moreover, with respect to emission reductions since 1975, the state lists 23 sources of particulates in the Detroit area which have already undergone (or will undergo) emission reductions of greater that 100 tons per year.

** Research efforts and studies necessary for linking particulate source problems to ambient conditions in at least four areas identified by the state as in violation of secondary air quality standards has been undertaken.

The state is also committed to providing further progress in the Detroit nonattainment area by:

1. continuing to enforce RACT (Reasonably Available Control Technology) regulations for point sources,
2. enforcing new fugitive emission regulations when enacted,
3. continuing to enforce fugitive emissions currently covered under enforcement orders (e.g., coke batteries),
4. enforcing an emission offset policy,
5. conducting additional study (primarily microscopy) to determine the reason or reasons for nonattainment.

On such evidence the State Air Quality Division does maintain that reasonable further progress can be anticipated in the Detroit area. However, largely because of problems in modeling particulates in the area*, it is not presently possible to comply with requirements of the Clean Air Act that call for demonstration by the state that ambient air quality standards can be attained.

In summary of the implementation plan for attainment of ambient air quality standards for suspended particulate, historical evidence indicates that progress is being made. Moreover, in the near future, efforts will be made by the Air Quality Division to control all identifiable sources of particulate matter within major areas of nonattainment, including fugitive dust, through the development of abatement orders. In areas of secondary standard violations, specific study programs have been suggested and are being carried out.

Sulfur Dioxide

Currently nearly all areas of the state are meeting the sulfur dioxide primary standards. Therefore, no change in the existing sulfur dioxide emission limits or control programs are proposed under the State Implementation Plan.

It should be noted that, to date, achievement of sulfur cleanup in the state has been accomplished mainly by encouraging coal users to utilize low sulfur coal, and in some cases, by permitting taller stacks for disperse sulfur discharges.

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* A discussion of problems encountered in validating models of particulate pollutants in the Detroit area and in completing detailed microscopy analysis is outlined in pages 2-8 to 2-24 of the State Implementation Plan.

EPA and the state do intend over time to provide for the elimination of what are called "supplemental control systems" in favor of "constant emission control systems." The supplemental systems, responsible for nonattainment status of two geographically limited areas - one in Monroe County and one in Ingham County - are based on the idea of controlling emissions only at certain times when meteorological conditions are presumed to be inadequate for dispersion of emissions. During these times, the companies utilizing only "supplemental control" switch from high to low sulfur fuel. However, as indicated, the state is committed to replacing such practices with constant emissions control such as constant burning of low sulfur fuel or use of flue gas desulfurization technologies.

New Source Review

The State Implementation Plan provides for a review program for new sources which has been designed to assure that developments occurs in a manner consistent with standards for ambient air quality. This review process will involve consideration of the proposal in terms of categories of pollution (e.g. sulfur dioxide, suspended particulates etc.) which the proposed source can be expected to emit. For each pollutant category, it is anticipated that the adopted State Implementation Plan will be utilized to indicate whether the proposed emissions involves an area of attainment or non-attainment.

A. Project Review in Nonattainment Areas

In nonattainment areas a permit for a major air pollution source cannot be issued unless the permit complies with Section 173(1)a of the Clean Air Act. Section 173 requires that all major new sources install equipment which is designed to meet the lowest achievable emission rate (LAER). The applicant must also demonstrate that all sources owned by the applicant located in the state are in compliance with the State Implementation Plan or on an enforceable schedule to come into compliance. And finally, emission offsets must be provided so that when the new source becomes operational, existing sources will have decreased pollution a sufficient amount to produce a net air quality benefit.

B. Project Review in Areas of Attainment with Air Quality Standards

With respect to attainment areas, growth will be provided consistent with federal prevention of significant deterioration regulations. Under the 1977 Amendments, areas having air quality better than the national secondary ambient standards must be zoned into one of three categories. Significant air quality deterioration is prohibited in all zones, but "significant" is defined differently in each category. In Class I areas, almost any decrease in air quality will be regarded as significant. In Class II areas, a decrease in air quality beyond that associated with "moderate, well-planned growth" will be assumed to be significant. In Class III areas, only deterioration beyond that resulting from heavy industrial development using the "best available control technology" will be considered significant and thus prohibited. Deterioration beyond the national secondary ambient standards is prohibited in all zones regardless of the increments otherwise permitted under provisions for preventing significant deterioration.

Rules 203 (2), 203 (3), 205 and 231 through 237 promulgated by the State Air Pollution Control Commission have effectively zoned areas of attainment in Class II areas. Under the rules, new proposed sources require compliance with minimum federal requirements for prevention of significant deterioration. These rules generally require the application of best available control technology and limit the cumulative air quality impact for all new major sources.

EVALUATION

State Administration

1. Air quality monitoring and development and implementation of air quality control sufficient to achieve ambient air quality standards are among the responsibilities of the Air Pollution Control Commission, an appointed statewide citizen committee, and the state Air Quality Division of the Department of Natural Resources.

Air Quality Conditions

2. Results of air quality monitoring by the state are briefly summarized within this report. More extensive information can be obtained from the State Implementation Plan or directly from the Air Quality Division.

Relevance of New Source Performance Standards to Coal Transportation, General

3. Combustion is a step of the coal fuel cycle which is largely beyond the scope of the present study, however a summary of new source performance standards for coal burning facilities has been provided in that such standards influence demand for coal. New source performance standards have been promulgated for particulates, NO_2 and SO_2 emitted from electrical utility facilities. New source performance standards are also currently being developed for industrial coal-fired boilers. New source performance standards are uniformly applicable to all regions of the country and should not create special regulatory hardships upon new industries and utilities interested in siting in Michigan.

Relevance of SO_2 New Source Performance Standards in Impactors Regional Demand for Coal

4. The EPA Administrator has adopted a "variable control" SO_2 standard, with 90 percent emission reduction required of high sulfur coal and 70 percent emission reduction required of low sulfur coal. This "variable control" strategy is expected to result in somewhat greater use of western coal by eastern states in the year 1995 then would have resulted under uniform 90 percent emission control requirements. The amount of additional transported western coal, estimated at 27 million tons, represents about 23.7% greater volume of eastward transport of western coal. EPA studies conducted prior to selection of the variable control strategy have indicated to the Administrator that the adverse effects of this increase in use of distant sources of coal is offset by future advantages of variable source control levels including promotion of advance technology, retirement of obsolete electrical generation facilities, and anticipated cost savings.

Recognized Sources of Coal-Generated Particulate Source Pollution

5. Compliance with national ambient suspended particulate standards has proven difficult for the state and, for that matter, for most other regions of the country as well, largely because sources of particulate contamination are more extensive and varied. In contrast to sulfur and nitrogen dioxide pollution generally impacted by coal use only during the

combustion stage), particulate pollution occurs at every step of the coal fuel cycle and every site in which coal is mined, processed, transported, stored or burned.

State Areas of Noncompliance with Primary Particulate Standards

6. Primary Standard particulate nonattainment includes areas in the vicinity of Detroit, Saginaw, Flint and Albion. The most serious problems in attaining compliance exist in the Detroit/Wayne County metropolitan region.

Established Trend in Cleanup of Particulates

7. Available information does suggest that significant improvement in ambient concentrations of particulates has been achieved.

Control Programs for Continued Cleanup of Particulates

8. The state is continuing its efforts to achieve statewide compliance with ambient standards for suspended particulates. In particular, the Air Quality Division intends to require control of existing sources of particulate matter within areas of nonattainment, including fugitive dust control for at least the Detroit primary nonattainment area. In those regions of the state where it is not possible to demonstrate attainment with the primary or secondary standards for particulate matter, emission offsets for all new sources seeking to locate within the nonattainment areas is required. The emission rule in part, requires the operator of a proposed new source of particulates to provide for the control of an existing source(s) of particulates within the nonattainment area so that the overall effect is to achieve a net air quality improvement.

State Areas of Noncompliance with Primary SO_2 Standards

9. Most of the state is presently in compliance with the SO_2 national ambient air quality standards. Those regions of the state not currently in compliance should attain the SO_2 primary ambient air quality standards within the near future.

State New Source Air Pollution Review Procedures

10. The state has adopted procedures for review of new sources of air pollutants.

Implications of Control Programs and Future Coal Use

11. Overall, the state appears to have made excellent progress in developing necessary programs for attaining and maintaining compliance with air quality standards. Progress achieved will help to assure accommodation of projected increased in coal use consistent with standards for maintenance of environmental quality.

AIR QUALITY PROGRAMS RELATED TO TRANSPORTATION OF COAL

EPA in 1977 ordered that urban area fugitive dust control measures must be included in future revisions of the State Implementation Plan. (see transportation section). Included in rules currently being promulgated are sections which are directed at control of fugitive dust resulting from coal transportation, handling, and storage.

If adopted, specific rules will deal with many of the identifiable points of generated coal dust including: storage piles, loading and unloading, truck transport and outdoor conveyance. Conspicuously missing are regulations capable of addressing wind blown dust resulting from train transport. For a more detailed discussion of proposed fugitive dust regulations, please see the transportation policy section.

EVALUATION

1. Recognized Sources of Coal-Generated Particulate Source Pollution. Information contained in this report's discussion entitled "Air Quality Programs and Their Impact on Demand for Coal Use" identifies areas of nonattainment for suspended particulates. In contrast to sulfur and nitrogen dioxide coal-derived pollutant loads which are generated only during the combustion stage, suspended particulates may occur at every step of the fuel cycle and at every site in which coal is mined, processed, transported, stored and burned.

2. Possible Regional Policy Implications Concerning Coal Transportation Impacts. The most serious particulates nonattainment difficulties exist in the Detroit Metropolitan area.

3. Anticipated Programs for Managing Fugitive Dust Derived from Coal Transportation. Rules are presently under consideration which will aid the state in achieving a means for appropriate controls of fugitive dust resulting from coal transportation, handling, and storage. These rules appear to be adequate for managing fugitive dust problems with the exception that the rules do not specifically provide for control of coal dust derived from wind blowing over the tops of train cars.

THE NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) OF 1969

The National Environmental Policy Act of 1969 represents the first national declaration of a comprehensive environmental policy, as well as a attempt to implement that policy by ensuring the consideration of environmental values in administrative decision making. To this end, Section 102 of the Act contains "action forcing" provisions; provisions which seek to ensure agency behavior within the mandate of NEPA by requiring these groups to perform certain activities. Foremost among the provisions of section 102 is the requirement for Environmental Impact Statements (EIS's) found within Section 102(c). The primary purpose of the EIS is to provide full discussion of all significant environmental impacts resulting from major federal actions and to inform the public, as well as decision makers, of reasonable alternatives which could serve to avoid adverse impacts or even enhance the quality of the environment.

The requirements of Section 102 of NEPA may have a substantial effect on projects related to coal transshipment in the coastal zone of Michigan. EIS effects on the permitting process, with respect to facility development and/or supplementary activities, may be substantial and should be identified. Further, consideration of alternatives to various actions within EIS's may influence factors such as facility location, technology employment, and mitigation measures.

NEPA'S INFLUENCE ON AGENCY DECISION MAKING

As mentioned above, one of the main goals of NEPA was to involve the consideration of environmental values in agency decision making. Rules evolved pursuant to the act contain provisions constructed in an attempt to ensure the accomplishment of that goal and include:

- the implementation of procedures under Section 102(2) (action forcing procedures)
- identifying the major decision points within an agency's environmentally related programs, and assuring that NEPA process corresponds with them
- requiring relevant environmental documents, comments, and responses to be part of the record during rulemaking or adjudicatory proceedings
- requiring that such documents as those mentioned above, accompany a proposal through an agency review process
- requiring sufficient presentation and discussion of the full range of project alternatives

Agencies involved in cases falling under the NEPA provisions are also responsible for assuring that their decisions are carried out. Specifically, rules promulgated pursuant to NEPA mandate that mitigation measures and other conditions established in the environmental impact statement or during review, and committed as part of any decision, shall be implemented by their lead agency. In pursuit of this mandate, lead agencies shall take action such as conditioning the funding of actions on the implementation of mitigation measures; informing any cooperating or commenting agencies on progress in carrying out mitigation measures which they have proposed and which were adopted; making available to the public the results of relevant monitoring; and perhaps most importantly, including appropriate conditions in grants, permits, or other approvals.

NEPA's affect on the obtainment of the various permits which may be necessary during the construction of a facility such as one involved in coal transshipment can be substantial. Court decisions in cases such as Calvert Cliffs Coordinating Committee v. Atomic Energy Commission[1] have held that the issuance of permits and/or licenses to public as well as private entities can in some cases require the completion of Environmental Impact Statements. Environmental Protection Agency (EPA) argues that its environmental permit programs, being "environmentally oriented anyway",[2] should be exempted from NEPA requirements, have led to numerous exemptions under various federal acts. Due to such exemptions, specific pieces of Federal legislation in this area which would require EIS's in all cases are virtually nonexistant. The necessity of EIS completion is however determined on a case by case basis, and may be required under certain Federal laws in some circumstances.

Under the Federal Water Pollution Control Act, the construction of a facility of a type for which new source performance standards have been proposed; which is classified as a "new source", and which is in a state where the EPA administers the National Pollution Discharge Elimination System (NPDES); will require the completion of an EIS. Federal EIS's for such facilities are, however, not required when a state has assumed responsibility for the NPDES permit program,[3] and as Michigan has assumed such responsibility, would not be required for new sources in Michigan.[4] No other actions under the FWPCA would trigger the completion of an EIS.

Amendments to the Clean Air Act contained within the Energy Supply and Environmental Coordination Act of 1974 excluded EPA's actions under the Clean Air Act from the provisions of NEPA. Although this law did not exempt industrial coal conversion from NEPA requirements, the Powerplant and Industrial Fuel Use Act of 1978 does exempt Department of Energy (DOE) ordered conversions from the EIS process.[5]

Under the provisions of the Federal Coastal Zone Management Act, state coastal zone programs must be approved by the Secretary of Commerce, and EIS's are prepared for each program as it is submitted. Individual projects falling under programs within this act would be the responsibility of state agencies however, and would not reuqire federal EIS completion. It should be noted however, that dredge and fill permits required from the U.S. Army Corps of Engineers would be subject to the provisions of NEPA.[6]

Another piece of legislation which could potentially trigger the completion of an EIS with respect to the obtainment of a federal permit would be the Rivers and Harbors Act. Activities which could produce such by-products as hazards to navigation, for example pier extensions or permanent moorings, would require permits and could necessitate EIS's. Contacts within the Corps of Engineers have stated, however, that, although environmental assessments are carried out in virtually every case, very few EIS's are completed pursuant to the requirements of this act.

It should perhaps be noted that environmental assessments are carried out for practically all coastal development projects in the absence of EIS's. These assessments would, as would EIS's, include consideration of related secondary impacts, such as the construction of rail spur lines serving coastal facilities, when applicable. The general feeling among agency representatives contacted seems to be that assessments are preferable to EIS's in that they are less cumbersome and time consuming; possibly owing to the fact that they do not include sections found in EIS's such as discussions of alternative projects. EIS's are therefore generally conducted only in some of the circumstances mentioned above, and when projects are of a controversial nature.

SOME IMPORTANT FEDERAL EIS DEFINITIONS AND COMPONANTS

Major Federal Actions

"Major Federal Actions," as defined under NEPA, include actions with major effects which are subject to federal control and responsibility. Both new and continuing activities are included under this definition, as are projects and programs affected only partly by federal agency connections. Federal actions tend to generally fall into one of the following groups:

- adoption of official federal policy such as rules, regulations, treaties and international conventions or agreements, formal agency policy documents, and agency interpretations adopted subject to the Administrative Procedure Act.
- federally approved documents prescribing alternative uses of federal resources
- adoption of programs enacted to implement a specific policy or plan, and
- approval of specific projects, such as construction or management activities located in a specific geographic area. Projects include actions approved by permit or other regulatory decision as well as federally related activities.

Under this definition, many aspects of coal unloading and transshipment projects could be considered major federal actions and would require EIS's. Facility construction projects such as land clearing, access road and rail spurline construction and various port development projects such as pier or dock construction and dredging, would all probably fall within the definition of major federal actions.

Lead Agencies

Where more than one Federal Agency is involved in a certain project, NEPA requires the designation of a lead agency to supervise the preparation of the Environmental Impact Statement. When disagreements between agencies occur, the lead agency is to be determined by the following criteria:

- magnitude of agency involvement

- project approval/disapproval authority
- expertise concerning the actions environmental effects
- duration of agency's involvement, and
- sequence of agency's involvement

In certain cases, federal, state, or local agencies, including at least one federal agency, may act as joint lead agencies.

The potential effect of the designation of a lead agency for any given project should not be underestimated. Each agency brings with it a particular constituency, set of objectives, and set of priorities. The identity of the lead agency with respect to a coal transshipment project may help determine what problems are identified, what studies are undertaken, what alternatives are examined, and the nature of action on any necessary permits.

Alternatives

Based on the information and analysis contained in earlier parts of EIS's, latter sections of EIS's should present the environmental impacts of the proposal in question and any alternatives to the proposal in comparative form. The general purpose of the alternative section is to provide a sharp definition of issues and options, thereby providing a clear choice among options for decision makers. Specifically, the alternative section is to:

- explore and evaluate all reasonable alternatives and provide reasons for elimination from study for those eliminated
- evaluate each alternative, including the proposed action in detail sufficient to allow comparision
- include reasonable alternatives not within the jurisdiction of the lead agency
- include the "no action" alternative
- identify the agency's preferred alternative, and
- include appropriate mitigation measures not already included in the proposed action or alternatives

The alternative section of an EIS is perhaps the most important part of the statement. This section provides an opportunity for the examination of various solutions to a problem, inlcuding the "no action" alternative, and compels agencies to justify choices made from among various options. This part of an EIS may therefore yield the clearest exhibition of agency reasoning and objectives, as applied in the evaluation of a proposal, and can be viewed as a method of compelling agencies to account for their decisions.

Finding of No Significant Impact (FONSI)

A FONSI is a document by a federal agency briefly presenting the reasons why an action, not otherwise excluded, will not have a significant effect on the environment and for which an environmental impact statement will not therefore be prepared. It shall include at least a summary of the environmental assessment; and shall note any other environmental documents related to it.

NOTES

1. 449 F.2d 1109 (D.C. Cir. 1971)
2. Quarles, John, Federal Regulation of New Industrial Plants, Copyright 1979 by John R. Quarles, Jr., p. 196.
3. Ibid., p. 197.
4. 33 U.S.C. Subsection 1371 (c)(1).
5. Quarles, p. 197.
6. Ibid., p. 198.

MICHIGAN EIS REQUIREMENTS

Many state governments have enacted laws similar to NEPA which require the completion of environmental impact statements. Michigan does possess such a requirement, as outlined in Executive Order 1974-4 issued on May 3, 1974 by Governor Milliken. Large facility development projects are more likely to trigger the completion of a state EIS than a federal one, and such statements may therefore exert a greater influence on administrative decisions with regard to these projects.

The purpose, applicability, and structure of the Michigan EIS is substantially similar to those required under NEPA. Executive Order 1974-4 requires broadly that:

> all major activities of each agency of state government having a significant possible impact on the environment or human life be the subject of a formal environmental assessment by the agency involved.

Specifically, EIS's shall be applicable to all major state activities including:

(1) Policies

Any major policy, procedure, program or plan that sets a definite course or method of action that will result in any alteration or destruction of a significant element of the state's resources, that would significantly alter existing land use patterns and distribution of population, would result in alteration of the maintenance and enhancement of the long-term productivity of the state's natural resources, or would propose to change the management of a resource. An Environmental Impact Statement for any component of a program that constitutes a major activity.

(2) Administrative Actions

Major administrative actions taken by state agencies including: the issuance of licenses, permits or other forms of approval and authorizations for the discharge of use of materials that would result in significant degradation of environmental quality; the granting of exceptions or variances to rules or regulations, laws, administrative orders or guidelines, including a failure to act, on the part of an agency, where action is required by law, rule, regulation or order, that would likely result in significant degradation of environmental quality; the approval of projects requiring land acquisition, disposition or leasing, or construction that will utilize state funds including grants-in-aid; the authorization of changes in land utilization through exchange or use permits; industrial development or expansion programs or actions; or changes in administrative practices that would alter the management of our natural resources base and/or the relationships of portions of the base.

Under the guidelines of Executive Order 1974-4, state EIS's are to be prepared whenever:

(1) Requested by the Governor

(2) The director of an agency determines that a proposed activity may reasonably result in or create one or more of the significant environmental effects listed under Part 4 A(1) - (7) [of the Executive Order].

(3) An activity raises general public concern or controversy.

(4) Recommended by the Board after review of a "negative declaration EIS" or abstract and a finding that public concern or controversy exists or the proposed activity may reasonably result in or create significant environmental effects which warrant the preparation of an EIS.

(5) Requested by the Board as specified under Part 6 E (2) [of the Executive Order].

"The Board" referred to above is the Michigan Environmental Review Board (MERB) and is the entity responsible for the review of state EIS's with the aid of the Inter-Departmental Environmental Review Committee (INTERCOM). Executive Order 1974-4 makes it the responsibility of the MERB to recommend to the Governor those actions of state agencies that should be suspended or modified because of significant implications for the quality of the states environment, or human life.

State legislation has not been exempted from EIS requirements the way many federal programs have been. With respect to coal transshipment and related projects, various state laws could trigger the completion of EIS's pursuant to the granting of a permit or license. Specifically, the activities covered by the Great Lakes Submerged Lands Act, the Inland Lakes and Streams Act, the Wetlands Protection Act, the Great Lakes Shorelands Protection and Management Act, and the Soil Erosion and Sedimentation Act could still require the completion of EIS's under the guidelines of Executive Order 1974-4.

Contact with the executive director of the Michigan Environmental Review Board however, has indicated that few EIS's are completed pursuant to these acts. The reason for this seems to be that state agencies have not indicated that any projects requiring state permits contained impacts significant enough to trigger the provisions of Executive Order 1974-4. Assessments are still carried out in the determination of whether a state EIS is necessary or not, much as are federal assessments, yet again are not as extensive as EIS's. The MERB does keep track of any federal environmental impact statements being prepared on Michigan projects, and does occasionally provide comments on these statements, as well as notification of state agencies when actions possibly requiring state EIS's come up.

SOME IMPORTANT STATE EIS COMPONANTS AND DEFINITIONS

Major State Activities - Any policy, administrative action, or project, as described in Part 5A of these Guidelines, proposed by an agency of the State of Michigan which could reasonably raise a question about any of the following.

(1) A potential significant impact on the human environment that could adversely affect the public health and welfare or could degrade the quality of life.

(2) Alteration or destruction of a significant element of the human, natural, amenity or historic resources of the state.

(3) Significant alteration of existing land use patterns.

(4) Significant alteration of population distribution of which would lead to potential distribution changes.

(5) Significant impact on the maintenance and enhancement of the long-term productivity of the state's natural resources.

(6) The imposition of an alteration to the ecological balance of a significant element of the environment.

(7) Significant additional uses of energy resources or the acquisition thereof.

Alternatives - A listing of alternative actions to achieve the project or program objective, including: alternatives which cannot be effectuated by the agency. Quantitative and qualitative descriptions of each alternative in terms of both positive and negative economic and environmental impacts. The alternative of "no action" should be considered.

Negative Declaration EIS - A concise series of statements, with appropriate graphics, which describes an activity or action proposed by a State agency, identifies any potentially adverse environmental effects and public concerns or controversies that may occur as a result of the proposed activity or action, defines the significance of the environmental effects and public concerns or controversies and indicates that the activity or action does not warrant the preparation of an environmental impact statement.

EVALUATION

The environmental impact statement provisions of NEPA do not appear to have in the past, nor do they promise to in the future, greatly affect coal transshipment related projects in Michigan. Due to the extensive number of exemptions to NEPA's provisions, permits arising from statutes which would be expected to relate to coal transshipment most directly, often do not require EIS's. Other federal statutes require state implementation of federally outlined programs, and EIS's would be completed on the state level with respect to these programs if at all. In actuality, representatives of the

Michigan Environmental Review Board indicate that very few EIS's are conducted for projects related to our study area. Nevertheless, the framework for the requirement of state EIS's does exist; and the many exemptions from the requirements of NEPA which can be found in federal statutes are not present in state statutes with respect to the guidelines of Executive Order 1974-4. State environmental impact statements therefore may provide the best avenue for the examination of such factors as project alternatives, which are found in both federal and state EIS's, though generally not found in environmental assessments.

LEVELS OF ALTERNATIVES

Though it appears that not many federal or state environmental impact statements have been done for coastal facility projects in Michigan, the consideration of alternatives within any EIS's which may be done in the future will be important on both the federal and state level. Though the possible range of and circumstances surrounding various coal transshipment related projects is vast, there are some general alternative classes that would in most cases apply.

- The No-Project Alternative

  Under provisions of both NEPA and Executive Order 1974-4 the alternative of not undertaking any given project is to be considered in EIS alternative sections.

- Project Relocation

  Adverse impacts may sometimes be avoided by an alternative project location. In cases where such a result could possibly be gained by relocation, this alternative should be considered.

- Alternate Technologies

  In any cases adverse impacts can be avoided by the employment of technologies different from those initially proposed. Consideration of alternate structural solutions should therefore be considered as possible mitigation or prevention measures.

- Comprehensive Mitigation Strategies

  The development of a comprehensive mitigation strategy for the mitigation of potential environmental impacts could provide an alternative to other, perhaps more structurally oriented solutions to adverse impacts.

THE MICHIGAN ENVIRONMENTAL PROTECTION ACT

The Michigan Environmental Protection Act (MEPA) provides litigation guidelines for court cases dealing with the states air, water, and other natural resources. Specifically, MEPA expands the concept of standing for cases brought under this Act (Section 2); requires a prima facie showing of pollution or impairment by a plaintiff, which once made shifts the burden of proof to the defendant for the remainder of the action (Section 3); provides for temporary relief during administrative or judicial proceedings (Section 40) with retention of jurisdiction by the original court (Section 42) and requires the consideration of the liklihood or extent of pollution, impairment, or destruction of natural resources in all future administrative actions (Section 5[2]).

The provisions of MEPA clearly contain implications for the transshipment of coal in Michigan's coastal zone. First of all, cases brought alleging pollution impairment, or destruction of natural resources as a result of coal related activities in Michigan will be litigated under the MEPA guidelines. Once a prima facie case has been established by a given plaintiff, these guidelines can serve to place a rather heavy burden of proof on alleged polluters; while also empowering the courts to grant injunctive relief, possibly halting progress on coal related projects. Secondly, MEPA's requirement for envionmental considerations in administrative licensing or permitting procedures may effect the ease at which construction or development projects pass through the state bureaucracy when necessary. In shore, the provision of MEPA may slow coal development projects which present environmental threats, and may force environmental impact mitigation in some areas.

WATER POLLUTION CONTROL PROGRAMS

The following information discusses state water pollution control programs concerning site construction, impervious materials, and coal stockpile runoff controls.* Table 1 summarizes activities and facilities necessary for coal transport and may also be used to show that** the various potential sources of water pollution are of nonpoint source origin.

Note that Table 1 suggests that a range of coal-based transport facilities and activities may potentially impact several of the classical physical, chemical and biological parameters of water quality including total suspended solids (TSS), dissolved oxygen (DO), trace elements, toxic substances, oil and grease, pH, and nutrients. For more extensive information regarding water quality effects of land clearing, fugitive dust, spillage of coal and other potential water pollution sources, please see this report's environmental impact section.

A few general observations on achievement of cost-effective nonpoint pollution management may be in order. First, there is the problem of identifying, quantifying and modeling potential nonpoint source pollution problems. For example, with respect to coal fines, other than studies undertaken in the Duluth/Superior region,[1] it appears that almost no information is available on the potential water quality effects of coal particulates***. This deficiency of information probably reflects perceptions that environmental effects of coal transport are of relatively low priority in funding for both nonpoint source problem research; and for research of coal issues.

A second policy issue common to nonpoint source management relates to the nature of institutional arrangements established under the 208 program. Section 208 contains that FWPCA's major provisions requiring the state to manage nonpoint source water quality problems. In Michigan, 14 economic

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* Other transportation, air quality, and dredge and dredge disposal may also entail secondary benefits in maintaining water quality, however, these sections are discussed elsewhere in this report.

** Since the NPDES permit program for point source is the main means Congress devised for restoring water quality, the FWPCA provides a definition of point sources as follows: "... The term 'point source' means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft from which pollutants are or may be discharged." However, nonpoint source pollution was not defined by the Act, and consequently has evolved operationally by a process of excluding point sources. Of some assistance defining nonpoint source categories in and of themselves, EPA in its 1975 program regulations indicated the term refers to pollution that is:

1) Generated by diffused land use activities, not by identifiable facilities
2) Conveyed to waterways through strong runoff or groundwater seepage and
3) Not susceptible to "end of pipe" treatment, but controllable by changes in land practices.

*** See environmental impacts section.

development and planning regions have prepared initial 208 plans certified by the governor and approved by the EPA Administrator. These regional planning agencies do not have legal authorities for plan implementation. Instead, the actual implementation of the 208 plan is normally achieved by state and local entities, called "designated management agencies". Particularly where land use controls are the most cost-effective approach to managing nonpoint source pollution problems, it can be difficult to amend historic government roles and attitudes in management of land use effects on water quality. Decisions with respect to siting and design of industrial development (recognizing that location and design is often the single strongest determinant in the extent and severity of stormwater runoff) are decisions which largely remain the prerogative of local government.

There are at least two general means by which more effective water pollution control could be achieved by the state if necessary. One technique which could be employed would be to reclassify certain problems traditionally dealt with as nonpoint sources (e.g. stockpile runoff, land clearing, and creation of impervious surfaces) mandating that they will henceforth be treated as point source discharges. This redefinition of what constitutes a point vs. a nonpoint source is based on the concept of collection and drainage of pollution at readily identifiable discharge sources. NPDES permitting, in other words, could be extended to necessitate the establishment of an identifiable drainage network, such as point(s) of discharge and appropriate treatment strategies sedimentation basins.

As a second method, if any of the constituents of coal were ever to be classified as soluble toxic substances either by EPA or DNR toxic substances control divisions, it would be necessary to consider more extensive water pollution controls on coal transport and stockpiling.

Short of a) classifying coal as a carrier of soluble toxics, or b) redefining runoff from coal piles etc. as point source pollution, programs associated with water pollution derived from construction and operation of coal transport facilities will continue to focus on nonpoint source management. The major nonpoint source programs by activity are discussed below.

Site Preparation Controls

Act 347 of the Public Acts of 1972, the State Erosion and Sedimentation Act, represents one of the first state-enacted statutes of its kind in the nation. Under the Act, a landowner or developer who engages in an earth change shall, prior to commencement of the change, obtain a permit for any earth change which is a) 1 or more acres in size; or b) located within 500 feet of a lake or stream. Earth change, under the Act, is defined as a man-made change in natural cover or topography of land, excluding the practice of plowing and tilling for crop production.

Industrial development and transportation facilities are among the construction activities and earth moving changes regulated where located within 500 feet of a watercourse or where the total project area exceeds 1 acre. With the possible exception of expanded stockpiling at a site not adjacent to a lake or stream, proposed coal transport facility developments require an erosion and sedimentation permit.

TABLE I-6

SUMMARY OF POTENTIAL WATER POLLUTION
FROM COAL TRANSPORT ACTIVITIES AND INDENTIFICATION OF CURRENT REGULATORY FRAMEWORK

Activity	Pollution Parameter(s)	Control Program(s)	Administering Agency
Site Preparation			
Land Clearing	TSS, DO		- None
Earth Movement	TSS, DO, trace elements toxics	- Soil Erosion and Sedimentation Act	- Michigan DNR or local entity for DNR
Creation of Impervious Surfaces			
	TSS, oil and grease, trace elements, toxics	*also problems may be addressed as part of the 208 Planning Process	208 Designated Mgmt. Agency and other local entities.
Coal Stockpiling			
Stormwater Runoff	TSS , possible trace elements, ph	- Potential for addressing problems with the 208 Planning Process	- local entity
Fugitive Dust	TSS , possible trace elements, ph	- Fugitive dust source problems can be addressed under the Air Quality Implementinion Plan	- Michigan DNR
Coal Transportation			
- Fugitive dust		- Problems arising from fugitive coal dust within the Air Quality Implementation Plan	- Michigan DNR
- Spillage - Engine Emissions	TSS, ph, trace elements, CO, NO, CH	- Spillage of coal is not currently regulated	- None
Operation of Ships			
Vessel conduct	- Resuspension of TSS toxics, nutrients, trace elements	- Potential under Federal Ports and Waterways Act, No enforceable USCG Regs.	U.S. Coast Guard
Sanitary wastes	- bacteria, TSS, DO	- Regs. against oily bilge discharge (33CFR 155)	
Spillage	- TSS, trace elements, ph	- spillage not regulated	
Harbor Maintenance			
Dredging	- Resuspension of TSS, toxics, nutrients, trace elements	- FWPCA Section 404 Dredge and Fill Provisions	U.S. Corps of Engineers Michigan DNR jointly administer
Dredge Disposal	- Leaching of toxics, trace elements, TSS	- State Submerged Lands Acts (3) - Shorelands Protection and Management Act	

Earth changes under the Act, must be conducted in a manner which effectively minimizes the occurrence of accelerated soil erosion. This objective requires the permit applicant to prepare a soil erosion and sedimentation plan identifying control measures to be utilized during the duration of the project.

The Natural Resources Commission is authorized to delegate state, county or local implementing agencies for implementation of the Soil Erosion and Sedimentation Act. Rules of administering agencies may be more restrictive than the Act and state implementing regulations, but may not make lawful that which is unlawful.

The Soil Erosion and Sedimentation Act has already been evaluated by the Great Lakes Basin Commission as part of the regional Water Quality Plan. Appendices of the adopted Water Quality Plan, indicate that the Act represents a workable framework. However, the plan also concludes that weak enforcement due to inadequate staff represent major impediments to achieving the Act's objectives concerning construction activities.[2]

Controls on Creation of Impervious Surfaces

Once compliance with provisions of the Soil Erosion and Sedimentation Act has been assured, the applicant need be concerned only with local land use regulations. (See Zoning ordinance section) Creation of impervious surfaces will not be specifically regulated in most cases, however, if property is to be used for industrial purposes, the proposed use will need to comply with local zoning codes pertinent to the property.

The Great Lakes Basin Commission's adopted Water Quality Plan indicates that enabling legislation for local zoning codes does not contain adequate provisions which address environmental impacts of land use, including effects of stormwater runoff from urban areas.[3] In addition to problems within the enabling legislation, it should be indicated that lack of state judicial or legislative standards for guiding local rezoning decisions may pose limitations for use of zoning as a reliable environmental management technique.[4]

Coal Pile Runoff Controls

As previously suggested, Section 208 Water Quality Planning represents one of the chief mechanisms for evaluating and managing nonpoint source problems. However, while it was intended that during the course of developing the initial 208 policies specific recommendations for control strategies would be developed, this has not proven to be the case. Plan recommendations "instead are primarily non-interventive in nature and deal with additional planning, analysis, and so forth."[5]

According to sources contacted, nonpoint source controls on coal pile runoff, including sedimentation basins, have not yet been required - except possibly in isolated cases by local ordinances - for either existing or proposed new stockpile facilities. However, DNR does attempt to encourage runoff controls as part of its evaluation of new proposals, and promotes the use of sedimentation basins for coal runoff in conjunction with basins necessary for fly ash.[6,7]

FINDINGS

1. Water Quality Impacts. A wide range of water pollution problems may be aggravated by coal unloading and storage, but relatively little is known about the seriousness or magnitude of these problems.

2. Scope of Policy Description. Information contained in this section is pertinent to the following sources of water pollution emanating from coal-based transportation: site preparation, creation of impervious surfaces, and coal pile runoff. Effects on water quality of transportation, dredge and disposal of spoils, and air quality are addressed in other sections of this report's policy assessment.

3. Nonpoint Source Origin of Impacts. Water pollution from coal transportation based activities are widely perceived as constituting nonpoint source problems. Conceptually it is forseeable that either a) soluable constituents of coal may be placed on toxic or other critical materials lists; or b) specific coal transportation based activities may eventually warrant treatment as point source pollution activities. If either charge were to be promulgated in the future under state or federal regulations, more stringent management of water pollution resulting from coal-based transportation could be anticipated.

4. Site Preparation. The Soil Erosion and Sedimentation Act have been summarized by the Great Lakes Basin Commission as part of the regional Water Quality Plan. The Water Quality Plan notes that the Act represents a workable framework, however inadequate staff and weak enforcement have been recognized as major impediments to achieving the Act's objectives concerning construction activities.

5. Creation of Impervious Surfaces. The Great Lakes Basin Commission's Water Quality Plan indicates that enabling legislation for local zoning codes does not contain adequate provisions which address environmental effects of stormwater runoff from urban areas. In addition, it should be indicated that a general lack of state journal standards for guiding rezoning decisions may also pose practical limitations for use of zoning for environmental management purposes.

6. Coal Pile Runoff. Nonpoint source controls on coal pile runoff, including sedimentation basins, have not yet been required for either existing or proposed new stockpile facilities. However, DNR does attempt to encourage runoff controls as part of its evaluation of new proposals, and promotes the use of sedimentation basins for coal pile runoff in conjunction with the basins necessary for fly ash.

FOOTNOTES

1 Weston Environmental Consultants-Designers, Coal Transshipment Facility, Superior, Wisconsin, 1974.

2 Great Lakes Basin Commission, Water Quality Plan, November, 1979, page 84

3 Ibid., page 83

4 Inman, Don, Environmental Enforcement Division, DNR, communication, June 17, 1980

5 Southeast Michigan Council of Governments, Financial and Economic Impacts of Plan Recommendations, March, 1978

6 Howard, Alan, Point Source Studies Section, Environmental Services Division, DNR, private conversation, June 23, 1980.

7 Bek, Chang, Engineering and Technical Services, Water Quality Division, DNR, private conversation, June 23, 1980.

DREDGING AND DISPOSAL OF DREDGED MATERIAL

Introduction

The U.S. Army Corps of Engineers and the Department of Natural Resources serve as joint reviewing agencies permits for dredging and dredged materials disposal into navigable waters when undertaken by public and private entities. The Corps' regulatory authority, to be discussed, is historically grounded in the Rivers and Harbors Act of 1899 and also the Federal Water Pollution Control Act (FWPCA) of 1972. In addition, the Corps is charged by law with maintaining the navigable waterways of the United States.

The role of other federal agencies, including the EPA, U.S.Fish and Wildlife Service, and the State DNR in dredging and dredged material disposal, are also discussed in the following sections.

It should be readily apparent that coal is not the only commodity in Great Lakes waterborne commerce. Therefore, this analysis recognizes that coal transport by vessels, like other waterborne commerce, is dependent on dredge and disposal programs. Therefore, the analysis offers background material and specific recommendations which are intended to assist in accomodating increased coal transport consistent with environmental and economic objectives.

Federal Responsibilities for Dredging and Materials Disposal

The Corps of Engineers must deal with two categories of dredging and dredged material disposal projects: projects by the Corps which represent Federal commitments for improvement and maintenance of navigable waters and administration of permit programs for dredging, dredged material disposal and associated activites. These Corps responsibilities were summarized below.

Civil Works Activities

Within the state of Michigan, the Corps itself has constructed or provides maintenance for 64 projects,[1] 23 of which provide commercial navigation.[2] In addition, the Corps routinely processes Section 10 and Section 404 permits necessary for a wide range of purposes including recreational boating and commercial navigation.

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* See projections for discussion of current and future anticipated volumes of transportation for coal by water and by other modes.

Regulatory Authorities

The Corps of Engineers exercises regulatory authority in navigable waters of the United States under Sections 9, 10, and 14 of the Rivers and Harbors Act of 1899. Under Section 10, Corps of Engineers permits are required a) for virtually all excavation work within U.S. navigable waters; b) for discharge of dredged material or fill into navigable waters; and c) for placement of structures such as piers, wharves, docks, riprap and groins in areas of navigable waters.

In adopting the Section 404 provisions of the Federal Water Pollution Control Act, the Corps' regulatory authority over discharge of dredged or fill material into waters was again established. The purpose of the 404 program is to insure that the chemical and biological integrity of water is protected from irresponsible discharge of fill material. The principle differences between the Section 10 and Section 404 provisions is that 404 only regulates placement of fill and dredged material while section 10 applies to a broader range of activities without regard to whether there has been a discharge.[3] A discussion of dredging project review procedures follows.

Dredging Project Review Procedures

With respect to the administration of dredging and dredged material programs, three major pieces of federal environmental legislation have been adopted which have greatly affected the Corps administration of both its regulatory and its capital improvements and maintenance programs.[4]

The first of these, the Fish and Wildlife Coordination Act of 1958 was adopted as a consequence of concern over destruction by dredging and filling of aquatic nursery and feeding areas. The Act provides that whenever the waters of "any stream or other body of water are proposed or authorized to be impounded, diverted, the channel deepened, or the stream or other body of water otherwise controlled or modified for any purpose whatever by any department or agency of the United States, or by any public or private agency under federal permit or license, such department or agency must first consult with the United States Fish and Wildlife Service, Department of the Interior," as well as the applicable state agency, "with a view to the conservation of wildlife resources by preventing loss of and damage to such resources as well as providing for the development and improvement thereof in connection with such water resource development" [P.L. 85-624]

The second significant legislation amending activities of the Corps (and other Federal agencies) was the National Environmental Policy Act of 1969. NEPA specified that prior to initiation of any major Federal action[5], the responsible agency must prepare a detailed environmental impact statement. The statement prepared must include identification of the following: 1) the environmental impact of the proposed action; 2) any adverse environmental effects which cannot be avoided should the proposal be implemented; 3) alternatives to the proposed action; 4) the relationship between local short-term uses of man's environment and enhancement of long-term productivity; and 5) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented." (P.L. 91-190, Section 102).

The third major legislative change, the 1970 Rivers and Harbors Act of 1970 (P.L. 91-611), authorized the Corps to build, operate, and maintain confined disposal facilities for contaminated dredged materials on the Great Lakes and their connecting channels. This Great Lakes Confined Disposal Program requires the Corps to place behind retaining dikes all dredged material which EPA determines is contaminated (P.L. 91-611, Section 123). The law also authorized the Corps to conduct a research program on the effects of, and alternatives to, current dredged material disposal methods.

Section 123 of the Rivers and Harbor Act of 1970 (P.L. 91-611) requires EPA to assist the Corps of Engineers in administering the Great Lakes Confined Disposal Program. EPA, under this law, is responsible for establishing standards used for determining degree to which dredged sediment is contaminated. As noted previously, when dredged material exceeds EPA pollution standards, by law the material must be placed behind containment dikes.

Section 123 together with Section 404 of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 912-500) and Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (P.L. 92-532) all require that EPA, in conjuction with the Corps, must establish and apply guidelines for the discharge of dredged materials into inland and ocean waters. These acts have substantial impact on dredge and disposal programs because they give EPA, rather than the Corps, the final authority as to where dredged material can be dumped.[6]

STATE RESPONSIBILITIES FOR DREDGING AND MATERIALS DISPOSAL

The basis for state regulation of dredging and dredged materials disposal is derived form the major shorelands and waterways state statutes including the Great Lakes Submerged Lands Act (PA 247 of 1955), the Inland Lakes and Streams Act (PA 346 of 1972), the Shorelands Protection Act (PA 245 of 1970), and (after October 1980) the Geomaere-Anderson Wetland Protection Act (PA 203 of 1979), all discussed at length in other portions of this report.

For administering provisions of these Acts as they pertain to dredging and materials disposal, the state has established its own advisory committee. The committee, called the Dredge Spoils Committee, includes representatives from various state agencies for the purpose of providing technical assistance for DNR and the Corps concerning dredged material disposal plans.

State permitting authorities extend to federal civil works projects, particularly in cases where the state can identify project inconsistency with a portion of the approved coastal zone management program.[8] Through its coastal zone program, the state of Michigan has worked with the Corps to provide for dredging activities that are consistent with the state's program.

Under a memorandum of understanding between Michigan DNR and the U.S.Corps of Engineers, the state's Dredge Spoils Committee does provide the Corps with a review of the proposed project which indicates degree of proposal compliance with state laws and policies. Consequently, at present the Corps and Michigan DNR jointly process permit applications for all dredging and disposal projects within the state.

It should be noted that under the Federal Water Pollution Control Act, states are authorized to establish administering programs for regulating discharges of pollutants into the navigable waters. Michigan has already been certified by EPA as responsible for issuance of NPDES (Section 402) point source discharges.

However, the state certified program and Section 402 provisions in general, do not include jurisdiction over dredged materials disposal.

If the state's dredged material program were to be approved by EPA as meeting administrative Section 404 standards, state permits would be issued in lieu of joint federal-state permit administration. Interest has been expressed by state officials in such an arrangement, however, program certification is not pending at this time. Detroit District Corps officials have cautioned that state responsibility for permitting dredging and dredged disposal programs may not occur for some time. Nevertheless, the state has made progress towards creating the type of program which could qualify as acceptable under Federal standards.

EVALUATION

Types of Dredging Projects

1. Two categories of dredging and dredged material disposal projects have been recognized in this report: projects by the Corps which represent federal commitments to maintenance of navigable waters; and projects by all other agencies and individuals which require permit approval.

Number of Civil Works Projects

2. Within the state of Michigan, the Corps provides maintenance for more than 64 navigation projects, of which 23 provide for water-borne commerce.

Maintenance of Existing Projects

3. As funds for federal projects becomes more limited, maintenance of existing Corps projects is likely to receive priority over initiation of new projects.

Identification of Initial and Maintenance Dredging Requirements

4. Dredging requirements necessary to support water-borne coal delivery may include the following: a) initial dredging for accomodating site delivery; and b) increased maintenance necessary for removal of channel sedimentation resulting from fugitive coal dust, runoff from coal piles, and resuspension of sediments caused by vessel operations.

Long-term Material Disposal Planning Needs

5. Where increased harbor delivery of coal is forecasted, additional confined dredged material disposal may be necessary. In instances where capacity of existing and planned confined disposal sites is constrained, it may be appropriate to encourage long-term disposal site acquisition and materials disposal planning prior to permit approvals.

State Responsibilities for Project Review

6. State administration of Section 404 FWPCA permits is a theoretical possibility once the state establishes an adequate regulatory framework. Presently the state has dredging and filling statutory provisions and has also made arrangements with the Corps for joint administration of permit applications.

FOOTNOTES

[1] Rogers, Environmental Law, page 399.

[2] Schoof, Carl, Corps of Engineers, Detroit District. Operations and Maintenance Branch, Phone interview, July 22, 1980.

[3] Billmaier, Donald L., Corps of Engineers, Detroit District. Chief, Operations and Maintenance Branch, Phone interview, July 2, 1980.

[4] General Accounting Office, "Dredging America's Waterways and Harbors - more information Needed on Environmental and Economic Issues", CED-77-74, June 28, 1977

[5] The GAO in its report entitled Dredging America's Waterways and Harbors indicates that the Corps has established an internal policy not to perform maintenance dredging without preparation of an EIS. This decision reportedly was made in response to a) guidelines published by the Council of Environmental Quality and b) a 1974 court decision. Since January 1, 1976, according to GAO the Corps has opted to prepare EIS statements for both new construction and maintenance dredging projects.

[6] ibid, page 11.

[7] Haywood, David, Chief of Land, Lake & Stream Protection Section, Personal interview, June 17, 1980.

[8] GAO, Dredging America's Waterways and Harbors, page 12.

[9] Billmaier, Donald L., phone interiew

STATE SUBMERGED LANDS LEGISLATION

Three state acts are discussed in the following sections each dealing with permit requirements for use of submerged lands and wetlands. These acts are discussed in order of their adoption by the state legislature. They are: the Great Lakes Submerged Lands Act (P.A. 247 of 1955), the Inland Lakes and Streams Act (P.A. 346 of 1972) and the Geomaere-Anderson Wetland Protection Act (P.A. 203 of 1979).

A single evaluation of these acts is presented in concluding remarks.

GREAT LAKES SUBMERGED LANDS ACT

Public Act 247 of 1955 applies to bottomlands and waters of the Great Lakes within the boundaries of the state. These bottomlands include bays and harbors lying below and lakeward of the ordinary high water mark. In most cases these lands belong to all the citizens of Michigan and, even where such lands have been sold, leased or otherwise granted to private interests, the state generally maintains a vested interest in protection of certain natural resource and public use of navigable waters. The Great Lakes Submerged Lands Act, Public Act 247 of 1955, provides a measure for the protection of these public interests.

In instances where dredging, filling or construction activities would involve use or alteration of the Great Lakes bottomlands, a permit for the activity is required. The Department of Natural Resources, acting on behalf of the state, is authorized to issue a permit only after finding that the proposed activity "will not substantially affect the public use thereof for hunting, fishing, swimming, pleasure boating or navigation..."[1]

Additional provisions are incorporated into the Great Lakes Submerged Lands Act which permit the Department of Natural Resources to enter into agreements which provide for sale, lease, exchange or other disposition of bottomlands. Prior to approving such agreements, the Department must find that the sale, lease or exchange of bottomlands will not impair the public trust in bottomland and waters of the Great Lakes.[2]

Implementing regulations for the Great Lakes Submerged Lands Act provide for coordination of the following government agency approvals to accompany the permit application[3]:

(a) Action by the United States Corps of Engineers shall be in permit or letter form to the applicant and shall indicate the consent or nonobjection of the corps from the standpoint of federal navigation.

(b) Approval by the State Waterways Commission shall be in letter form to the applicant and shall indicate the consent or nonobjection of the commission.

(c) Approval by a local unit of government shall be in the form of a certified copy of a resolution of its legislative body.

Within the implementing regulations, additional language was adopted by the Natural Resources Commission re-emphasizing that the Department shall consider public interest and public trust when reviewing permit applications.[4] In addition rules indicate that the Department concerns shall include maintenance of the shoreline.[5]

Therefore, collectively, criteria for approval of Great Lakes Submerged Lands applications indicate that public interest and public trust shall be considered in the following areas: navigation, hunting, fishing, swimming, pleasure boating and maintenance of the shoreline. Hunting and fishing concerns logically permit the Department to consider effects of the application on recreational opportunities and habitat considerations.

INLAND LAKES AND STREAMS ACT

Public Act 346 of 1972, the Inland Lakes and Streams Act, provides for protection of connecting Great Lakes channels including the St. Marys, St. Clair and Detroit Rivers, as well as inland lakes, streams and surface water areas of greater than 5 acres. The Inland Lakes and Streams Act specifically does not cover the Great Lakes and Lake St. Clair (which are under jurisdiction of the Great Lakes Submerged Lands Act) as well as those lakes and ponds with a surface area of less than 5 acres (under the Act such watercourses remain unregulated).

Within submerged lands areas covered by the Inland Lakes and Streams Act, a permit is required for various activities, including: dredge or fill of bottomland, placement of a structure on bottomland, and construction of a connecting artificial waterway.

The Department of Natural Resources, under the Statute

> "shall issue a permit if it finds that the structure or project will not adversely affect the public trust or riparian rights. In passing upon an application the department shall consider the possible effects of the proposed action upon the inland lake or stream and upon waters... and the uses of all such waters, including uses for recreation, fish and wildlife, aesthetics, local government, agriculture, commerce and industry. The department shall not grant a permit if the proposed project or structure will unlawfully impair or destroy any of the waters or other natural resources of the state."[6]

Implementing regulations for the Inland Lakes and Streams Act elaborate on criteria for permit approval, and are more specific than the implementing regulations for the Great Lakes Submerged Lands Act. Still, considerable flexibility is evident in the Inland Lakes and Streams Acts implementing standards.[8] Prior to permit issuance, DNR shall determine all of the following:

(a) That the adverse effects to the environment and the public trust are minimal and will be mitigated to the extent possible;

(b) That the resource affected is not a rare resource;

(c) That the public interest in the proposed development is greater than the public interest in the unavoidable degradation of the resource;

(d) That no feasible and prudent alternative location is available.

GEOMAERE-ANDERSON WETLAND PROTECTION ACT

Public Act 203 of 1979 covers wetlands, bogs, swamps and marshes which support aquatic or wetlands habitat and which is any of the following:

(1) Contiguous to a lake, pond, river or stream;

(2) Not contiguous but more than 5 acres (except for counties of less than 100,000 population until completion of a wetlands inventory); or

(3) Not contiguous and less than 5 acres if DNR determines that protection is essential and has so notified the owner.

After October 1980, the Act requires a permit from the DNR for essentially of the preceding wetlands areas. Uses of wetlands requiring a permit before initiation include drainage of surface water, structural development, dredging and placing of fill material.*

Implementing regulations for the Wetlands Act are currently being developed. It should be noted that in adopting the Wetlands Act, the legislature approved a relatively specific statute compared to the Great Lakes Submerged Lands and Inland Lakes and Streams Act particularly with respect to what criteria shall be used by the DNR in administration of the Act. The extensive criteria for approval of permits are outlined below:

(1) The DNR shall consider the following values of wetlands as part of the criteria for administering the Act**:

(a) Wetland conservation is a matter of state concern since a wetland of 1 county may be affected by acts on a river, lake, stream, or wetland of other counties.

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* Note the following exceptions:

1. Certain specified uses are allowed in a wetland without a permit [Section 6(2)], the range of uses exempted imply that transportation and coal stockpiling activities would require a wetlands permit located within wetlands covered by this act.

2. Specifically exempted from provisions of the Wetland Protection Act or activities requiring a permit under the Great Lakes Submerged Lands Act or Inland Lakes and Streams Act. In other words, the Wetlands Protection Act does not replace or otherwise affect the jurisdiction of earlier submerged lands legislation. [Section 6(1)].

3. Finally, after federal approval of a state program under Section 404 of the Clean Water Act of 1977 (see this report dredging and dredged material disposal section) where a project solely involves the discharge of fill material subject to the approved state 404 program, an additional permit shall not be required by this act. [Section 6(3)]

** This list serves the function of permitting the DNR to consider or broad range of state interests and public values for wetlands conservation. These values of wetlands are called criteria by the Wetlands Protection Act, however in all fairness, they can serve as criteria only in conjunction with the Act's other standards for project proposal review.

(b) A loss of a wetland may deprive the people of the state of some or all of the following benefits to be derived from the wetland:

(i) Flood and storm control by the hydrologic absorption and storage capacity of the wetland.
(ii) Wildlife habitat by providing breeding, nesting, and feeding grounds and cover for many forms of wildlife, waterfowl, including migratory waterfowl, and rare, threatened, or endangered wildlife species.
(iii) Protection of subsurface water resources and provision of valuable watersheds and recharging ground water supplies.
(iv) Pollution treatment by serving as a biological and chemical oxidation basin.
(v) Erosion control by serving as a sedimentation area and filtering basin, absorbing silt and organic matter.
(vi) Sources of nutrients in water food cycles and nursery grounds and sancturaries for fish.

(c) Wetlands are valuable as an agricultural resource for the production of food and fiber, including certain crops which may only be grown on sites developed from wetland.

(d) That the extraction and processing of nonfuel minerals may necessitate the use of wetland, if it is determined that the proposed activity is dependent upon being located in the wetland, and that a prudent and feasible alternative does not exist.

(2) A permit shall not be approved unless the DNR determines that: a) the permit is in the public interest; b) that the permit is necessary to realize benefits derived from the activity; and c) that the activity is otherwise lawful.

(3) In determining whether the activity is in the public interest, the benefit which reasonably may be expected to accrue from the proposal shall be balanced against the reasonably foreseeable detriments of the activity. The decision shall reflect the national and state concern for the protection of natural resources from pollution, impairment, and destruction. The following general criteria shall be considered:

(a) The relative extent of the public and private need for the proposed activity.

(b) The availability of feasible and prudent alternative locations and methods to accomplish the expected benefits from the activity.
(c) The extent and permanence of the beneficial or detrimental effects which the proposed activity may have on the public and private uses to which the area is suited, including the benefits the wetland provides.
(d) The probable impact of each proposal in relation to the cumulative effect created by other existing and anticipated activities in the watershed.
(e) The probable impact on recognized historic, cultural, scenic, ecological, or recreational values and on the public health or fish or wildlife.
(f) The size of the wetland being considered.
(g) The amount of remaining wetland in the general area.
(h) Proximity to any waterway.
(i) Economic value, both public and private, of the proposed land change to the general area.

(4) In considering a permit application, the department shall give serious consideration to findings of necessity for the proposed activity which have been made by other state agencies.

(5) A permit shall not be issued unless it is shown that an unacceptable disruption will not result to the aquatic resources (as determined pursuant to items 1 and 3).

(6) A permit shall not be issued unless the applicant also shows either of the following:

(a) The proposed activity is primarily dependent upon being located in the wetland.
(b) A feasible and prudent alternative does not exist.

EVALUATION

1. In general the adopted submerged lands legislation (Great Lakes Submerged Lands Act, Inland Lakes and Streams Act and Wetlands Protection Act) can be interpreted as requiring a state-issued permit for virtually any coal tansport or storage proposal involving wetlands or submerged lands within the Great Lakes, inland streams or rivers, and most other wetlands of greater than 5 acres.

2. Language adopted by the legislature in passage of the recent Wetlands Protection Act represents improvements in state management of natural resources with respect to the geographic areas where the state has determined that resource management programs are needed. The Act's language provides fairly specific language for use by the administering agency in review of proposed projects.

3. The Inland Lakes and Streams Act and Great Lakes Submerged Lands Act remain in effect. Many (if not most) project proposals for coal transportation activities will continue to fall under the jurisdiction of the Inland Lakes and Streams and Submerged Lands Act.

4. The continued development of specific guidelines - perhaps modeled in part after the legislature's Wetlands Protection Act criteria - would probably improve the Inland Lake and Stream and Submerged Lands Act for both the department and for other interested parties of all types. Some of the language of the Wetlands Protection Act which may merit attention by the Natural Resources Commission and state legislature in considering future amendments include the following:

   a. Is the proposed activity primarily dependent upon being located in a submerged lands or wetlands area?

   b. Has serious consideration been given to findings of necessity for the proposed activity mode by other (state) agencies?

   c. What is the probable impact of the proposal in relation to cumulative trends resulting from area land use changes?

   d. What is the public need for the proposed activity?

5. Since the three separate acts deal with submerged lands areas and require permits for basically the same set of potential uses, they should be administered in a coordinated manner.

THE SHORELANDS PROTECTION AND MANAGEMENT ACT

Public Act 245 of 1970, the Shorelands Protection and Management Act contains procedures for the designation of specified land areas and for regulation of land uses within three categories of Great Lakes shorelands: (1) environmental areas, (2) areas prone to high risk erosion, and (3) areas within the 100-year floodplain. The Act institutes what is probably the single most comprehensive state land use legislation pertaining to management of Great Lakes shoreland in that the Act is intended to prevent needless destruction of critical shoreland habitat and also provides measures for consumer protection. Substantive requirements of the Act vary according to shoreland category, the following discussion covers each of the land categories recognized by the Act.

Environmental Areas

As defined in the Shorelands Protection and Management Act, "an environmental area is an area of the shoreland determined by the department... to be necessary for the preservation and maintenance of fish and wildlife." To be eligible for departmental designation as an environmental area, property must lie within 1,000 feet landward of the ordinary high water mark of the Great Lakes or a connecting waterway. Also eligible are lands adjacent to waters affected by levels of the Great Lakes.

Under regulations promulgated by the state Natural Resources Commission, the following shorelands uses in designated environmental area shall require a permit from the department or from a local government agency pursuant to state approved local ordinance:

1) Dredging, filling, grading or other soil alterations;
2) Placement of permanent structures;
3) Modifications of natural drainage, except that reasonable care and maintenance of established drainage improvement works is not regulated; and
4) Alteration of vegetation utilized by fish and wildlife for spawning, nursery, feeding, migration, and other purposes (except that timber harvest is generally not regulated unless the site involves a colonial bird nesting area)

Under the adopted regulations, the preceding activities, if proposed for a designated environmental area, would require a state permit or a local permit issued pursuant to a state-approved ordinance. In cases where an approved local ordinance does not exist, the Act's implementing regulations provide that a permit application from the state shall be approved if both of the following conditions are satisfied:

A) Adverse effects to fish and wildlife habitat are minimal and have been mitigated to the maximum extent feasible; and
B) No feasible and prudent alternative to the proposed plan is available.

EVALUATION

1. Areas designated as environmental areas under the Shorelands Protection and Management Act tend to be wetlands or marshes but also includes some uplands and islands. Of over 2,000 miles of Great Lakes shorelands, as of May, 1978, approximately 100 miles had been designated as environmental areas. Approximately 35 additional miles have been added from May 1978 to July 1980.[4] Ultimately, the Department goal is to consider environmental areas designation for around 300 miles.[5]

2. It is generally acknowledged that the Shorelands Protection and Management Act represents one of the most useful provisions available for conservation of designated shorelands environmental resources.

3. If proposed for a designated shorelands environmental area, coal stockpiling and transportation facilities, together with associated industrial development, are not likely to be found compatible with purposes of the environmental designation. It is safe to assume that coal-oriented facilities will not (and should not) be located within designated environmental areas.

4. Formal project review mechanisms have not been established for considering environmental impacts of coal handling facilities where such facilities are proposed for sites adjacent to (or otherwise impacting) designated environmental areas.

5. Shoreland areas not designated as a critical environmental area may still contain important environmental values, including critical habitat for fish and wildlife. A mechanism for state review for shorelands project development for such sites has not yet been established, a shorelands project, however may require review under other state statutes such as the Soil Erosion and Sedimentation Act and Great Lakes Submerged Lands Act.

Areas Prone to Erosion

A "high-risk [erosion] area" is defined in the Act to be shorelands area determined by the department to be subject to erosion. Regulation promulgated by the Natural Resources Commission specify that the department shall designate high-risk areas where the department finds "that bluffline recession has been occurring at an average annual rate of 1.0 foot or greater per year, based on a minimum period of 15 years."

Of over 2,000 miles of Great Lakes mainland shoreline (excluding islands), the state has approximately 400 miles of shoreland which can be classified as high risk erosion areas,[1] of which about 225 miles are currently designated.[2]

Regulations promulgated by the Natural Resource Commission require the department to designate a minimum required setback from the bluffline in all designated high risk erosion areas. This setback is intended to provide a projected 30-year erosion zone. Permanent structures are not to be permitted within the required setack except under special circumstances where a parcel has been established prior to high-risk area designation and after additional criteria have been satisfied.[3]

EVALUATION

1. Of approximately 400 shoreline miles which have been recognized as of November 1979 as containing features which qualify the shoreland as a high-risk erosion area, only 197 miles were designated as of May 1978 and 225 miles as of July 1980.

2. Complete implementation of provisions of the Shorelands Protection and Management Act pertaining to measures for high-risk erosion areas which have already platted or improved has proven more difficult than implementation of protective measures for undeveloped lands.

3. A shoreline characterized by eroding bluffs is unlikely to qualify as potential water-related prime industrial development areas, which suggests that conflicts between coal handling facilities and designated high-risk erosion areas will be minimal.

4. Any new coal transportation facility sites within designated high-risk erosion areas will need to comply with required setbacks.

Flood Risk Areas.

As defined in the Shorelands Protection and Management Act, "flood risk area" means the area of the shoreland which is determined to be subject to flooding from effects of levels of the Great Lakes and is not limited to 1,000 feet. Implementing regulations further define the area of flood risk to be any area within the 100-year floodplain of a Great Lake or connecting waterway (as identified in an approved floodplain delineation study).

Under the Shorelands Act implementing regulations, "new nonresidential structures in a (designated) flood risk area shall have the lowest floor, including basement, not lower than the elevation defining the flood risk area, or together with attendant utility and sanitary facilities, be certified by a professional engineer or architect to be designed so that below the elevation defining the flood risk area, the structure is watertight and able to withstand hydrostatic pressures from a water level equal to the elevation defining the flood risk areas." (R 281.24 (10)).

EVALUATION

1. Structural facilities proposed for properties wholly contained within a designated flood hazard area must be able to comply with flood-proofing requirements for protection of the site from risk to life and property values.

2. Structural facilities proposed for properties partly within a designated flood hazard area must either: a) be sited in areas outside of the designated flood hazard area; or b) must provide adequate flood-proofing design approved by the DNR or local administering entity for DNR.

3. Coal stockpiling and non-structural coal handling equipment and facilities are not restricted under the Great Lakes Shoreland Protection and Management Act provisions pertaining to flood hazards.

SPECIAL LANDS LEGISLATION

Natural Rivers Areas

The Natural River Act, Public Act 231 of 1970, provides for designation of "a river or portion thereof, as a natural river area for the purposes of preserving and enhancing its values for water conservation, its free flowing condition and its fish, wildlife, boating, scenic, aesthetic, flood plain, ecological, historic and recreational values and uses."[1]

There are at least three classes of potential river designation - wilderness, wild-scenic and country-scenic - the purposes of each being to provide appropriate protection for recreational, scenic, historic, cultural, economic and environmental values. Designated rivers are free flowing and tend not to be intensively developed. Generally speaking, land presently in industrial use would not be included within Natural Rivers designation areas, and, in addition, proposed industrial facilities within a designated natural river area would ordinarily be found incompatible with the original purposes of designation.

River areas presently designated and other potential natural river areas under study are depicted in Figure I-3. Note that coastal zone area designated natural rivers presently include the Two Hearted, White, Betsie, Pere Marquette, and Rifle Rivers.

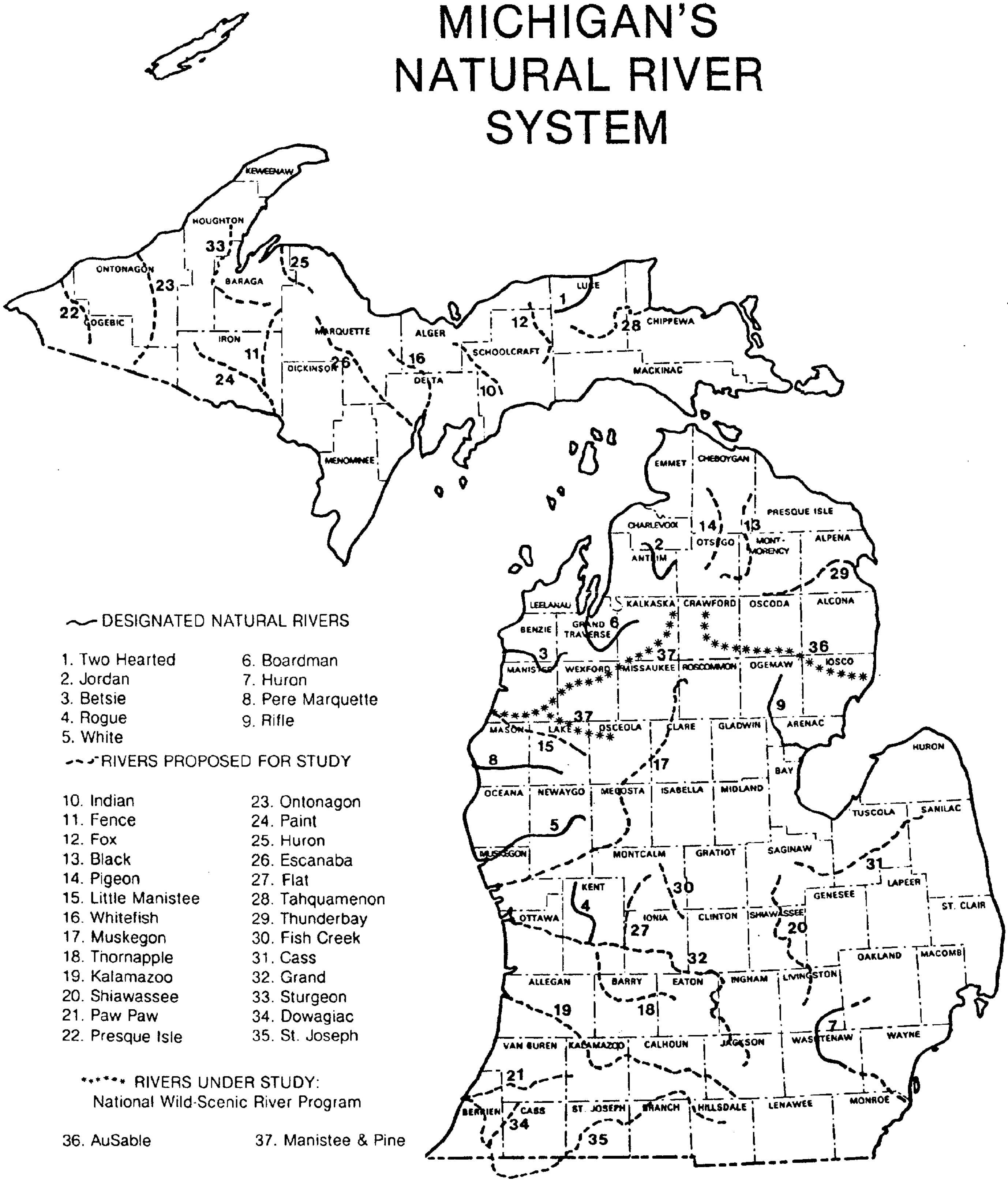
Agriculture and Open Space Areas

Under the Farmland and Open Space Preservation Act, P.A. 116 of 1974 as amended, landowners are entitled to voluntarily enter into a development rights agreement with the state. These agreements (including easement agreements) are legally recorded and ensure that enrolled lands remain as active farmland or open space areas for an agreed period of time. In insert Michigans natural river system return for maintaining the open space uses of the land, the landowner is entitled to specific tax benefits.

The significance of the Act is that it effectively serves to assist eligible landowners in retaining the lands agricultural or other open space values. As with designated Natural Rivers areas, this aspect of the program implies that development of industrial facilities is not compatible with purposes at the enrollment of land under the Farmland and Open Space Preservation Act.

FIGURE I-3

MICHIGAN'S NATURAL RIVER SYSTEM



NOTE: All rivers include some tributaries.

ZONING AND OTHER LOCAL ORDINANCES

Although the legal history of zoning law in America is a complex and rapidly evolving area of public policy, the following section will endeavor to describe the major statutory provisions enacted by the legislature which specify the purposes and intent of local government zoning. Other local ordinances–often collectively cited as "nuisance laws" or "police powers of local government" - must generally prescribe to the same kinds of tests for reasonableness of regulation. Local ordinances of this type include laws on air and water pollution and restrictions on routing of trucks. The following, specific to local zoning ordinances, also generally describes the limits of local regulations under this more general range of local government activities.

The state enabling legislation for local zoning dates back to 1921, when Public Act 207 the City and Village Zoning Act was first adopted. That original Act has been amended several times, most recently by Public Act 638 of 1978. Similar legislation has been adopted which enables the enactment of zoning ordinances by townships (Public Act 184 of 1943) and counties (Public Act 183 of 1943). All of the initial enabling legislation have been recently amended.

Collectively, these Acts provide that the legislative body of cities, villages, townships and counties may regulate and restrict the use of land and structures by dividing a geographic area into districts. Under* each of these Acts, local zoning in Michigan is voluntary and not compulsory. According to the enabling legislation, established zoning districts may permit, exclude from some districts, or subject to special regulations, all land uses.

However, the ability of a city, village or other local entity to exercise its zoning authorities is not completely unfettered. Several conditions for determining whether an adopted ordinance is a valid regulation can be specifically cited from the state enabling legislation and as a consequence of state court interpretations of zoning ordinance. These general limitations on the authority of local government to enact land use restrictions under zoning ordinances include:

1. Regulations and districts authorized by the zoning enabling legislation must be in accordance with a plan designed to promote and accomplish objectives of the enabling legislation (Public Act 638, of 1978);

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*One of the major differences between enabling legislation for incorporated jurisdictions, township, and county zoning, concerns intergovernmental review.

Incorporated cities and villages are autonomous, and formal review and coordination proceedings by state and other jurisdictions is not required.

County zoning ordinances, require review and approval by the DNR, though it has been proposed that this function be switched to the Department of Commerce.

Township zoning requires that the county government be permitted an advisory role, but county or state approvals are not required for zoning.

All local zoning regulations of wetlands, floodplains, coastal environmental areas, and designated natural rivers, are subject to DNR review and approval.

2. Although use of one's properties subject to ordinances designed to promote common good, regulations and districts must bear some meaningful relationship between restriction on property use and valid exercise of power. (Deltowne Housing Corporations v. City of Escanaba, 65 Mich App 624). Legitimate purposes recognized by the state for zoning include: to meet the needs of the state's residents for food, fiber, energy and other natural resources, places of residence, recreation, industry, trade, service, and other uses of land; to insure that uses of the land shall be situated in appropriate locations and relationships to limit the inappropriate overcrowding of land and congestion of population and transportation systems and other public facilities; to facilitate adequate and efficient provision for transportation systems, sewage disposal, water, energy, education, recreation, and other public service and facility needs; and to promote public health, safety, an welfare.

3. A zoning ordinance may be found unreasonable (using the judicial "arbitrary and capricious" standard) if the ordinance excludes legitimate land uses where such land uses are permitted in another district (Werkhoven v. City of Southfield, 75 Mich App 188 and Deltowne Housing Corporation v. City of Escanaba, 65 Mich App 624).

4. Although property need not be zoned for its most lucrative use, depreciation of land values may be considered as a factor in determining whether a zoning classification is unconstitutional as a taking without just compensation. (Equitable Bldg. Co. v. City of Royal Oak, 65 Mich App 223).

EVALUATION

1. Zoning (or other locally adopted) ordinances are most likely to be ruled a valid regulation if the ordinance has been adopted by the local legislative body according to acceptable procedural steps and if the regulation represents a reasoned approach to protection of public health, safety and welfare.

2. A zoning ordinance may preclude uses which it finds incompatable to a given geographic area if the use is an unlawful use, if no location exists where the use can appropriately be cited, or if the local entity has provided or set aside other areas specifically suited for accomodating the proposed use.

3. With respect to coal transportation facilities and associated industrial development, a local entity retains regulatory jurisdiction, if it chooses, over siting deisions within certain statutory and judicial limitations outlined in the main text.

4. Local entities also possess general powers to regulate nuisances to public health, safety, and welfare. The scope of such powers does not extend to regulation where the ordinance is determined to be "arbitrary and capricious."

RECREATION PLANNING

The state of Michigan's recreation planning efforts date back to the 1965 adoption of Public Act 316. This act authorizes DNR to "prepare, maintain and keep up-to-date a comprehensive plan for the development of the outdoor recreation resources of the state." The most recent plan, approved in 1979 urges that it is a public responsibility to "address inbalances in recreation opportunity."[2] The results of extensive inventory and analysis by the DNR indicates that for several distinct reasons urban recreational opportunities and facilities present the most serious policy issues, although historically more emphasis was given to provision of recreation facilities in rural areas, including northern Michigan. This conclusion is of special significance to the study of coal transportation in that: a) loss of recreational opportunities has been identified as one of the potential adverse impacts of increased coal utilization; and b) it can be anticipated that much of the future increase in coal use will occur in southern Michigan urban areas.

The following statements extracted from the 1979 Recreation Plan assist in identification of the geographic issues[3]:

1. Michigan's densely populated southern regions have a smaller share of the state's water resources on a per person basis compared to northern regions ... Public programs have not sufficiently emphasized developing to the fullest possible extent the recreation potential of the limited physical resources in southern Michigan, particularly the southern Michigan, Great Lakes shoreline.

2. Private lands are being closed to public use at an alarming rate, ... resulting in more pressure on public resources particularly in southern Michigan.

3. Rapid development of available open space will continue reducing potential recreation sites, particularly in high population growth areas ...

4. Valuable agricultural lands and wetlands continue to be lost to competing uses ... One result of rapid and unguided development is destruction of valuable plant communities and animal habitat, and the recreation potential attached to them.

5. Regional and state (land use) controls are inadequate to assure the future availability of these areas as potential recreation resources. There is no long-range comprehensive or even shortrange development plan to guide state and local development.

Compounding this perceived imbalance in recreational opportunities, the state recognizes that financing for operation of recreational facilities is declining at local and state levels.[4] Securing reliable sources of revenue for site acquisition, capital improvements and operations financing is therefore of continuing concern to recreation planners. The state has placed emphasis on cost-effectiveness of programs, support for state and local legislation providing fiscal support to meet rising costs and lost program revenues, and encouragement of private recreation opportunities and facilities where appropriate.

The state recreation plan addresses protection of the recreation resource base, again emphasizing the adverse effects of rapid development of available open space particularly in southeastern Michigan. Management actions to correct the perceived loss of agricultural land, wetlands and other open space areas suggest that state recreation planners place a high priority on securing effective land use legislation.

Of assistance in the future, recreation planners and others will be able to utilize results of resource inventories conducted pursuant to P.A. 204 of 1979. The Resource Inventory Act provides for funding and technical assistance to be made to municipalities, counties and regional planning commissions for participation in a uniform inventory process.

EVALUATION

1. Recreation needs. State recreation planning has recognized that some of the most severe imbalances between recreational needs and facilities are to be found in southern Michigan urban regions. This imbalance has been recognized as a legitimate state concern.

2. Need for matching facilities. Maintenance of urban waterfront park facilities and development of future waterfront recreation facilities within urban regions are key elements in the effort to efficiently serve the recreation needs of large segments of the population.

3. Depletion of recreational resources base. Particularly in southeast Michigan, it appears that overuse of recreation facilities, improper use of facilities and land development in general continues to deplete the natural resource base and environmental attributes necessary for pleasurable recreation.

4. Use of underdeveloped waterfront areas. Vacant and usable urban waterfront areas in southern Michigan (including southern Lake Michigan, southern Lake Huron, Lake Erie, Lake St. Clair, and the Detroit and St. Clair Rivers) have potentially high values for recreation facilities and, in other instances, as undisturbed areas.

5. Conflicts between user along waterfront. Vacant, usable waterfront areas within southern Michigan simultaneously may also represent necessary sites for accommodating coal-based and other industrial development. Much of the anticipated growth in coal use is anticipated to occur in the vicinity of urban waterfront areas, particularly in southern Michigan. Hinterland industrial coal use development in many instances will also require movement of coal through the southern Michigan urban shorelands area.

6. Need for land use planning. Land use planning of ports and other waterfront areas, which might be able to assist in local and state efforts to accommodate diverse recreational, industrial, commercial and other land use requirements, are simply not adequate for the task at hand. The likely future outcome is continued presumption of opportunities for public access and other recreational activities by scattered residential, industrial and commercial land developments.

7. Programs for acquiring national acres and potential park areas. Monies for the acquisition of natural areas, for purchase of potential park facilities, and for development and maintenance of recreation facilities has become increasingly constrained. In the face of limited fiscal resources, improved land use planning or cooperation with private developers including compensation by developers for destruction or impairment of public resources may represent the only remaining means for effectively guaranteeing opportunities for public use of the waterfront zone.

8. Public access. Insufficient attention appears to have been given by the state recreation plan to possible alternative means of assuring public waterfront access, particularly in conjunction with issuance of state permits for private developments, including proposed coal handling facilities.

RELATIONSHIP OF FEDERAL AND STATE COASTAL ZONE MANAGEMENT PROGRAMS TO COAL TRANSPORTATION

Background on Michigan's Coastal Zone Management

Sections of the Coastal Zone Management Act, as amended, which are of particular relevance to this study and to the Coastal Energy Impact Program in general include:

- Subsection 305(b)(8) encouraging each state program to include a planning process for energy facilities;
- Subsection 308(d)(1) and (2) providing credit assistance to help meet state and local needs to finance most of the new public facilities and public services that are required as a result of coastal energy activity.
- Subsection 308(c)(1) making grants available to states to study and plan for any economic, social, or environmental effects of energy facilities of all types in or significantly affecting the coastal zone;
- Subsection 308(c)(3) making grants available to states to mitigate or ameliorate environmental and recreational impacts arising from the transportation, transfer and storage of coal.

States (or local entities through the state) are eligible under the coastal energy impact program for grants to be used for "preventing, reducing or ameliorating unavoidable losses of valuable coastal environmental or recreational resources when such losses result from coastal energy facility" and to "ensure that the person or persons responsible for these environmental or recreational losses pay for their full cost."[1,2]

The present study provides much of the information necessary for assisting the state in planning for economic, social and environmental consequences of coal transportation. To fully evaluate coal related energy facilities, an analysis of use of coal by industries and utilities should be undertaken.

Federal Consistency with the Michigan Coastal Zone Management Program

The Federal Coastal Zone Management Act requires federal agency coastal zone actions (including development projects and activities requiring federal licenses or permits) to be consistent to the maximum extent practicable with the approved state coastal zone management program.[3]

The Department of Natural Resources, Division of Land Resource Programs has been designated as the state agency responsible for federal consistency requirements. Substantive requirements of programs administered by the division for "controlling soil erosion and sedimentation, natural rivers, inland lakes and streams, natural areas, Great Lakes submerged lands, shoreland erosion and flooding, and coastal wetlands protection" are to be utilized by the Land Resource Programs in consistency review. Air and water quality permit reviews by DNR divisions along with other state and local agencies, in addition, are to be "coordinated for coastal consistency by the Coastal Management Program Unit" of the Land Resource Programs Division.[5]

More detailed information on procedural and substantive aspects of Michigan's coastal management program are discussed below.

Energy Facility Siting and the Michigan Coastal Zone Management Program

The State of Michigan has no legislation directly governing the siting of energy facilities. However, the state utilizes its 'comprehensive permitting system' to review proposed energy facility siting projects in the state,[6] and exerts a great deal of authority over facility development through the implementation of various environmental statutes. The state influences the siting of energy facilities by insuring that the project is in compliance with the associated environmental protection policies including incorporation of specific terms and conditions into the permit to mitigate advance environmental effects.[7]

Several permits from the Department of Natural Resources are required before construction of an energy facility can be initiated. These are summarized as follows.

MAJOR STATE ENVIRONMENTAL PERMITS REQUIRED TO CONSTRUCT AN ENERGY FACILITY

Requirement	Authority
National Pollutant Discharge Elimination (NPDES) permits for all point source discharges to surface waters	Act 245 of P.A. 1929, as amended
Permit for all discharges to groundwater	Act 245 of P.A. 1929, as amended
Soil erosion and sedimentation control permit	Act 347 of P.A. 1972
Permit to erect a structure in or alter the flow of navigable waters of the Great Lakes	Act 247 of P.A. 1955
Permit to physically alter inland lakes and streams	Act 346 of P.A. 1972
Permit to install source of air emissions	Act 348 of P.A. 1965, as amended
Permit to dispose solid wastes	Act 641 of P.A. 1978

Source: Adapted from State of Michigan Coastal Management Planning Processes, September, 1978, page 14.

As previously indicated that DNR's Division of Land Resource Programs is responsible for administration of many of the major environmental statutes. The Land Resource Programs Division is also charged with determining federal consistency in cases where determination of consistency with the state coastal zone management program is necessary.

Another division of the DNR which has major responsibilities for coordination of DNR permits is the Environmental Enforcement Division. The Environmental Enforcement Division coordinates the issuance of DNR permits (when multiple permits are required) for all facilities, including energy developments. To streamline the review process, the Environmental Enforcement Division encourages a preliminary meeting held between the applicant and appropriate DNR divisions. At this meeting, it is intended that the applicant and DNR will discuss primary and alternative sites, methodology for selection of sites, and preliminary DNR recommendations for use by the applicant.

Evaluation of Michigan's Coastal Zone Management Program

Under the various authorities comprising the Michigan Coastal Zone Management Program, the state appears to be making good progress in dealing with many identified coastal concerns including protection of critical fish and wildlife habitat, conservation of shoreline dune areas from indiscriminate mining, accommodation of industrial and commercial water dependent uses, acquisition of critical environmental areas, and protection of life and property against hazards. This is particularly true becasue of the networking of many programs through Michigan's coastal management program.

In order to continue the progress of coastal management, the state may wish to consider the following items. These suggestions are provided as a means of increasing the utility of the state coastal zone management programs:

1. The Great Lakes Basin Commission, based on review of published state documents and conversations with state officials, suggests that additional long-range planning for the following coastal activities would be helpful in the following areas:

   (a) dredge and dredge disposal needs and siting;
   (b) additional coastal port development and planning (such as completed for St. Joseph/Benton Harbor and the Saginaw River) in order to provide means for protecting environmental values and to assure that adequate areas are maintained for accommodating water-dependent industrial and commercial development (port inventories are currently being conducted by Michigan Department of Transportation);
   (c) energy facility siting which assures adequate planning and accommodation of new facilities consistent with national interests.
   (d) assuring public access particularly in the southern Michigan area where the state recreation plan has identified severe recreational demand/supply imbalances.

2. Completion of shoreline maps as coastal resource inventories including the coastal zone boundary areas, land uses, environmental values, and identified geologic hazards would help state and local planners as well as private developers. Two-thirds of the Michigan shoreline has already been mapped.

3. Tables I-7 and I-8 provide a comparative compilation of state programs for coastal resources prepared by National Oceanic and Atmospheric Administration. This compilation may suggest future policy areas for state consideration.

TABLE I-7

Summary of State Protection of Historic and Cultural Resources under CZMA

State	Required Dedication of Access	Open Beach Laws or Court Action	Protection/Restoration of Historic and Cultural Resources	Protection of Scenic Areas/ Provision of Visual Access	Urban Waterfront Projects
Alabama	P		P	P	
Alaska	X		X		
California	X		X	X	
Connecticut			X		New Haven, Stamford, Norwalk
Delaware		X			Wilmington, Newcastle County
Florida					Miami, Sarasota
Georgia			X	P	Brunswick, St. Mary's
Guam		X	X		
Hawaii	X	X	X	X	Honolulu
Illinois			X	X	Chicago-Waukegan
Indiana					
Louisiana			X		Moon Walk, Lincoln Park
Maine				X	Calais South Portland, Vinalhaven
Maryland	X		X		Cambridge Creek
Massachusetts			X	X	
Michigan			X	X	Detroit
Minnesota					Duluth
Mississippi					Gulfport
New Hampshire	P			P	Portsmouth,
	P			P	Exeter
New Jersey	X			X	Jersey City
New York			P	X	Buffalo
North Carolina			X		Wilmington
N. Marianas					
Ohio					
Oregon		X	X	X	
Pennsylvania	P		P		
Puerto Rico	X		X		San Juan
Rhode Island		X	X		
(Am.) Samoa					
South Carolina	X		X		
Texas		X			
Virgin Islands	X	X	X	X	
Virginia					Alexandria, Norfolk, Newport News, and Virginia Beach
Washington			X	X	Seattle
Wisconsin	X			X	Milwaukee, Kenosha

X=Pre-existing law or program incorporated into CMP or new or expanded law or program directly attributable to CZM participation.

P=Proposed law or program to be part of Coastal Management Program.

Source: National Oceanic and Atmospheric Administration, Office of Coastal Zone Management, "The First Five Years of Coastal Zone Management," (Washington, D.C., U.S. Department of Commerce, March 1979) Table V, p. 39.

TABLE I-8

Summary of State Laws Affecting Management of Coastal Development

(by type of activity or area affected)

State	Erosion-Prone Areas	Floodplains	Subsidence and/or Saltwater Intrusion	Energy Facility Siting	Priority to Water-Dep. Uses	Locating Dredge Disposal Sites	Offshore Oil & Gas; Sand & Gravel Extraction
Alabama	P	P	X		X		
Alaska	X	X	X	X	X		X
California	X		X	X	X		X
Connecticut					P	X	
Delaware	X				X		
Florida	X			X			
Georgia	X		X		X		X
Guam		X					X
Hawaii	X	X	X		X		X
Illinois		X				X	X
Indiana		X				X	X
Louisiana	P	P	P	X		P	P
Maine	X	X			X		X
Maryland	X	X		X	X		
Massachusetts	X	X		X	X	X	X
Michigan	X	X			X		X
Minnesota		X				X	X
Mississippi					P	P	
New Hampshire		X	P		P		P
New Jersey	X			X			X
New York	P	P		X	P	X	X
North Carolina	X	X	X	P	X	P	
N. Marianas							
Ohio	P	P		X		X	X
Oregon	X	X			X	P	X
Pennsylvania	X	X		P			X
Puerto Rico	X	X			X		
Rhode Island	X	X				X	X
(Am.) Samoa							
South Carolina	X				X		X
Texas		X	X			P	P
Virgin Islands	X	X	X	X	X		
Virginia							
Washington	X	X		X	X	X	X
Wisconsin	X	X		X	X	X	X

X = Pre-existing law or program incorporated into CMP or new or expanded law or program directly attributable to CZM participation.
P = Proposed law or program to be part of CMP.

Source: National Oceanic and Atmospheric Administration, Office of Coastal Zone Management, "The First Five Years of Coastal Zone Management," (Washington, D.C., U.S. Department of Commerce, March 1979) Table IV, p. 31.

FOOTNOTES

[1] P.L. 94-370, Section 308(b) and 308(d)(4) as discussed in implementing regulations CFR Volume 15, Sec. 931,71 1979 edition, page 822.

[2] The CEIP (Coastal Energy Impact Program of the Coastal Zone Management Act) "will be administered in a manner that will strike a balance between the major national goals of obtaining a greater degree to energy self-sufficiency and protecting the coastal environment:

(1) Only coastal energy activities for the rational, timely and orderly development of the Nation's coastal energy resources will be encouraged; and

(2) Unnecessary development in the coastal zone will be discouraged by providing financial assistance or only for those public facilities and public services that are actually needed because of coastal energy activity.

[3] Although federal activities and projects within the coastal zone require consistency review, it should be clarified that, by definition, federally-owned lands--irrespective of location--are not considered part of the coastal zone area. Federal activities on federal lands, however, may require consistency determination if the activity significantly affects non-federal coastal zone land areas. In addition federal activities outside the coastal zone (for example, landowned of the coastal zone) are subject to consistency review to determine whether the activity significantly affects the coastal zone.

[4] State of Michigan Coastal Management Program and Final Environmental Impact Statement, U.S. National Oceanic & Atmospheric Administration, July 1978, page 146.

[5] ibid

[6] State of Michigan Coastal Management Planning Processes: Energy Facility Siting, Shorefront Access, Shoreland Erosion, Michigan DNR, Division of Land Resources Programs, September 1978, page 10.

[7] ibid, page 10

[8] ibid, page 11

PORT DEVELOPMENT IN MICHIGAN

Current Situation

Port development and planning in Michigan is determined by the structural divisions between the state and local political bodies and the relationship maintained among these groups. The Michigan Department of Transportation has a planning responsibility for port development and is currently conducting a state-wide port needs study which will evolve into a state port plan. The study is being conducted with the cooperation of local political interests. The purpose of the study is to identify opportunities for commercial harbor development and to quantify funding requirements for implementation. In addition, the Coastal Zone Management Program of the Michigan Department of Natural Resources has funded and will continue to support special studies of specific commercial harbors to identify management options related to potential project development.

For purposes of discussion, it is useful to group coal receiving ports in the state of Michigan into three categories (see Table I-8). The first group is the largest, containing 17 commercial harbors that have no local port management organization and rely on the state or local planners for any planning required.

The second group, containing four harbors, has local harbor commissions established by ordinance that are part of the governmental unit or units which created them. These commissions meet occasionally to deal with specific problems and generally have a local planning agency provide the only staff member.

The third, and smallest group with two members, has port authorities with both management and planning responsibilities. The Port of Monroe operates under the provisions of Act 234 of 1925, as amended, and the Port of Detroit was recently reorganized under the provisions of Act 639 of the Public Acts of 1978. (The Port of Detroit operated under Act 234 of 1925 from 1932 to 1980). Both authorities are semi-independent with jurisdiction extending to the political limits of the city or county that created the authority. (Detroit-Wayne County and City of Monroe-Monroe). Monroe is a good example of a Michigan port which is well planned and is expanding its facilities at a rate which is keeping up with the demands for waterborne commerce, including coal.

Current Policy

Act 639 of the Public Acts of 1978 offers a new approach to local governments in the management of their water resource. A city and county, two or more counties, or any combination including at least one county and one city may, by joint resolution, request the Governor for authority to incorporate a Port Authority. Upon approval by the Governor, the Authority is eligible for Department of Transportation assistance for 50% of the annual operating budget and for capital grants for specific projects. The Governor's appointment of one member of the Port Authority Board ensures the active participation of state agencies in furthering the objectives and program of the Authority.

The establishment of a local Port Authority under the provisions of Act 639 of the Public Acts of 1978 requires the approval of the Michigan Department of Transportation and Department of Commerce prior to approval of the Governor. The Departments of Transportation and Commerce must also approve the Port Authority annual program, budget and the comprehensive port plan required by the Act. (Act 639 of 1978 provides that Act 234 of 1925, as amended, is repealed when both Detroit and Monroe organize under Act 639.)

Although Act 39 offers the benefits of state oversight and approval of port development and state financial assistance to local authorities, it does not provide for state initiation of port development projects. Local initiative must be present both in the establishment of an authority and in the request for state financial assistance. The final work concerning when and where port development occurs in Michigan, therefore, within local government jurisdiction.

Evaluation

The inability of the state under current law to undertake port development projects independently of local authorities has yielded arguments in favor of a statewide port authority. Those supporting such an agency argue that greater state control of port development would produce greater coordination, and perhaps as a result, more efficient use of Michigan's port facilities. Some proponents of a statewide authority contend that the current lack of development in many potentially valuable Michigan ports may put Michigan at a disadvantage with respect to its ability to handle newer transportation technologies, and consequently, at a competitive disadvantage in terms of ability to attract new industry and the jobs that come with it.

Among the arguments posed by those favoring the current system of local port authority emphasis is the assertion that the creation of a statewide authority could lead to a inefficient allocation of resources due to what could be expected to be a glut of demands for state funds. In other words, this point of view would contend that where only those ports with the best potential are encouraged to establish port authorities, state funds, in the form of aid to these ports, would only be spent in the most promising areas. Establishing a state authority, on the other hand, would entitle many state ports to some aid, including those whose further developmet may not be in the public interest, and could create a budgetary disaster.

It seems that perhaps a middle ground between the two would be preferable to either. A state port authority which possessed both the power to initiate port planning and development projects, yet at the same time retained the authority to deny funds to ports where development may not be in the public interest, may be ideal. Perhaps it would be worth while to study the operation of state port authorities in states such as Georgia, Indiana, Massachusetts, Mississippi, the Carolinas, and others, in an attempt to learn what works in these states and how it could be applied to Michigan. The fact is, that whatever path is taken, greater port planning and development is clearly needed in Michigan. A continued lack of port development progress on a large scale may have an adverse effect on the ability of the state to compete with other coastal states for commerce, and to receive waterborne shipments of commodities such as coal.

TABLE I-8

MICHIGAN COMMERCIAL HARBORS RECEIVING COAL BY WATER

A. Ports with no comprehensive management or planning functions:

- Muskegon Harbor
- Charlevoix Harbor
- Harbor Beach
- Mackinac Harbor
- Marquette Harbor
- Traverse City Harbor
- Frankfort Harbor
- Saginaw River
- Escanaba
- Menominee Harbor
- Petoskey Harbor
- Gladstone Harbor
- Holland Harbor
- Alpena Harbor
- Presque Isle Harbor
- Ontonagon Harbor
- Calcite Harbor

B. Michigan Ports with Harbor Commissions established by ordinance:

- Grand Have Harbor
- Manistee Harbor
- Ludington Harbor
- St. Joseph Harbor

C. Michigan Ports with Port Authorities

- Port of Detroit
- Port of Monroe

ORGANIZATION OF MICHIGAN DNR

Introduction

The state presently has no legislation directly governing the siting of energy facilities. Coal transport infrastructural proposals, for example, are regulated only to the extent which the proposed facility involves application of other statutory authorities, including the various state environmental protection and resource management programs.

A number of statutes do exert some influence over the siting of coal transport facilities by virtue of the project impact on specific geographical areas or state concerns. For example, the Great Lakes Submerged Lands Act, Inland Lakes and Streams and the Wetlands Protection Act effectively assure that physical alterations and structural improvements within most of the state's waters will be subject to permit authorities. Likewise, the state's Soil Erosion and Sedimentation Act requires a permit prior to clearing and grading projects of more than one acre in size (or if within 500 feet of a water course). Along the coastal zone, the Shorelands Management and Protection Act applies to sites which have been designated by the state either for flood and erosion protection or because of exceptional environmental values. The Air Pollution Control Act, in addition, applies to installation, construction, reconstruction or alteration of any process or system which may be a source of air contamination, including coal transshipment and stockpiling.

These and other pertinent state legislation are discussed in this report. These statutes often empowers the states Department of Natural Resources (DNR) with permitting authority over new coal transport facility proposals. Frequently, however, administrative attention is logically extended only to those components of the proposed operation which are pertinent to the resource being administered as specified by the relevant legislation (e.g. the Erosion and Sedimentation Control applies to erosion effects of earth moving and not to other possibly significant economic or environmental aspects of the proposal).

The lead state agency for administering environmental legislation within Michigan is the Department of Natural Resources. Act No. 17 of the Public Acts of 1921 established the Department with duties to "... protect and conserve the natural resources of the state of Michigan; provide and develop facilities for outdoor recreation ... prevent and guard against the pollution of lakes and streams within the state, and enforce all laws provided for that purpose ..."

Six DNR commissions are responsible for a wide range of policy issues:4

- Natural Resources Commission (established by Act No. 17 of the Public Acts of 1921), is comprised of seven citizen members appointed by the Governor and serves as the Department of Natural Resource's board of directors. In the Commission rests responsibility for setting policy which guides the Department programs. As noted previously, the Commission appoints the Director of the Department.

- The Water Resources Commission (established by Act No. 245 of the Public Acts of 1929), is composed of four ex-officio directors of state agencies, including the Department of Natural Resources, and three appointed citizens. The Commission is charged with responsibility to protect and conserve water resources of the state; control pollution over waters of the state; and prohibit pollution of waters held in public trust. These objectives are accomplished largely through permits, surveillance and enforcement. The Commission is also directed to develop adequate wastewater collection and treatment systems.

- The Air Pollution Control Commission (established by Act No. 348 of the Pubilc Acts of 1965), contains 11 members; three ex-officio directors of state agencies, including the Department of Natural Resources, and eight appointed citizens. The Commission's major role is to prevent new sources of air pollution and to reduce air pollution from existing sources through compliance with air quality.

- The Resource Recovery Commission (established by Act No. 366 of the Public Acts of 1974), is composed of the directors of the Department of Natural Resources and Treasury Department, and nine appointed citizens. The Commission is responsible for managing disposal of refuse.

- The State Waterways Commission (established by Act No. 320 of the Public Acts of 1974), is composed of five citizen members. Its primary function is to acquire, construct and maintain harbors, channels, pubilc access sites and facilities for recreational boating.

- The Mackinac Island State Park Commission (established by Act No. 355 of the Public Acts of 1927), has seven citizen members which are appointed by the Governor. Its objectives are to provide for public use and historic preservation of Mackinac Island State.

There are 27, DNR divisions and offices, which serve the state. The relevant divisions and offices are listed and described in alphabetical order. Information presented is from DNR's forthcoming publication "Working For You".

Air Quality

The goal of the Air Quality Division is to achieve and maintain a level of air quality consistent with national standards for protecting the health and welfare of the pubilc. The Division is directly responsible to the Michigan Air Pollution Control Commission for all actions taken to fulfill that obligation.

Achievement of the goal demands comprehensive review of all proposed new potential sources of emissions; strict, continuous investigation and surveillance of all operating sources, and constant monitoring of current pollution levels. To insure that each activity is properly carried on, four sections, each responsible for specific phases of Division programs, have been established:

The Engineering Section is responsible for permit application processing, plan review, tax exemption review, environmental impact analysis, emission inventory, and surveillance fee assessment.

The Compliance Branch inspects all sources of air pollution to determine compliance with federal and state emission limitations, investigates citizen complaints of air pollution problems, issues abatement orders, and develops compliance schedules for facilities exceeding emissions limits.

The Technical Services Section is responsible for air quality sample collection and data collation, analysis and interpretation of sampling results, and collection of samples from specific source emissions.

Engineering

In addition to providing services to other Divisions of the Department for project developments, the Engineering Division performs topographic and boundary surveys, relocates survey corners, determines the ordinary high water mark for Great Lakes fill and dredge activities, and provides testimony and reports relating to those for the Attornty General, Water Resources Commission, and the Department.

The Division reviews local government plans for federal and state recreation bond projects and also approves their construction. It coordinates Department review of engineering plans for county and state bridge and road projects, submitted by the Department of Transportation, to assess effects on the environment. The Division also participates in making damage survey estimates, reports, and final inspections relating to federally declared disasters.

Environmental Enforcement

Establishment of the Environmental Enforcement Division (EED) relieves other Divisions of litigation responsibilities so they can pursue other management programs. At the same time it provides a single contact point for the Attorney General, thus streamlining the litigation process.

Criminal actions under environmental laws also are handled by EED. Violations are investigated, coordinated and referred either to local prosecuting attorneys or to the Attorney General. This function provides reforcement posture to discourage violations which can have profound adverse effects on public health and natural resources, and reduces the work load of the law enforcement officers in the field.

The Division's second major function is environmental review. By Governor's Executive Order 1974-4 all state agencies are required to review their actions to determine the necessity of Environmental Impact Statements. This Division is charged with coordinating review of Environmental Impact Statements prepared by the Divisions and approves them. The EED also serves as the Department's clearinghouse for Environmental Impact Statements drafted by other state agencies and federal units, which are submitted to the DNR for review and comment. Department representation on the two environmental review groups established by Executive Order 1974-4 is provided by staff of EED.

Environmental Services

The Environmental Services Division provides technical support services to the Air Quality, Water Quality and Resources Recovery divisions, and to the Department as a whole.

The Department's environmental laboratory is quartered within the Division. The lab provides a full range of analytical services to support the Department's pollution control activities.

The Comprehensive Studies Section of the Division is responsible for collecting data concerning the physical and chemical quality of Michigan's rivers. This Section also develops waste load allocations and effluent limitations for municipal and industrial facilities which discharge wastewater into the surface waters of the state.

Lands

This Division is the "real estate" office and record center for the 4.3 million acres of state-owned land, 130,000 platted lots and 2.2 million acres of mineral titles. Its records include an abstract of the initial deedings under which 16 million acres of lands granted to the state by the U.S. Government passed into private ownership. Original field notes of the U.S. Land Office Survey for the entire state are also maintained in its files.

Besides keeping records and providing services for divisions of the Department, the Lands Division helps shape policy and program decisions involving land use for state owned lands.

As part of its major role in Department land affairs, the Division since 1921 has sold or traded approximately 200,000 platted lots and more than 3 million acres of tax-reverted lands not suited for conservation purposes. Under this phase of its operation, the Division schedules pubilc auction sales of tax-reverted properties each year.

The Lands Division has a key role in the Department's long-range development program, including acquisition of lands suited for recreation and other environmentally sensitive areas. These purchases have provided new and improved state parks, wildlife areas, water access sites, forest areas and campgrounds, sites for administrative purposes, and other facilities related to outdoor recreation and resource management. Purchases and gifts negotiated by the Division have brought more than one million acres of land into public ownership and use. The Department's land exchange program serves to consolidate and bring into public ownership key areas better suited to meet land management objectives.

Land Resource Programs

The Division of Land Resource Programs was established to consolidate major land and related water resource management and planning elements within one Division.

The Division works with local governments, private citizens and organizations to achieve wise resource management through the various programs assigned to it. Technical assistance and information are provided by the Division to insure appropriate use of land and water resources for the protection of Michigan's natural resources in conjunction with economic, environmental and social needs.

Approximately 25 planning and environmental protection management programs, which were enacted into law by the Michigan Legislature and the U.S. Congress, are administered by the staff of the Division. These programs range in scope from: local assistance, such as zoning and planning; financial assistance, such as the Coastal Zone Management Program; land preservation, such as the Farmland and Open Space Preservation Program; landowner assistance, such as the Self-Help Water Quality Monitoring Program for inland lakes. Regulatory programs such as the Soil Erosion and Sedimentation Control Act and the state's Submerged Lands and Wetlands Acts are also administered by the Division of Land Resource Programs.

Recreation Services

The Legislature created Recreation Services Division to provide technical assistance to all recreation interest groups and agencies in the state, to prepare and keep up-to-date a State Recreation Plan, and to coordinate role all trail activities. These responsibilities fit together and complement each other. Recreation and resource specialists, landscape architects and community planners in the Division bring their professional know-how to bear on state and community recreation problems.

The job of fitting all the resources and programs into one "big picture" is reflected in the Michigan Recreation Plan. The Plan evaluates resources, population projections, travel patterns, and changing social and economic influences in light of findings from the public participation process. The Plan also charts possible courses to meet recreation needs and projects.

Water Management

The Water Management Division promotes orderly development of these waters and allied lands to meet commercial and industrial needs.

Various sections deal with flood plain management, hydraulic review, dam construction, dam safety regulation, water use and hydrologic engineering. General hydrologic studies conducted by the Division's staff are essential in developing basic knowledge of the quantities and variations of Michigan's water resources. The information is used to support departmental programs and is provided to local units of government, other state agencies, and private developers.

Water Quality

Primary responsibility of the Water Quality Division is to protect state water resources and secure compliance with quality standards. The

Division consists of two branches-Pollution Control and Municipal Facilities and Planning, and a Biology Section.

In the Pollution Control Branch are several sections, including The Engineering and Technical Service Section functions primarily as a permit development unit. Discharges of wastewaters to the ground or surface waters of the state are allowed only by permits issued from the Water Resources Commission. The permits contain limitations, restrictions and other requirements to assure the protection of the receiving waters' quality.

The Oil and Hazardous Materials Control Section responds to transportation-related spills throughout the state on a 24-hour basis. The section also regulates licensing of liquid industrial waste haulers and septic waste haulers, and conducts investigations and surveillance of those and other pollution-related activities.

The Groundwater Compliance and Special Studies Section monitors compliance with permit conditions for groundwater discharges. Responsibilities include initiation of enforcement action against violators, investigations of groundwater contamination, and coordinating reviews of hydrogeologic study proposals and reports. In addition, the section is responsible for development and carrying out of groundwater studies and projects.

The NPDES Compliance Section administers compliance with National Pollutant Discharge Elimination System permits for surface water discharges. Responsibilities include initiation of enforcement activities and follow-up for violators, coordination with the Federal Environmental Protection Agency's water pollution programs, and case preparation for referrals to the Environmental Enforcement Division where litigation may result.

The Biology Section functions as the Division's scientific wing, conducting biological and chemical surveys of lakes and streams to determine the impact of waste discharges and other activities. Biologists review existing and proposed permits, projects and activities, seeking to minimize or prevent degradation of the waters.

Waterways

The Waterways Division spearheads construction of recreational boating facilities on waters throughout the State. These include refuge harbors, docks, launching ramps, channels, anchorage areas, parking areas, access roads and public restrooms.

Initially, the program of the Waterways Division called for construction of habors-of-refuge authorized by Congress in 1945. Such harbors were designed to provide shelter for recreational boaters at approximately 30-mile intervals along the Great Lakes shores. This concept has been expanded to 15-mile interval harbors in high population areas.

The Division participates with the Federal Government in coordination, design and construction of commercial harbors and channel facilities, and is involved in mobilizing local participation required for the these projects.

Construction of docking and launching facilities on the Great Lakes is part of the Waterways Program. These facilities are generally constructed under grants-in-aid agreements with local communities and thereafter operated by the community. However, the Division also operates a few facilities.

The public water access site program of the Department is under the jurisdiction of the Waterways Division. More than 900 sites come under the Division's responsibility, and more than 600 have been developed and are in active use as boat launching facilities.

Recent program additions include the river use rules and access-to-public-waters programs. Under the river use rules program, the Division is surveying current uses of various rivers to determine a desirable mix of activities and regulations and/or policy decisions required to allow such uses. The access to public waters program involves Department action to prevent abandonment or loss of existing accesses such as streets and roads running to the edges of lakes and streams.

FOOTNOTES

1 The preceeding paragraphs extracted from Working For You, a forthcoming Michigan DNR public information manuscript currently being printed.

2 State of Michigan, Department of Natural Resources, State of Michigan Coastal Management Program and Final Environmental Impact Statement, July 1978, page 105.

3 Working For You

4 Sources: Working For You and Michigan CZM Program and Final EIS, page 108-9.

TABLE J-1

MATRIX OF MICHIGAN ENERGY POLICY

CONSERVATION

POLICIES	STATE PLANS	RESIDENTIAL	APPLIANCES
-Provide an energy conservation grants program for schools, hospitals, local governments, and public care buildings -Promote building surveys -Conduct mini and maxi audits -Promote and conduct energy conservation projects -Restrictions may be placed on interior temperatures of public, commercial, industrial and school buildings	-Aim for reduction in state's overall energy use in the future -An act to provide for the declaration of a state energy emergency providing for specific energy measures -The Governor may declare an energy emergency	-Promotes energy audits -Elimination of the sale of decorative lamps that use natural gas or liquid propane gas -Elimination of the sale of appliances with continuously burning pilot lights except for ones using liquified gas or on hot water heaters -Encouragement of residential audits -Establishment of a home weatherization program for low income households -Allowance of a state income tax credit for heating fuel costs	There should be no false labeling of energy efficiency -Cannot sell appliances with continuously burning pilot lights, except for water heaters or appliances using liquified gas -Appliances shall be required to be labeled as to energy use and efficiency
TRANSPORTATION	**EDUCATION**	**ELECTRICITY**	**ENVIRONMENTAL**
-Imposition of a motor fuel tax -55 mile per hour speed limit -Right turn on red allowed -In emergencies restrictions on the use of privately owned vehicles and reduced speed limits may be enforced -In emergencies restrictions on public and pupil transportation programs may be enforced	-Develop centers for public information and education -Development of Michigan Energy Information System -Promote energy education within the schools under the Energy Extension Service program	-Prohibit declining block rates accross the board -Restrictions may be placed on lighting levels and display and decorative lighting	-Restrictions may be imposed on the use and sale of energy resources -Mandatory deposit on bottles and cans
INDUSTRY/COMMERCIAL			
-Develop a program of comprehensive energy audits and conservation efforts			

MATRIX OF MICHIGAN ENERGY POLICY (Con't)

RENEWABLE ENERGY SOURCES	WOOD -Develop the wood energy program to promote wood resources as an energy source	SOLAR -Provides a state tax credit for single and multifamily housing -Provide technical solar assistance educate the public, and accelerate the implementation of solar energy technology -Provides for sales and use tax exemptions for solar equipment -Property tax exemption for solar installations	HYDROPOWER -Provision for a state tax credit for housing and rental buildings that are owned by a taxpayer	WIND -Provides for a state tax credit for housing and rental buildings owned by a taxpayer
NATURAL GAS	USE -Ban the sale of decorative lamps which use either natural gas or liquid propane as its source of fuel			
OIL	CONSERVATION -Development of energy conservation projects for schools, hospitals, local goverments, and public care buildings			

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