

J R Peters

Project A-632

A PRELIMINARY APPRAISAL AND RECOMMENDATIONS
ON THE DEVELOPMENT OF WATERFRONT PROPERTY
SOUTH OF COLUMBUS

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Prepared for
Muscogee County Commissioners of Roads and Revenues,
Columbus City Council, and
Columbus Chamber of Commerce
Columbus, Georgia

by
Wade McKoy

REVIEW

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Industrial Development Branch
Engineering Experiment Station
GEORGIA INSTITUTE OF TECHNOLOGY
May 1962

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Summary

1. It is recommended that at the earliest possible time the Corps of Engineers be requested to make an engineering study to determine the feasibility of constructing a levee on the Chattahoochee River south of Columbus, Georgia, for the purpose of creating a riverfront industrial district.

Dr. M. R. Carstens, Professor of Civil Engineering at Georgia Tech and an expert on dams and levees, has gone over the site and has found nothing to rule out the leveeing program. He recommends that the Corps of Engineers be requested to undertake the engineering study of the proposed leveeing program, since they have the facilities and personnel for the engineering and testing. A copy of his report is attached (see Appendix).

Dr. Carstens points out that Law Engineering Testing Company, Atlanta, is also capable of doing the engineering required.

2. As a corollary study it is recommended that the Corps of Engineers examine the possibility that maximum flood level below Columbus can be lowered by flood control measures from the Bull Creek Watershed and the West Point Dams. If such a reduction in maximum flood level can be obtained the height of the levees can be reduced, which in turn will reduce the cost.

3. Since \$75.5 million has already been allocated on the channel and locks to make Columbus the head of navigation on the Chattahoochee River, it is worth an additional small percentage of this amount to assure that the channel will be used as intended.

The levee would not only protect 900 acres already developed but would, in addition, by protecting 1,200 undeveloped acres, save 2,100 acres in all. This would permit the establishment of a 1,500 acre waterfront industrial district for development as a chemical complex -- an industrial combination which could eventually represent an investment of \$300 million. Such a combination would employ 3,300 people and bring in an estimated \$5 million in taxes annually.

4. It is recommended that Columbus and Muscogee County set up a working committee to request the Corps of Engineers to (1) drop plans for easements and, (2) make the necessary studies to carry out the levee program.

5. It is also recommended that an industrial development corporation be formed for the specific purpose of handling the development of the industrial district resulting from the levee. The corporation should concern itself with:

- a. securing options on the sites,
- b. soliciting industry,
- c. studies to determine industries or companies most likely to be attracted to the district.

The Problem and the Recommendations

Columbus will be the head of navigation on the Chattahoochee River as soon as the work by the Corps of Engineers is completed. Theoretically, this channel would encourage economic development at Columbus because many companies would want to take advantage of the opportunity to ship materials as far inland as possible at water rates. It is logical to assume that industry would grow up in Columbus once water transportation is provided, for the following reasons:

1. Raw materials can be shipped in at water rates.
2. Columbus is a good distribution center and is far enough inland so that finished products can be shipped in all directions.
3. Columbus is a metropolitan area with concomitant services and amenities.
4. Existing pipe lines will serve Columbus with low cost natural gas, propane, and refined petroleum products.

Interviews with knowledgeable people in the chemical and the chemical construction field have not only drawn endorsement of the idea of a chemical complex at Columbus, but they have elicited suggestions as to direction and make-up for such a complex.

But such a complex requires waterfront land.

The land directly south of Columbus is dry most of the time but it is subject to flooding. Therefore, the Corps of Engineers proposes to take flood easements so that the land can be used for flood control purposes. For this use the land cost will probably not run above \$500,000. But if the land is used only for flood control, Columbus, Muscogee County, and the State of Georgia will lose the opportunities presented for massive industrial development, because this same land is the obvious site for a chemical complex. There are other Georgia sites along the Chattahoochee River with land well above flood level, but none offer the combination of advantages that the Columbus area offers.

It is common practice elsewhere in the country for chemical companies to build on low land protected by levees.

Georgia Tech's Industrial Development Branch originally suggested the

the idea of protecting the land south of Columbus, and has since examined the land with the help of Dr. M. R. Carstens, Professor of Civil Engineering at Georgia Tech. Dr. Carstens is an acknowledged expert on dams and levees and has indicated in the attached memorandum the considerations involved in building a levee to protect 2,100 acres of land from flooding -- 900 acres already under development and 1,200 acres of undeveloped land. He feels that an engineering study is definitely in order and recommends that the Corps of Engineers be requested to carry out the study, because they are already involved and they have the personnel and facilities to perform the job.

Other organizations, such as Law Engineering Testing Company in Atlanta can do the work if necessary.

The Industrial Development Branch endorses the recommendation and adds the request that the study be pursued with all possible haste.

Since the cost of the levee is directly related to its height, any way of reducing the height should be examined. There is a possibility that flood control measures from Bull Creek Watershed and the West Point Dams can reduce the maximum flood level from the one now used as a bench mark. It is therefore also recommended that the Corps of Engineers study this problem.

Benefits to Be Derived from Construction of Levee

A 1,500 acre waterfront industrial district could be formed by protecting the flood plain south of Columbus with a levee. Regional industrial complexes could be expected to locate in the development to serve the southeastern markets.

A chemical and petrochemical complex would likely build up, using barges, railroads and pipe lines to bring in the raw materials. If the levee is completed in 1965, then by 1970 a total of as much as \$100 million worth of plants could be built. This investment could expand to \$300 million by 1975. In 1970 employees would number 1,300 and increase to 3,300 by 1975. These new employees would require goods and services from the stores and shops in the Columbus area, creating additional jobs in the retail and service trades. The new payrolls would amount to \$10 million annually in 1970 and \$27 million in 1975.

Of the jobs in the chemical plants, 90 per cent could be filled by local people. The primary requirement would be a high school education.

The practice in the chemical industry is to hire inexperienced personnel and train them in the skills needed for plant operation. Jobs in the chemical industry are challenging, interesting and rewarding. Between 1965 and 1975 the Columbus and Muscogee County high schools expect to graduate over 15,000 students. These future high school graduates are now in the 5 to 15 year age bracket, and unless the economic growth in the Columbus area increases substantially many will have to go elsewhere to find jobs.

Public revenues from the projected new plants and payrolls to the local governments should amount to \$1.5 million annually in 1970 and grow to \$5 million in 1975. This estimate takes no account of additional public revenues accruing from service jobs generated as a result of the added payrolls from the chemical plants.

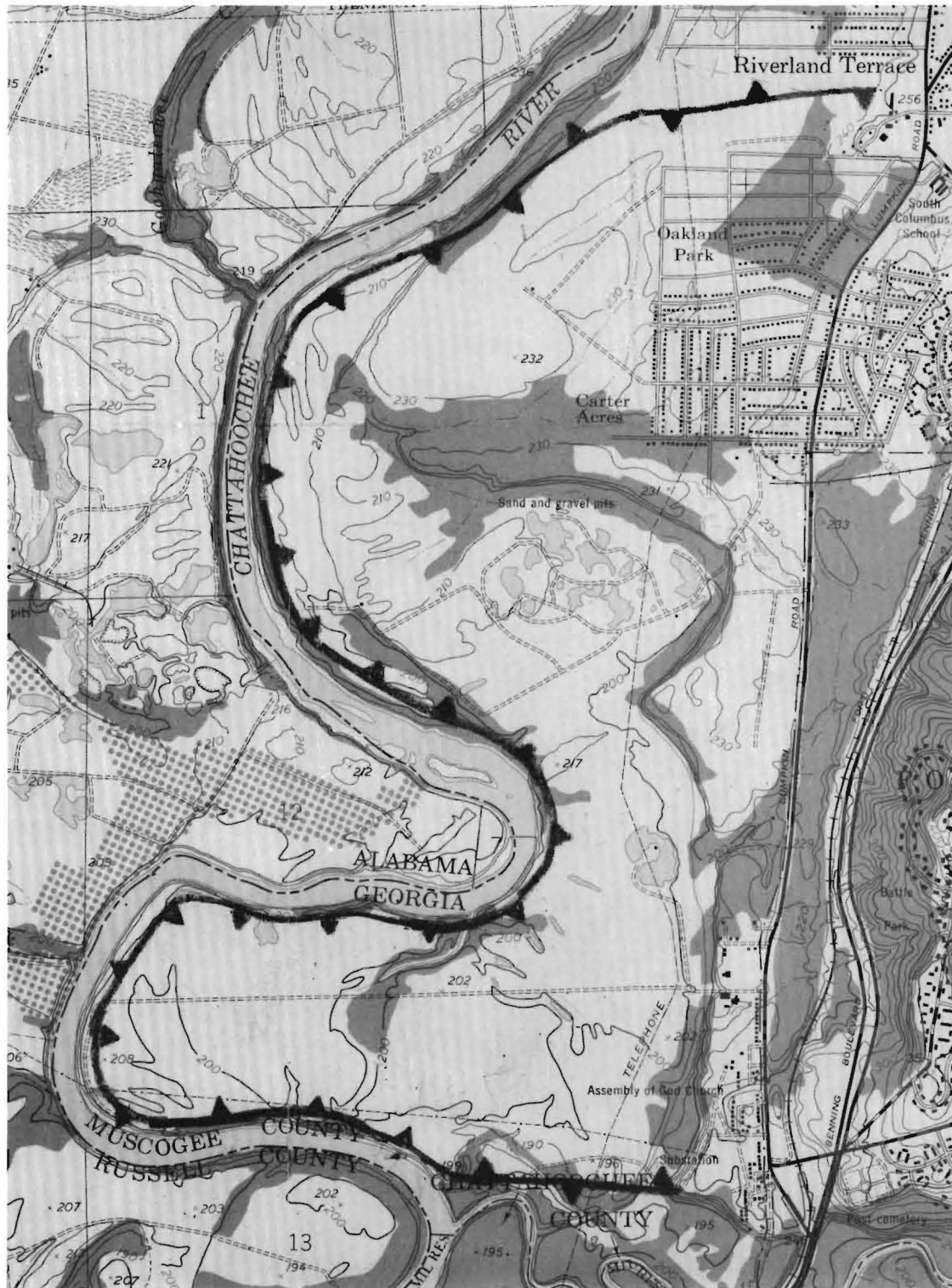
Table 1
Estimated Results of a Chemical Complex
on the Chattahoochee River South
of Columbus, Georgia

	<u>1970</u>	<u>1975</u>
Investment	\$100,000,000	\$300,000,000
Annual Payroll	\$10,000,000	\$27,000,000
Employment	1,300	3,300
Taxes	\$1,500,000	\$5,000,000

Raw materials for the plants, moving up the Chattahoochee River by barge, would amount to 300,000 tons in 1970 and 800,000 tons in 1975.

The above picture can become a reality if the levee is completed without delay. The levee will cost between \$4 and \$8 million, a small investment for the benefits expected (see Table 2). The levee will protect approximately 2,100 acres, as shown on Map 1.

MAP 1
PROPOSED INDUSTRIAL AREA SOUTH OF COLUMBUS, GEORGIA



Levee shown
by:



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Table 2
Public Revenues as an
Annual Return on Cost of Leveeing

<u>Year</u>	<u>Annual Public Revenue</u>	<u>If Cost of Levee is \$4 million</u>	<u>If Cost of Levee is \$8 million</u>
1970	\$1.5 million	37 1/2%	18 3/4%
1975	\$5.0 million	125%	62 1/2%

Products that could be produced in a Columbus chemical complex are shown on the accompanying flow sheet (Figure 1). All products shown are large volume industrial chemicals that have a record of growth. The United States chemical production capacity will double between 1960 and 1975, according to a study made by the McGraw-Hill Department of Economics. Columbus can be in a position to participate in this growth.

The federal government has already allocated \$75.5 million in developing a navigable waterway to Columbus. An additional amount, possibly \$500,000, will be necessary to obtain flood easements on the subject land, whereas leveeing will increase the value of the undeveloped land by over \$1 million, permit the building of a \$300 million chemical complex, and protect approximately 900 additional acres of already developed land.

The completion of the navigable waterway will round out Columbus' facilities for obtaining raw materials economically. Existing facilities are low cost natural gas, a liquid propane pipe line and a refined products pipe line. Centrally located to serve southeastern markets, Columbus has the distribution facilities for manufactured products, namely, its railroads and highways, as well as air freight when needed. Also of importance are the general social and economic characteristics of the Columbus metropolitan area, which can provide the needs of a southeastern industrial complex.

Table 3 shows the estimated benefits to Columbus and Muscogee County from the present plan and from the revised plan.

Table 3

Present Plan

Cost of channel to date	\$75,500,000
Additional cost for easements, etc.	500,000
Total planned cost	\$76,000,000
Estimated industry gained by Columbus	\$1,000,000

Proposed Plan

Cost of channel to date	\$75,500,000
Additional cost for leveeing (maximum)	8,000,000
Total planned cost	\$83,500,000
Estimated industry gained by Columbus	\$300,000,000

Recommended Action

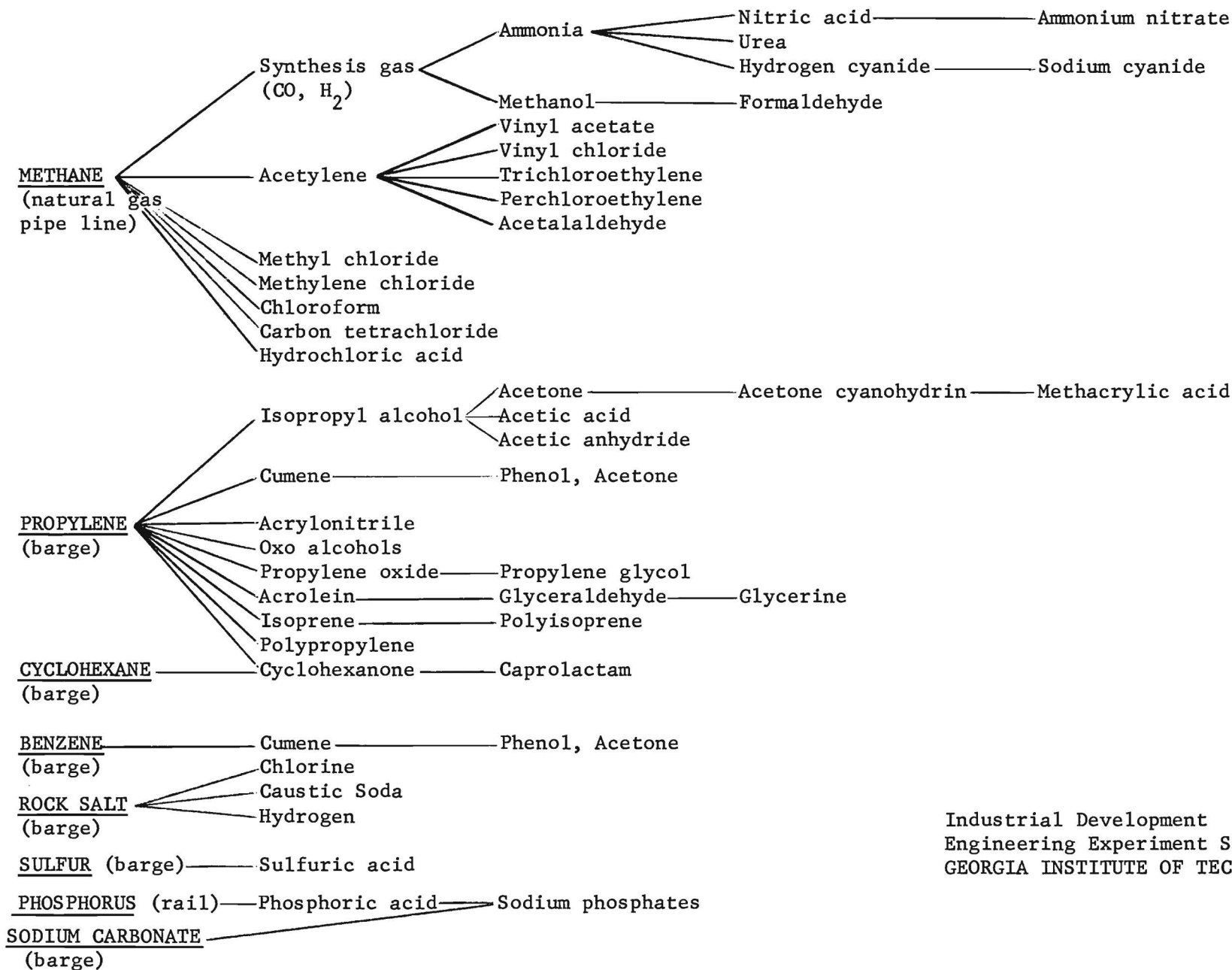
1. Interested local groups should form a committee to act in behalf of Columbus and Muscogee County to prevail upon the Corps of Engineers to:

- a. set aside plans for taking easements on the subject land and to proceed with the necessary tests upon the levee site and the engineering for the levee,
- b. decide what further economic studies, if any, are needed in order for the Corps to recommend the project.

It is suggested that the committee be made up of representatives of the City Commission, the County Commission, the Chamber of Commerce, a representative of the property owners, and a representative of the U. S. Study Commission, along with legal and technical advisors. Investigation and development of plans and methods for financing the levee should be within the Committee's scope.

2. An industrial development corporation should be formed for the specific purpose of handling this development. Firm options should be obtained on the land. Research work should be carried out on the market potentials and on the economic feasibility of locating prospective plants in the reclaimed

Chemical Raw Materials and Products for
a Production Complex at Columbus, Ga.



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area. The corporation should start a promotional program and plans for a continuing sales program. Important to the success of a regional complex is that it develop along the lines of a community of plants that share common needs. Joint ownership by competitors of large size production plants that use standard technology should be encouraged. The industrial development corporation should be able to make package offers of land, design, construction, financing and employee training. With such a complete approach many companies will find it to their advantage to join the complex rather than stay on the outside and compete with it.

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CAMPUS MEMO

APPENDIX

Date May 18, 1962

TO: Wade McKoy Department: Industrial Development Branch, EES
FROM: M. R. Carstens Department: School of Civil Engineering
SUBJECT: Potential Industrial Tract at Columbus, Georgia

On Thursday, May 10, Mr. Wade McKoy and the writer visited the site of a potential industrial tract at Columbus, Georgia for the purpose of ascertaining the engineering feasibility of reclaiming flood-plain acreage. The tract is bounded by the main channel of the Chattahoochee River on the west, Bull Creek on the north, Lumpkin Road on the east, and Upatoi Creek on the south. The major portion of this area lies in the flood plain of the Chattahoochee River. The undeveloped acreage in this plot is now devoted to agriculture and to sand-and-gravel mining.

The area is subjected to frequent flooding to an appreciable depth. Mr. Wilson Camp estimated that flooding occurred at least three times per year. Undoubtedly the Mobile District office of the Corps of Engineers has conducted hydrologic and flood-routing studies in connection with Walter F. George Reservoir which would define the probability and duration of flooding. In any event, the area must be protected against flooding at a much lesser frequency than now exists, say, once in 50 years on the average.

Obviously in order to obtain this protection, levees would be required. The height of such levees is an economic problem involving cost of height versus cost of flooding. The location of the levees is established as being as close to the main channel as possible since the protected acreage is small anyway.

The soil profile under the agricultural land appears to be quite uniform. The top layer of 8-12 ft. is sand containing silts and clays. This top layer is suitable for levee construction inasmuch as this top layer appears to be quite impermeable. In fact at one point in the tract there is an artesian well indicating that the silty sand of the upper strata is an effective seal over the sand and gravel aquifer. Below this upper strata,

sand and gravel constitute the soil profile down to a depth of approximately 50 feet where (according to Mr. Wilson Camp) marl is encountered. The writer has no way of knowing the extent or permeability of this material.

The soil profile in the area which has been mined for the sand and gravel is very nonuniform. The mining operation consists of stripping the silty-sand surface strata to expose the relatively clean sand and gravel. The sand and gravel are hydraulically mined down to about a 50 ft. depth. The silty sand material and other unwanted materials are then pushed into the ponds formed where the sand and gravel were removed. The land which has been mined is much less desirable as an industrial tract because (1) the foundation conditions for construction are nonuniform and poor and (2) the silty sand layer which would be suitable for levee material is not available.

The feasibility of this development depends solely upon the unit cost of the flood protection. It would be a relatively simple matter to arrive at a preliminary cost for the levee alone. A more difficult problem is to estimate the cost of measures to safely handle the seepage under the levee through the deep strata of sand and gravel.

During floods the water level rises in the river creating a force which tends to push the water through the sand and gravel under the levee. Efflux areas within the leveed area would develop. If the piezometric-head gradient is sufficient the soil becomes quick and "boils" are formed. If unchecked, the material begins to erode at an accelerated rate from the efflux point under the levee to the main channel. This type of failure is called piping. The conditions at this site are conducive to this type of failure, namely (a) close proximity of the levees to the main channel of the river, (b) extensive permeable strata of sand and gravel under the levee, and (c) the main channel of the river penetrates deeply into the permeable strata.

The protective measures against seepage are generally of three types. First, the placement of clay blanket over the area of entry reduces the flow and localizes the region of greatest piezometric-head drop within the blanket. Second, cutoff walls or trenches beneath the levee are used to localize the greatest piezometric head drop beneath the dam. Cutoff walls do not need to penetrate to a lower impermeable strata to be effective. Third, screened relief wells within the leveed area allow the efflux of seepage water without

APPENDIX (Cont'd)

the formation of boils which, in turn, lead to piping.

The sealing of the entry is not feasible at this site because of erosion in the main channel.

Inasmuch as the levee length is great in relation to the protected area the feasibility of cutoff walls depends upon a low-cost scheme of construction. The traditional method of excavating a dry trench which is filled with compacted materials is unfeasible. The injection of grouting materials such as cement, bentonite clay, or chemical stabilizers likewise appears to be too expensive. A possible scheme is to employ in-place mixing of clays and silts. One possibility is to dump these fines in the wake of a trenching machine.

Even if a cutoff wall were to be employed screened relief wells also have to be used. The discharge and spacing of these wells would have to be established. In all likelihood pumping stations would have to be established in order to handle the well efflux.

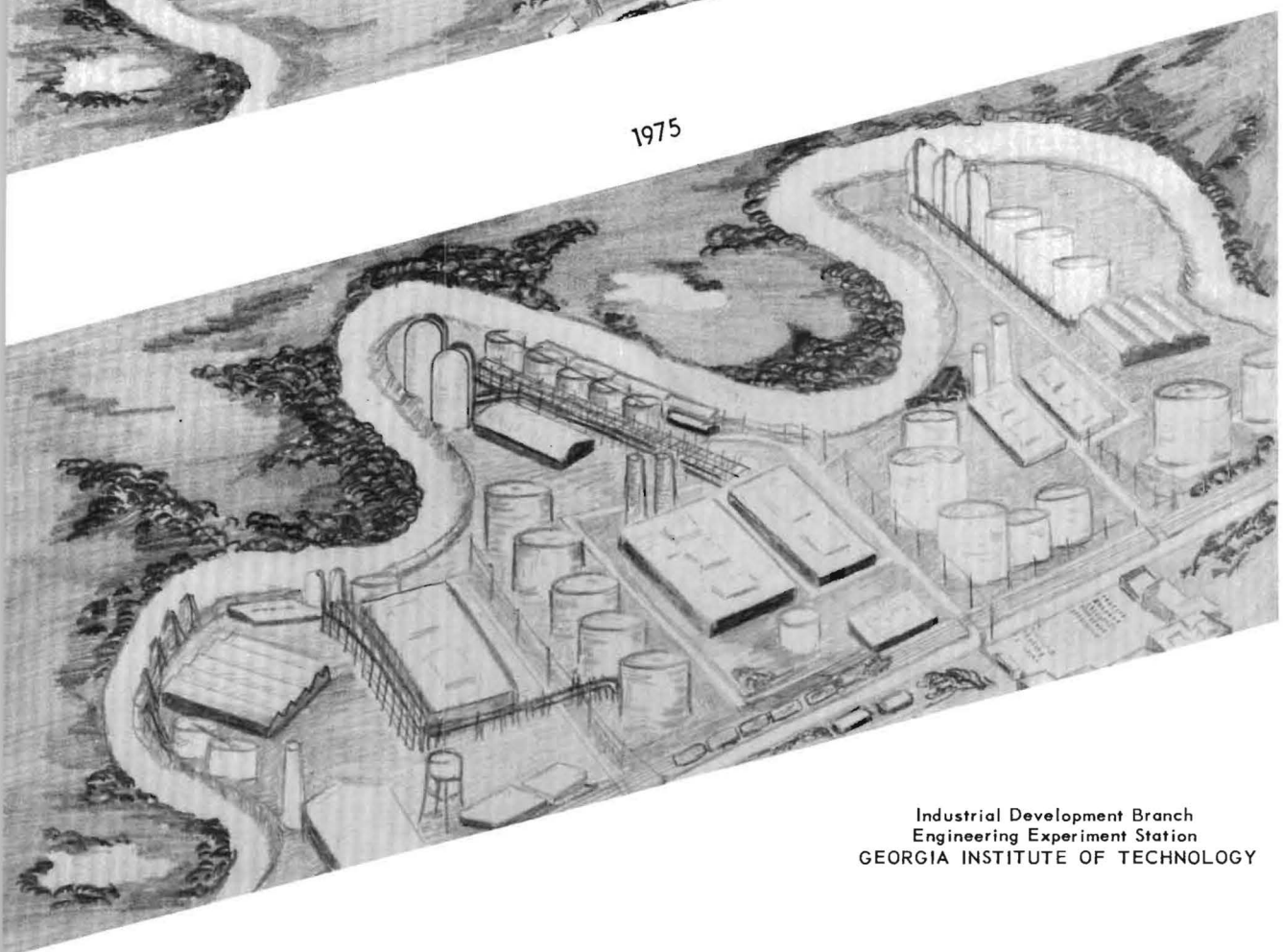
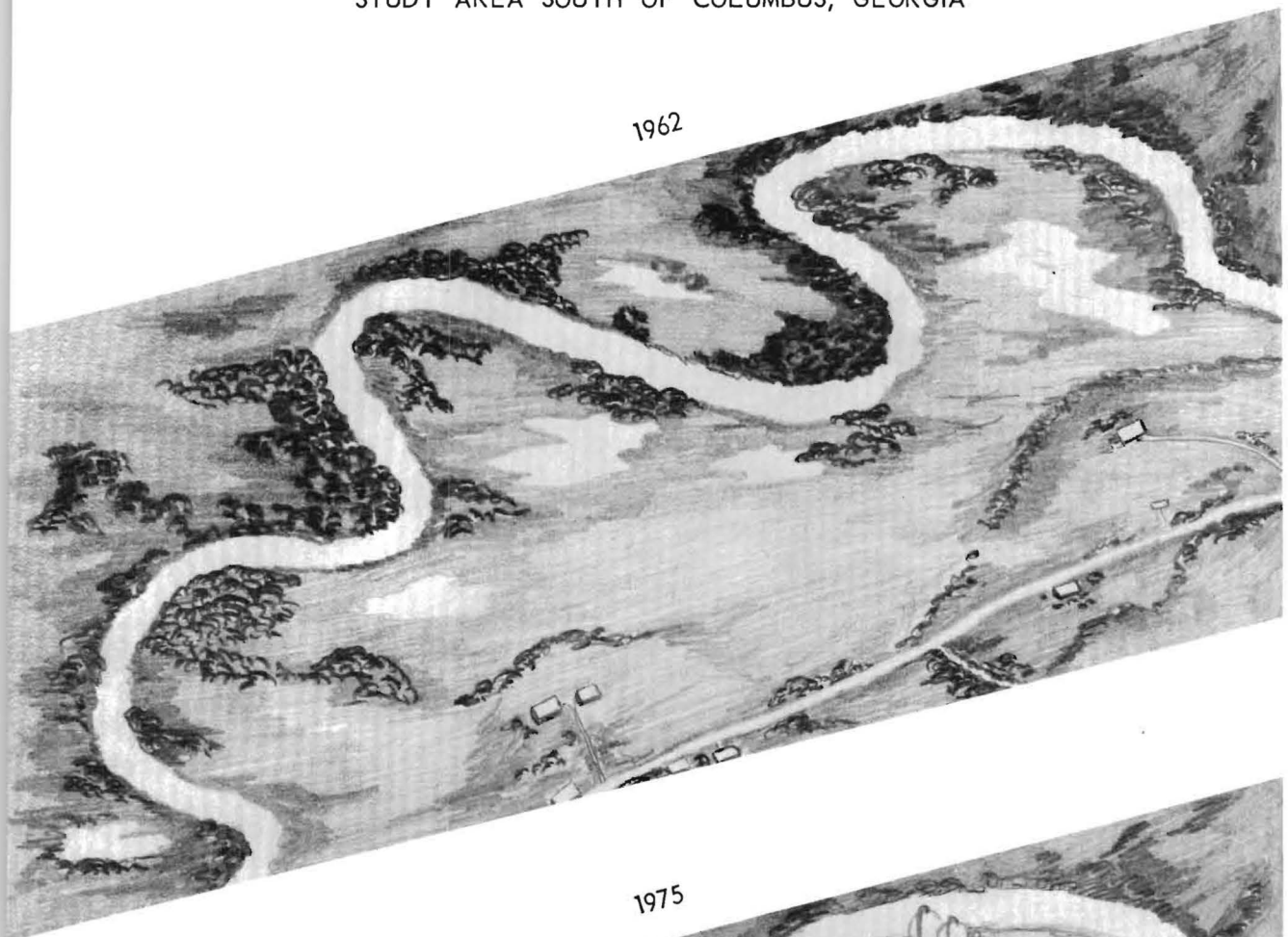
The previous introductory material has been presented simply to indicate that engineering analysis is required before a reasonable cost estimate can be formulated. A first step in this analysis would be to obtain river stage-duration-frequency information. Also a pumping test should be conducted in order to establish the coefficient of transmissibility of the sand and gravel aquifer. With this information analysis could proceed concerning well spacing, pumping requirements, effect of cutoff walls, etc.

In view of the rather extensive engineering analysis required I recommend that the Corps of Engineers be persuaded to investigate the feasibility of this land-reclamation project. Other organizations such as Law Engineering Testing Company of Atlanta possess the facilities and staff with which to perform the study.

Respectfully submitted,

/s/ M. R. Carstens
M. R. Carstens
P. E. 3424 (Georgia)

MAP 2
STUDY AREA SOUTH OF COLUMBUS, GEORGIA



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