Project B-209

INDUSTRIAL, LABORATORY AND OTHER TECHNICAL GLASSWARE

A Manufacturing Opportunity in Georgia

Prepared for

The Georgia Department of Industry and Trade
Jack Minter, Director
100 State Capitol
Atlanta, Georgia

by

George W. Morris, Jr.

Industrial Development Division
Engineering Experiment Station
GEORGIA INSTITUTE OF TECHNOLOGY
June 1963

Table of Contents

* * *

Tables

Maps

Figure

Foreword

This report examines the manufacturing potentials of a growing but often overlooked segment of the glass industry -- industrial, laboratory and other technical glassware. As is documented in this analysis, Georgia has the necessary combination of location requirements essential to the profitable operation of a plant in this specialized field of glass manufacture.

Like the two related reports on other segments of the glass industry, this analysis points up the significance of labor and fuel costs and the potential savings which a Georgia location offers. Unlike the companion reports, the emphasis in this study is on the ability of a Georgia manufacturer of industrial, laboratory and other technical glassware to serve the national market. This further substantiates the contention that manufacturing opportunities in Georgia are attractive not only to those firms seeking to serve the growing southeastern market, but also to many of those whose markets extend far beyond regional boundaries.

Additional or more detailed information desired by individual companies will be provided on a confidential basis. Questions or comments on this and other studies in the series are invited.

Kenneth C. Wagner, Chief
Industrial Development Division
GEORGIA INSTITUTE OF TECHNOLOGY

Summary

Georgia offers manufacturers of industrial, laboratory and other technical glassware the following advantages as a location for a new plant:

1. Greater output per dollar of wages paid would provide savings in production labor cost ranging from 8.0% to 9.9% of manufacturers' sales value. (Operating profit before taxes presently amounts to 11.7% of sales value.)
2. Economical natural gas rates would provide annual fuel savings ranging from .5% to 1.7% of sales value.
3. Most materials required for manufacture of the glass (except soda ash) are produced in the area. Soda ash can be barged into Columbus, Georgia, at transportation rates comparable to those paid by present producers of glassware. (See Appendix 2.)

The savings in labor and fuel costs would result in an increase in profits of between 70% and 100%.

The important location factors to be considered in the location of a new plant are production labor costs in various regions, fuel costs, and the production in the area of materials needed in the manufacturing process.

A plant in Georgia could serve the national market for industrial, laboratory and other technical glassware more economically than present plants because of the fact that lower labor and fuel costs would far more than offset any freight disadvantages. Generally, freight costs on shipments of the products do not amount to a significant percentage of sales value.

U. S. sales of industrial, laboratory and other technical glassware are expected to increase from $65.1 million in 1961 to $84.0 million in 1965. Since shipments for a typical plant amount to only $6 million and since there is no substantial excess production capacity in the industry at present, there will be a need for additional production facilities by 1965 or shortly thereafter.

INTRODUCTION

U. S. manufacturers' shipments of industrial, laboratory and other technical glassware (excluding electronic glassware) amounted to $66.6 million in 1961. Shipments experienced a significant expansion over the period 1956 through 1961 (from $41.7 million to $66.6 million) and are expected to increase significantly in the immediate future. If sales continue to grow as anticipated, there will be a need for additional production facilities in the industry. It is the purpose of this report to analyze for national manufacturers of industrial, laboratory and other technical glassware the advantages and disadvantages of locating a new facility in Georgia.

The products covered in the study include glass tubing (except electrical and electronic), insulators, scientific and laboratory glassware, industrial glassware (gauge glass, instrument faces, machine parts, glass knobs, meter covers, pumps, battery jars, etc.), and other technical glassware. Manufacturers in the industry vary in their scale of production from the very large integrated firm to the small producer who hand makes the products from glass purchased from the large producers.

The great bulk of the products are sold through large wholesalers, such as W. H. Curtin Company and the Will Corporation, who distribute to the customers from regional warehouses.

THE ADVANTAGES OF A GEORGIA LOCATION

As a location for a plant to produce industrial, laboratory and other technical glassware, Georgia offers the following attractions to a prospective manufacturer:

1. Greater product output per dollar of production wages paid caused by high worker productivity and relatively low wage rates.
2. Economical natural gas rates.
3. Production in Georgia of the great bulk of the materials required for glassware manufacture.

Product Output per Dollar of Production Wages Expended

The relative efficiency of the production wage dollar in Georgia and in states producing large quantities of pressed and blown glassware (SIC 322), including industrial, laboratory and other technical glassware, is indicated in Table 1.

Table 1

EFFICIENCY OF PRODUCTION WAGE EXPENDITURES
IN GEORGIA AND MAJOR PRODUCING STATES

Producing State	Value Added per Dollar of Production Wages Expended
GEORGIA	3.705 (est.)
Ohio	2.537
New Jersey	2.390 (est.)
New York	2.361 (est.)
Pennsylvania	2.203
West Virginia	2.113 (est.)

Note: The estimated ratios were derived by subtracting from the value added by manufacture and production wages expended for SIC 32 the respective totals of value added by manufacture and production wages expended for all three-digit industries in SIC 32 listed in the Census of Manufactures (i.e., SIC 321 and 323 through 329). The resulting figure for production wages expended was then divided into the resulting value added by manufacture to obtain the ratio for SIC 322.

Source: Computed from data in 1958 U. S. Census of Manufactures.

The importance of the ratios in Table 1 becomes apparent when their effect on annual production labor costs is determined. The estimated annual labor costs for a typical plant producing glass tubing and industrial, laboratory and other technical glassware in Georgia and major producing states are given in Table 2.

Table 2

ESTIMATED ANNUAL PRODUCTION LABOR COSTS
FOR A TYPICAL GLASSWARE PLANT
IN GEORGIA AND MAJOR PRODUCING STATES

State	Shipments	Value Added by Manufacture	Production Wages
West Virginia	$6,000,000	$3,880,000	$1,840,000
New York	6,000,000	3,880,000	1,640,000
New Jersey	6,000,000	3,880,000	1,620,000
Ohio	6,000,000	3,880,000	1,530,000
GEORGIA	6,000,000	3,880,000	1,050,000

Notes: A typical plant is estimated to ship between $5 million and $7 million worth of glassware annually. Annual shipments of $6 million are used for computation purposes.

Value Added by Manufacture determined by dividing $6 million shipments by the U. S. ratio of shipments per dollar of value added by manufacture (1958 U. S. Census of Manufactures).

Production Wages computed by dividing the value added by manufacture for each state by the state ratio of value added by manufacture per dollar of production wages expended. (See Table 1.)

The advantage in production labor costs which a Georgia facility would experience amounts to $480,000 to $790,000 annually on $6 million in shipments -- a saving of from 8.0% to 9.9% of sales value. The significance of this saving is emphasized when compared with a 1961 average net operating profit before taxes of 11.7% of sales for the two largest producers of industrial, laboratory and other technical glassware.[1/]

1/ The 1961 average net operating profit before taxes of Corning Glass Works and Owens-Illinois Glass Company combined is 11.7% of sales. See 1962 Moody's Industrials.

Fuel Cost

The fuel most commonly used in glass-making furnaces is natural gas, although oil furnaces are used by some producers. The areas in Georgia where the most economical natural gas rates are found are Columbus, Macon, Atlanta and Augusta. (See Map 1.) As an example of the saving in fuel costs available to a Georgia producer, the annual cost for a Columbus plant is compared with the costs for plants in major producing cities in Table 3. The estimated fuel consumption rate for a typical plant with $6 million annual shipments is 280,000 therms per month.

Table 3

ANNUAL FUEL COSTS FOR A TYPICAL GLASSWARE PLANT IN COLUMBUS, GEORGIA, AND MAJOR PRODUCING CITIES

(Consumption Rate: 280,000 therms per month)

Plant Location	Annual Fuel Cost
Toledo, Ohio	$226,811.88
Big Flats, New York	206,847.48
Vineland, New Jersey	204,994.80
Parkersburg, West Virginia	152,161.80
COLUMBUS, GEORGIA (Rate E-Industrial)	124,060.80

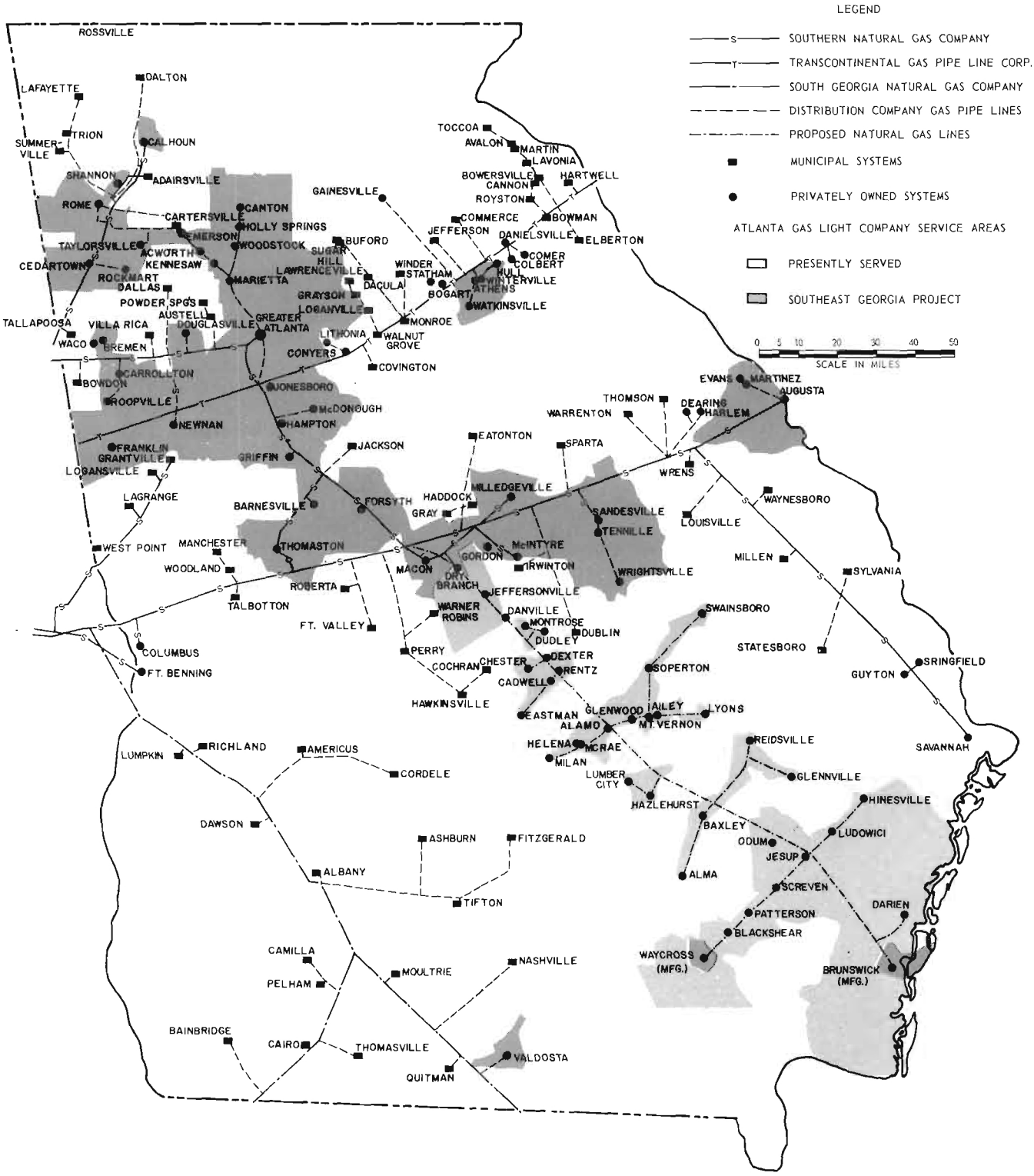
Source: Computed from rates published in American Gas Association Rate Service.

The annual saving in the cost of natural gas on $6 million in shipments for a Columbus plant ranges from $28,101 (over a Parkersburg plant) to $102,751 (over a Toledo facility) and amounts to from .5% to 1.7% of the value of shipments. This saving is significant when compared with net profit before taxes of 11.7% of shipment value for major firms in the industry.

Materials Required for Production

Most industrial, laboratory and other technical glassware is made from hard glass of the potash or pyrex types. These glasses have a higher percentage of silica (80% to 96%) than the soft glass used in the production of containers and tableware. In addition to silica, the production of hard glassware

MAP 1
NATURAL GAS SERVICE



requires soda ash, lime, feldspar and various other ingredients (such as borax and zinc oxide), depending on the exact type of glass desired.

Map 2 indicates the location of Georgia sand suitable for glassware production. High quality flint sand is now being produced in Thomas County, and over a million tons of sand for high quality glasses are estimated as available near Matthews, Georgia, in Jefferson County.[1/]

Potassium feldspar, used in the production of hard glass, is produced in quantity in Jasper County, Georgia. (See Map 2.) The daily capacity of the plant in Jasper is 150 tons of minus 20-mesh material, 10 tons of minus 40-mesh, or 70 tons of minus 200-mesh. The chemical analysis of this feldspar is given in Appendix 1.

The type of limestone required for quality glassware production is produced in Alabama and Tennessee. Since the cost of this material compared with the cost of other production materials is very small, the freight costs on lime shipments from the two states would be nominal.

The nearest sources of soda ash are in Baton Rouge and Lake Charles, Louisiana, and in Saltville, Virgina. However, a glassware plant in Georgia could have the material shipped in from Baton Rouge by inland water barge through the Apalachicola and Chattahoochee rivers at an estimated cost of $.00188 per pound.[2/] This compares very favorably with the rail cost of $.00155 per pound of incoming shipments of soda ash for a Toledo plant, which is located nearer a source of soda ash (Detroit) than any major plant.[3/]

The volume of the other specialized materials used in the production of hard glassware is relatively small, and freight costs on the shipments into Georgia would add an insignificant amount to their total costs.

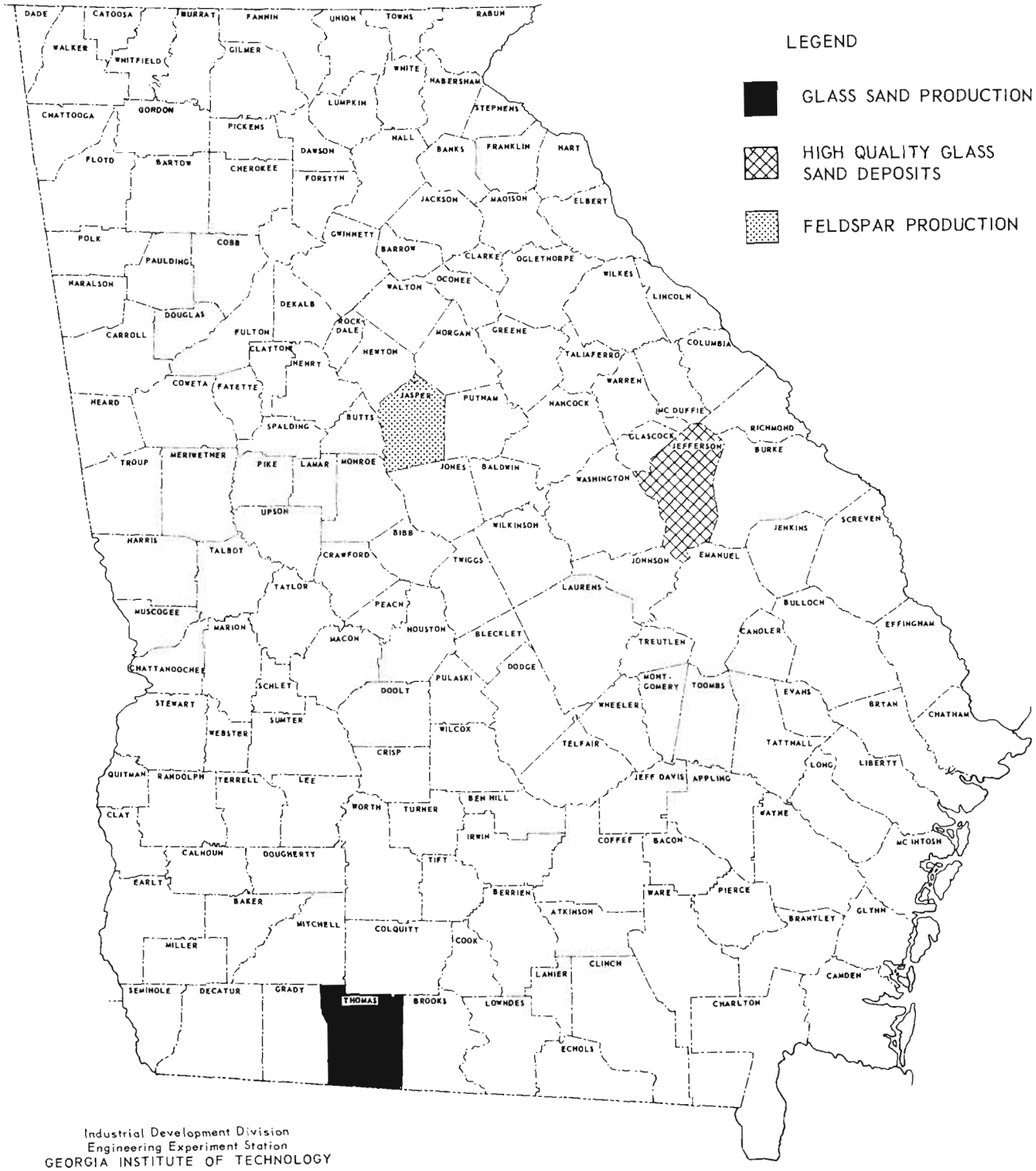
1/ Whitlatch, George I., Georgia's Mineral Resources, Industrial Development Division, Engineering Experiment Station, Georgia Institute of Technology, Atlanta, Georgia, June 1962, pp. 67-72.

2/ Based on a minimum shipment of 600 net tons.

3/ See Appendix 2 for rates.

MAP 2

GEORGIA SOURCES OF MATERIALS USED IN GLASSWARE PRODUCTION



Industrial Development Division
Engineering Experiment Station
GEORGIA INSTITUTE OF TECHNOLOGY

LOCATION FACTORS

The principal factors to be considered in the selection of an area in which to locate a new plant are:

1. the cost of production labor;
2. the cost of fuel used in glass production; and
3. the production in the area of materials required for the manufacture and shipment of glassware, including glass sand, soda ash, and paper and paperboard containers.

Cost of Production Labor

In the pressed and blown glass industry (SIC 3229), including industrial, laboratory and other technical glassware, production labor costs represent a high percentage of the value of the products. According to the 1958 Census of Manufactures they amounted to 29.6% of shipment value and 42.2% of the value added by manufacture. Just a 10% reduction in production labor costs would increase operating profit before taxes approximately 25%.[1/]

Cost of Fuel

The cost of fuel in the production of pressed and blown glassware also is significant. In 1958, it amounted to 12.1% of all materials consumed and 3.5% of the value of shipments. As fuel rates vary greatly in different sections of the U. S., this is an important item to consider in plant location decisions. (See Table 3.)

Production of Raw Materials

Location of a plant near producers of the raw materials used in glassware manufacture is usually desirable. The relative importance of the costs of various materials is as follows:

Material	Per Cent of Total Material Cost
Soda Ash	3.6
Glass Sand	3.2
Paper and Paperboard Containers	13.7

1/ Formula: Reduction in labor cost (as a percentage of sales) divided by present net profit X 100 = $\frac{.1(.296)}{.117}$ X 100 = 25%.

Since glass sand and soda ash both have a low value per pound, shipments of either product overland for a long distance would considerably increase the product's total cost. The present price of soda ash is about $30 to $40 per ton, or $.015 to $.020 per pound, while the price of glass sand is approximately $.019 per pound. An increase in transportation costs of only $.005 per pound for either item would increase the cost of the material over 30%.

Corrugated shipping containers averaged approximately $.11 per pound in 1958 according to the 1958 Census of Manufactures. It would require a much larger increase in freight cost in comparison with sand and soda ash to substantially increase the cost of this product. An increase in transportation cost of $.005 per pound would increase the cost of the material approximately 4.5%. It is nevertheless desirable to minimize the freight cost on the product by having the glassware plant fairly near the source of supply.

Therefore, from the standpoint of minimizing freight costs on incoming shipments of soda ash, glass sand and paperboard shipping containers, it is desirable to locate a plant manufacturing industrial, laboratory and other technical glassware relatively close to the sources of production of these products.

ECONOMIC MARKET AREA FOR A GEORGIA PLANT

One of the primary factors which determine the extent of the market area to be covered from a given plant is the relative importance of freight costs. If the freight costs amount to a significant portion of the total delivered cost of the product, a plant to serve a regional market is indicated by a strict economic analysis. The regional market then must be sufficiently large to consume more than the output of a typical-size plant.

In the case of industrial, laboratory and other technical glassware, freight costs on the majority of shipments are estimated to amount to less than 1% of shipment value.[1/] Freight costs, therefore, are a relatively unimportant part of the delivered cost to distributors, and most manufacturers consequently would serve the national market rather than a regional one.

Even on the few items where freight costs are substantial, a Georgia plant could serve the national market with freight costs comparable to present producers. For example, the costs from Columbus, Georgia, to various areas of the U. S. are compared in Table 4 with costs from present major producing cities.

Table 4

RAIL FREIGHT COSTS IN DOLLARS PER POUND ON CARLOAD SHIPMENTS OF LABORATORY GLASSWARE

TO	FROM				
	Big Flats N. Y.	Parkersburg W. Va.	Toledo O.	COLUMBUS GA.	Amount Columbus Cost Exceeds Lowest
St. Louis	.0313	.0236	.0212	.0259	.0047
Los Angeles	.0350	.0323	.0311	.0315	.0004
Dallas	.0435	.0366	.0357	.0294	-0-
New York	.0166	.0236	.0269	.0338	.0172
Chicago	.0265	.0208	.0159	.0303	.0144
Seattle	.0350	.0323	.0311	.0315	.0004

Note: Freight costs are based on a minimum shipment of 18,000 pounds, with the exception of those to Los Angeles and Seattle, which are based on a minimum shipment of 30,000 pounds.

1/ This would not be true on shipments of the bulk of glass rods and tubing which, according to the 1958 Census of Manufactures, had an average manufacturers' value per pound of $.46. However, a plant would normally not be established to produce these items exclusively.

Of the shipments indicated, the greatest freight disadvantage of a Georgia facility would be in shipments to New York in competition with the plant at Big Flats, New York. (See Table 4.) This disadvantage amounts to $.0172 per pound. Since the estimated value per pound of the shipments is in excess of $2.00 per pound, the increased freight cost from Columbus amounts to .008% of the value of the product. This negligible increase in freight cost would be more than offset by labor savings over the Big Flats facility, estimated at 9.8% of shipment value (Table 2), and fuel savings, estimated at 1.4% of the value of shipments (Table 3).

A Columbus facility, therefore, could serve the U. S. market more economically than the other plant locations indicated.

THE NEED FOR NEW PLANTS

U. S. manufacturers' shipments of industrial, laboratory and other technical glassware increased from $39.7 million in 1955 to $65.1 million in 1961, a gain of 64% over the seven-year period. (See Table 5.) According to the Business and Defense Services Administration, imports of technical, scientific, industrial and other technical glassware in 1960 amounted to 6.5% of the value of U. S. manufacturers' shipments for the year.[1/] Exports for 1960 accounted for approximately 15.0% of U. S. shipments.

If the trend of U. S. shipments continues to increase as anticipated, their value in 1965 will amount to $84.0 million, an expansion of $18.9 million. (See Figure 1.) Since the yearly shipments of a typical plant are around $6 million, there should be a need for additional production facilities to produce industrial, laboratory and other technical glassware in the period from 1965 to 1970.

1/ Pressed and Blown Glassware Industry, ER 61-79, Business and Defense Services Administration, U. S. Department of Commerce, February 8, 1962.

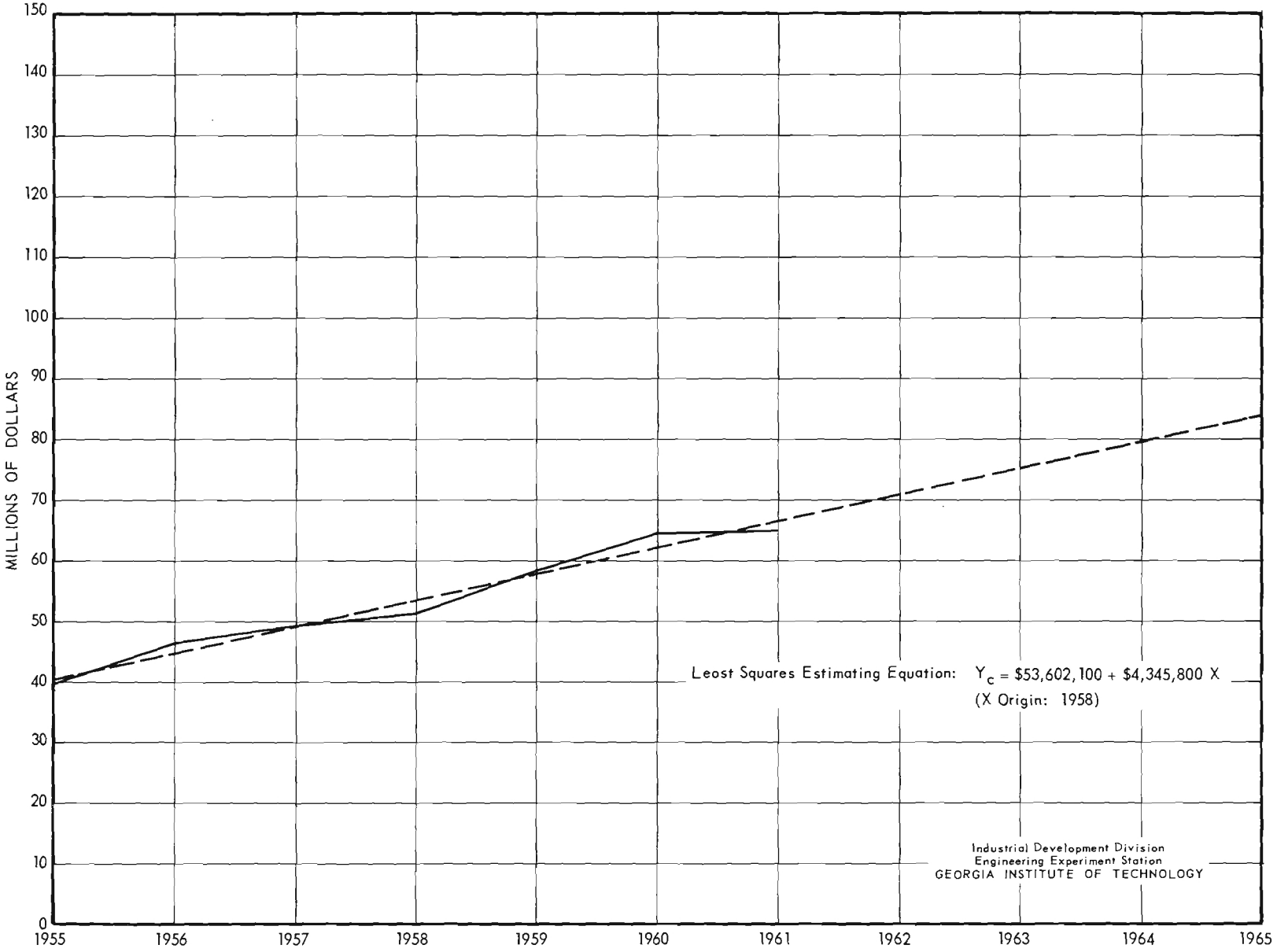
Table 5

U. S. MANUFACTURERS' SHIPMENTS
OF INDUSTRIAL, LABORATORY AND OTHER TECHNICAL GLASSWARE
(in thousands of dollars)

	1955	1956	1957	1958	1959	1960	1961
Tubing (excluding fluorescent and neon); Rods and canes (excluding electrical)	4,780	6,529	6,494	7,555	8,357	9,555	10,270
Insulators (all types)	1,916	2,129	1,566	986	5,572	6,626	5,449
All other technical glassware (excluding electronic tube blanks)	1,981	1,723	3,125	3,506			
Scientific and laboratory glassware	18,049	21,529	22,955	24,465	26,169	30,115	28,039
Industrial glassware	12,975	14,553	15,229	14,825	18,601	18,262	21,330
Totals	39,701	46,463	49,369	51,337	58,699	64,558	65,088

Source: Current Industrial Reports, Series M32E.

FIGURE 1
TREND OF U.S. MANUFACTURERS' SHIPMENTS OF INDUSTRIAL, LABORATORY AND OTHER TECHNICAL GLASSWARE
1955–1965



CONCLUSION

There definitely will be a need by 1965 for new plants to produce industrial, laboratory and other technical glassware, due to the rapid expansion of the U. S. market.

A new facility in Georgia would be in a very favorable position to compete nationally with existing plants because the negligible disadvantage in freight rates would be greatly outweighed by significant savings in labor and fuel costs. These savings, which could total up to 11.6% of the sales value of the products, would make it possible for a Georgia manufacturer to almost double the average profit rate of existing manufacturers.

APPENDICES

Appendix 1

ANALYSIS OF FELDSPAR, JASPER COUNTY, GEORGIA

Content	Amount
SiO_2	65+% - 66%
Al_2O_3	19+%
Fe_2O_3	.07%
CaO	.9%
MgO	Trace
K_2O	10+%
Na_2O	3+%
Loss on ignition	.20%

Notes:

"+" indicates additional fractional per cent.

Two analyses, furnished 18 months apart, by Appalachian Minerals Company were consistent within less than 1%.

Source: Whitlatch, George I., Georgia's Mineral Resources, Industrial Development Division, Engineering Experiment Station, Georgia Institute of Technology, Atlanta, Georgia, June 1962, p. 27.

Appendix 2

TRANSPORTATION RATES ON SODA ASH

Sodium Carbonate, Soda Ash, Monohydrate or Sesquicarbonate

I. Carload Rail Rates in Cents per 100 Pounds

	Baton Rouge, La.		Saltville, Va.		Detroit, Mich.	
	Rate	Min.	Rate	Min.	Rate	Min.
Atlanta, Ga.	56.5	70M	44.5	70M	--	--
Columbus, Ga.	52.5	70M	50.5	70M	--	--
Toledo, O.	--	--	--	--	15.5	70M

II. Barge Rates in Cents per 100 Pounds

	Baton Rouge, La.	
	Rate	Min.
Bainbridge, Ga.	15.6	600 Net Tons
Columbus, Ga.	18.8	600 Net Tons

Note: Minimum carload weights are expressed in thousands of pounds.