Birmingham-Jefferson County Port Authority Study on "Opportunities for Growth in an Era of Supply Chain Realignment" for The Regional Planning Commission of Greater Birmingham

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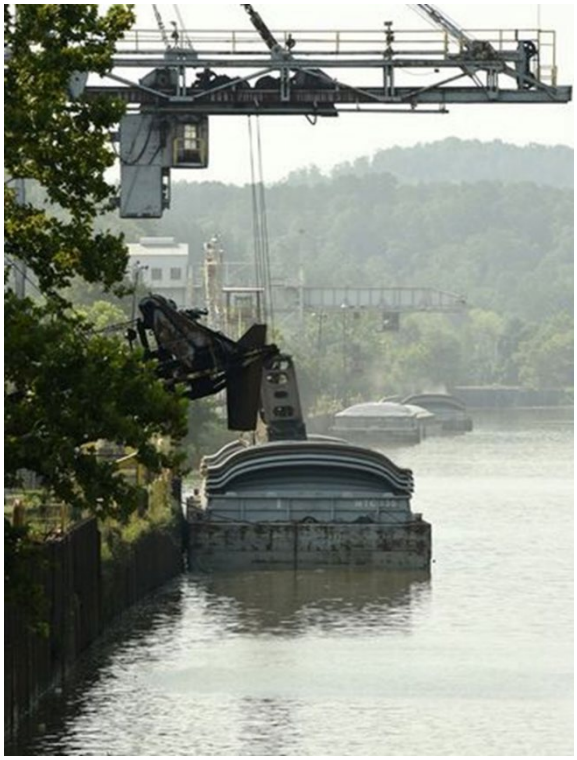
EXECUTIVE SUMMARY

Background



The Birmingham Jefferson Country Port Authority (BJCPA) engaged Auburn University's Government and Economic Development Institute (GEDI) and the Raymond J. Harbert College of Business (HCOB) in 2022, to conduct an assessment of BJCPA's operations as well as the feasibility of expanding the regional port and its warehouse assets. The BJCPA is a public authority established in 2016, with the aim of promoting the development of Port Birmingham (PB). PB is an inland port on the Black Warrior River, upstream from the port of Mobile (AL). At the current time, the port mostly operates as a barge terminal and Watco is the primary tenant. The current assessment was designed to identify opportunities for future expansion of operations within the confines of the extant infrastructure – i.e., for example, an analysis regarding the feasibility of converting the port to a container port is beyond the scope of the current report since the navigable waterways on the Black Warrior River downstream from PB are currently unable to support this kind of transport and will have to be substantially altered to support such an endeavor. The assessment we report here, therefore, seeks to identify current challenges, avenues for expansion, and growth in the future, given the logistical bottlenecks currently in place, and the needs of the local industry. This is done through an assessment of the current port's capabilities and potential, an assessment of the local business community's estimate of how their supply chains may realign in the coming years, and their level of current and anticipated engagement with the port.

This study was conducted in 2022 between the months of July and December and consisted of three phases – (i) project initiation and site visits, (ii) fact finding and data collection, and (iii) reporting.

Approach

We conducted five meetings with the Executive Director of BJCPA, one tour of the port, one meeting with senior leadership of the port and representatives from Watco, focus group discussions with 10 industry leaders, and collected survey responses from 51 local industry leaders in the Greater Birmingham area. In addition, we collected detailed import and freight traffic data from *Import Genius*, a leading intelligence service for the global import-export industry.

Observations and Recommendations

Our analysis of the interviews and surveys resulted in the identification of four major thematic areas for future growth –

(i) Warehousing / Crossdocking
(ii) Training and Education
(iii) Intermodal Carriage
(iv) Product Proliferation

These are summarized below and discussed in detail later in this report.

Warehousing: In the past few years, the retail industry in the United States has undergone a seismic shift. Instead of focusing on scale, retailers have changed their focus to coverage by moving from having a few large, centralized stores in large malls and central locations to having numerous smaller stores located in many urban and suburban city blocks. For example, industry reports suggest that for every store that closed in 2019, more than five new but smaller ones were opened (NRF, 2019). Concomitant with this trend, is an increased need to tailor, forecast, and maintain product mixes and stock keeping units (SKU) at each new business location. This has led to complexity in managing the SKU-mix across locations. Given how retail is the driver of supply chains, upstream businesses such as manufacturers and distributors are also revising their extant business models. The onset of COVID-19 in early 2020 has only accelerated this trend. This means that in the next few years, growth opportunities for new supply chain intermediaries are likely to be better than ever. As companies realign their supply chains to be more resilient to risk and reassess their vendor bases as well as their transportation & distribution channel partners, it is likely that new players will emerge who may heretofore not have been considered as "mainstream" options. This opens the door for additional

warehousing/crossdocking facilities that are positioned with rapid order fulfillment / decreased order cycle times in mind. Several of the interviewed respondents indicated support for such facilities and suggested that their companies would be likely to avail themselves of such facilities in the future. BJCPA and PB are in a unique position to take advantage of this opportunity given their proximity to rail yards, as well as the interstate.

At the current time, most operators at PB do not have any dedicated, controlled / protected storage facility. Most commodities are stored in the open, and while this is probably okay for the commodities that are most frequently traded at PB (i.e., iron ore, coal), the lack of one certainly limits operators' ability to compete for business in the era of post-COVID supply chain realignment, where firms will seek to revamp their inventory strategy. It is this team's belief that warehousing space of between 12,500 and 20,000 sq. ft. made available at PB will position PB competitively to attract business.

Training & Education: As is highlighted repeatedly in study after study, logistics is getting increasingly complex by the day. This complexity requires developing and managing talent that is skilled, loyal, and understands the tasks needed to get the job done. For example, according to the 2021 "Logistics 2030" report, recruiting and retailing logistics talent was an ongoing concern for over 71% of surveyed managers. Similarly, finding appropriate training avenues and opportunities for their entry level workforce in the future was expected to be a challenge for 87% of the respondents. Among all the categories covered (i.e., managing employee expectations of flexible schedules, enhanced benefits, work/life balance, and training) the latter (i.e., training) was raised as an issue by the largest subset of respondents. Further, over half of all respondents indicated that the availability and readiness of logistics talent will be an even bigger issue in 2030 than it is today. These challenges raise opportunities for BJCPA.

Specifically, while the port lacks certain facilities (e.g., a true container handling terminal), it does have several other infrastructural elements that are critical in most logistics operations – e.g., cranes, barges, railcars, loading and unloading docks, and so on. We contend that if the warehouse (discussed in the previous point) were added, this would also allow the port to incorporate other infrastructural inputs such as forklifts and so on. There is, therefore, an

opportunity for the port to provide training / classes / certification programs to individuals either by themselves or in conjunction with local community colleges. Such opportunities have been created in the north of the country, but none currently exist in the south. For example, there is currently no Domestic Maritime Center of Center of Excellence (CoE) in the state of Alabama even though Mississippi has three such centers, including one that is over 200 miles inland. The US Department of Transportation's Maritime Administration division periodically calls for applications for designating locations with the CoE designation, and there is tremendous opportunity for BJCPA to partner with local education providers to achieve said designation.

Intermodal Carriage: On a per ton-mile basis, the barge is one of the most environmentally sustainable forms of transport. For example, researchers have suggested that transport by rail emits nearly 40% more Carbon Dioxide than by barge. Similarly, transport by truck emits over 370 % more Carbon Dioxide than transport by inland barge. Of course, this low carbon footprint comes at a cost – specifically barge is also among the least flexible modes of transport in addition to being among the slowest. Inland barges are especially notorious in this in the sense that inland waterway transport is slower than even ocean freight. This is where the need for intermodal transport arises. Specifically, intermodal transportation involves the combination of two or more modes of transportation for a single shipment. Standard intermodal cargo containers can be transported by truck, rail, ship, or barge. Railroads are a common component of intermodal transportation because they usually enjoy efficient portside access for international shipping and can reach cities very efficiently over long distances. Major railroads also maintain strategic relationships with trucking and / or shipping companies to provide the door-to-door convenience that trucking services offer, while adding the low cost that other modes are able to deliver. At the current time, BJCPA shows some intermodal capacity, but given the lack of container transport ability and covered storage, there are limitations on the extent to which this can be explored. It is possible that expanding this avenue may provide opportunities for future growth.

Product Proliferation: At the current time, PB is primarily utilized by the steel, coal, and raw material industries. An analysis of the raw material flowthrough in the Birmingham metro area

reveals that in 2022, there were at least 156 different commodities either inbound or outbound from Birmingham (data sourced from Import Genuis) with a shipment value of $ 1 Million or more. This number only reflects the cargo that either originated outside the United States with Birmingham at the destination, or which originated in Birmingham and was designated for shipment overseas and was shipped through ocean freight. Arguably, therefore, opportunities exist for PB to capture a share of this traffic through increasing the diversity of products / items that the port is able to handle. Again, this is at least somewhat contingent on the ability of the port to build a warehouse since many of these items (e.g., chemicals) typically require storage away from the elements.

A detailed analysis and description of the various stages in this study is presented in the next few sections.

INTRODUCTION

Background

In April 2021, the Birmingham Jefferson County Port Authority (BJCPA) engaged Auburn University's Government and Economic Development Institute and the Harbert College of Business to conduct an assessment of the Birmingham Port's operations as well as the feasibility of expanding the regional port and its warehouse assets. BJCPA is a quasi-government agency with bonding issuing authority and can operate anywhere within the Jefferson County footprint. Specifically, the current is associated with Birmingham Port, which is an inland port on the Locust Fork branch of the Black Warrior River. Currently the Birmingham Port operates terminals for six clients, including Watco, Lynn Port, Miller & Co., Parker Towing, Mid-South Paving, and Ergon.

The purpose of this project is to conduct an assessment of BJCPA's operations as well as to investigate the feasibility of expanding the regional port and its warehouse assets. Specifically, the assessment includes the following activities –

1) Review the current operating structure and characteristics of the port.
2) Analyze the current flowthrough of material and relevant inventory into and out of the Greater Birmingham area to identify alternate materials / products in which the port can develop market capabilities.

3) Assess current logistics and operations challenges of participants in the local business community to identify opportunities for the port to add value.
4) Suggest recommendations and action plans.

The Auburn team, in cooperation with BJCPA's leadership, divided the analysis into the following four phases –

1) Project initiation and management
2) Fact finding and data collection
3) Operational analysis and assessment
4) Reporting

This report is the culmination of meetings and interviews, surveys, and analyses of the collected qualitative and quantitative data.

Project Meetings

The project began with an initial meeting at the port in Mulga (AL) (i.e., 8250 Birmingham Rd., Mulga, AL, 35118) with representatives of BJCPA and Auburn University on May 20, 2022. The following members attended BJCPA and Auburn University.

Table 1: Attendees at project kickoff meeting

Name	Organization
David Russell	SGC Works & BJCPA
Kenneth McKenzie	Watco
Jesslan Wilson	Regional Planning Commission of Greater Birmingham
Christian Sanford	Representative of Senator Shelby
Daryl Perkins	Water Works Board member
David Mixson	Associate Director, GEDI, Auburn University
Shashank Rao	Raymond Harbert College of Business, Auburn University

BJCPA's leadership discussed the current state of the port operations, its current tenants, and operational details. A tour of the Watco and other tenant facilities was also organized, in addition to a tour of the rail yard. Attendees discussed the challenges with the current operations, including extant bottlenecks, and the general nature of business at the port at the current time. The following is the list of topics discussed:

1) History of Birmingham Port
2) The need to modernize the facility to create increased efficiency
3) Overview of current tenants & the extant facilities

The project team then had its kickoff meeting on July 18th via Zoom. At that point, the project team informed the main sponsor (David Russell) about the upcoming plan of action and the need for organizing focus group panels soon.

Introduction to the Birmingham Port

Birmingham Port is located on 614 acres of land along the Locust Fork of the Black Warrior River, approximately 20 miles west of downtown Birmingham (AL). It was originally developed in 1920 by Port Birmingham Company. While it is primarily a barge terminal, it is capable of handling some intermodal cargo on account of having access to a rail link. At the current time, it has substantial acreage for product placement and storage, but does not have any sheltered / controlled storage facilities. Currently there are six operators that have facilities at the port - Watco, Lynn Port, Miller & Co., Parker Towing, Mid-South Paving, and Ergon. The location of the port as well as the current operators are illustrated in Figure 1 and 2 respectively.

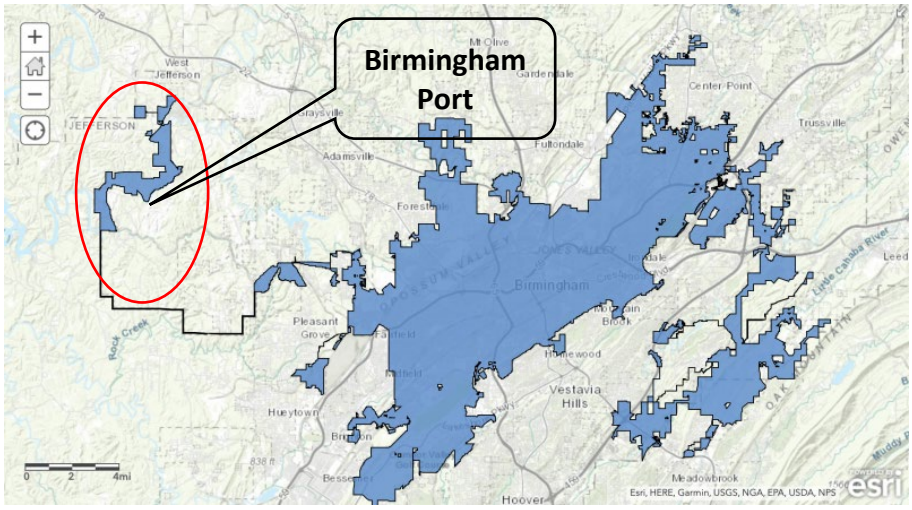


Figure 1: Birmingham City Limits (from http://data.birminghamal.gov)

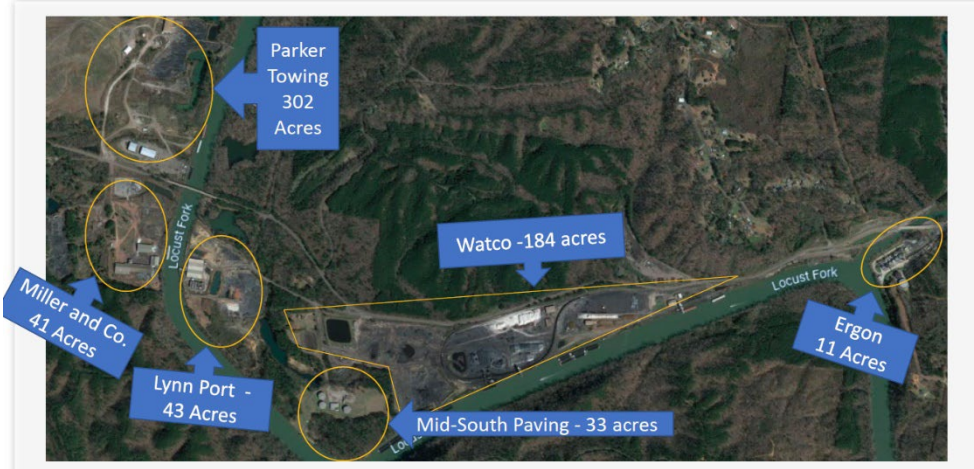


Figure 2: Birmingham Port's Terminal Operators (Data provided by Birmingham Port)

While the port has substantial operational capacity, it is currently being majorly underutilized since it currently only operates at 5% capacity overall. For example, in 2006, the port was handling about 13 million tons of throughput, which has now decreased to 2.2 million tons. Additionally, while the unemployment rate of the state of Alabama metro area is approximately 2.9%, that of the zip codes surrounding the port is over twice that at nearly 6.6%. This is indicative of the limited extent to which the port has been successful at creating jobs in the surrounding community in the past few years.

Initial Observations and Current Bottlenecks

In our initial observations, our team found several bottlenecks that limit the port's ability to take advantage of the current supply chain and logistics environment. Some of these observations include the following –

1) Limited ability to handle container cargo.
2) Limited controlled storage
3) Infrastructural bottlenecks in terms of road access

Limited Ability to Handle Container Cargo

One major benefit of standard shipping containers is the ability to stack them on ships and railcars and to ease the transfer of containers among ships, barges, rail, and trucks to accommodate intermodal transportation. Intermodal transportation often involves road, rail, and water transportation in succession. In the first segment, a container is collected at a shipper location by truck. The truck delivers

the container to an intermodal rail yard, where it is loaded (i.e., transloaded) to rail for ground movement to a shipping port. The container can then ship along with thousands of other containers on a ship or barge. Similarly, on the import side, a container can be transferred to the ground for movement by rail or truck to the customer location. The development of international standards for container sizes and configurations supports this seamless transition across different modes in multiple countries. It, therefore, stands to reason that for a port to be competitive in today's global marketplace, it needs to have an ability to handle shipping containers. Our conversations with Birmingham Port revealed that the port is unequipped to handle container cargo. This is not surprising since several reports have indicated that a container-on-barge is likely to require to require substantial increases in the depth of the Black Warrior River.

Limited Control Storage

As discussed before in this report, most commodities are stored in the open, and while this is probably okay for the commodities that are most frequently traded at Birmingham Port (i.e., iron ore, coal), the lack of one certainly limits operators' ability to compete for business in the era of post-COVID supply chain realignment, where firms will seek to revamp their inventory and logistics strategy.

To further assess this, we analyzed the freight corridors that either originated or concluded in the Greater Birmingham metro area (i.e., in the 6 counties (i.e., Bibb, Jefferson, Chilton, Blount, St. Clair, Walker) in a 125-mile radius of the Birmingham metro area). The goal was to identify opportunities for freight rerouting in the future, should the facilities be available. We relied on the *Import Genuis* database, which complies data from various sources, including various Customs agencies and other private data scrapers (e.g., Dun & Bradstreet). Note that said database is largely focused on international trade, therefore the numbers presented below may be skewed towards imports / exports and may discount domestic trade. At the same time, however, we should note that imports / exports should be generally reflective of the broad type of freight flowing through or into the Greater Birmingham area. Further, we would note that at least one of the counties has a very common name (i.e., Jefferson) and presented some challenges since it resulted in 77 pages of results from the search engine. While every effort was made to manually parse through the results to ensure that only the "correct" Jefferson County is presented in the results, our analysis has not been independently audited, and should be interpreted with some caution. Nevertheless, we believe that the numbers reported

below are indeed reflective of the state of freight throughput in the area of interest (i.e., Greater Birmingham).

Preliminary analyses revealed that there was a total of 232,206 lbs. of cargo earmarked for Birmingham (AL), representing 32 international shippers and 27 consignees. By far, the largest source of said freight was China, which accounted for 56 out of the 80 shipments (i.e., 70%) designated for Birmingham as the final destination. Subsequently, we expanded our coverage to the 6 counties mentioned above. This resulted in a substantial increase in coverage, with the data now representing 67,997,630 lbs. of cargo. This cargo came from 543 international shippers and 541 consignees. Even in this case, China was the largest source country, representing 770 out of the 2134 inbound shipments (i.e., 36%). India was the second largest source country with 239 inbound shipments (11.1%). Analysis suggests that there is substantial difference between the nature of freight inbounding into Birmingham as compared to the surrounding 6 counties. Consider, for example, that the *second largest* source of inbound freight to Birmingham is from South Korea representing 7 out of 80 consignments (i.e., 8.75%) while India represents less than 2%. On the other hand, when one considers the 6 counties mentioned above, South Korea's share drops to slightly more than 5% of all inbound shipments.

Irrespective of these differences, however, one thing is consistent. When one categorizes the freight into that needing controlled (i.e., sheltered from the elements, not necessarily "climate controlled"), versus that not needing controlled storage (such analysis was independently conducted by two doctoral students), between 87 % and 95 % of the freight (by volume) calls for storage that is protected from the elements / weather controlled. Lack of weather protected / covered storage, is therefore, a substantial challenge for the port despite the connectivity that it enjoys with the city and the wider market on account of the rail line (Birmingham Port is currently the only rail-served port in Central Alabama).

Infrastructure Bottlenecks

Road (or motor) transportation is the most common form of transport in most settings. Given the extensive network of roadways within towns and cities, as well as the connections among them, most origin–destination pairs within a land mass can be reached via some means of motor transportation. Trucks serve as the primary means of moving shipment of a single pallet-size container to several

pallets. A 53-foot trailer, which has become quite common in many settings, can hold two rows of 13 pallets, or 26 pallets. If the goods can be double-stacked (one pallet atop another), the capacity doubles to 52 pallets. The weight capacity for such a trailer is in the range of 45,000 pounds. Transportation by road is also a relatively fast and reliable means of transporting goods.

At the current time, Birmingham Port handles the equivalent of 235 semi-trucks daily, which would out to about 10 trucks an hour. However, our team observed that the highway leading to and from the port (i.e., SR-269) is a single lane road. Given that 1 in 10 collision fatalities in the US involve a large truck, this puts pressure on the ability of the highway to support increased traffic even if the port were to successfully attract additional cargo.

Further Analyses-Focus Group Discussions

Four respondent panels were solicited from the BJCPA leadership, with the criteria being that respondents meet the following criteria –

(i) The candidate has at least 10-15 years of experience (if not more), is in a key decision-making role within their organization (i.e., minimum plant manager / VP and so on).
(ii) They have some experience in the local business climate of the metro Birmingham area.
(iii) The participants reflect the general diversity of industry participants in the Birmingham metro and the surrounding countries.

The aim of this study is both exploration and confirmation. From an exploratory perspective, we wanted to investigate the issues that would incentivize local business leaders to realign their supply chains in a way to incorporate Birmingham Port into their future operations, while from a confirmatory perspective, we wanted to determine whether the issues raised in the previous (i.e., "Initial Observations) stage were raised by the local business leaders as well. From a methodological perspective this is similar to a Grounded Theory approach in the sense that it also follows a qualitative case study methodology with snowball sampling. Indeed, this approach is considered appropriate for issues that necessitate discovering concepts and relationships to develop a theoretical explanatory

framework (c.f., Stern, 1980; Strauss and Corbin, 1998[1]). Instead of surveying the phenomenon through a confirmatory, broad-based standardized instrument, the objective of such research is to gain deep, rich insights into the phenomenon (McCracken, 1988[2] , p. 18). As this is partially an exploratory study, we then followed the sampling guidelines proposed by McCracken (1988). Typically, such exploratory, theory building field studies will have fewer participants than theory verification studies., and it is common to interview eight or fewer informants until saturation is reached (c.f., McCracken, 1988; Strauss and Corbin, 1998).

A review of the literature allowed us to freeze our sampling frame and choose respondents accordingly: based on previous guidelines, we chose respondents who met the criteria outlined previously in this section. The questions were only semi-structured to allow the interviewees to narrate their experiences. There were also probes which ensured that the insights that the researchers' had regarding this phenomenon were addressed, if they did not arise during the semi-structured part of the interview (an interview protocol is presented in the appendix to this report – Appendix 1). After the initial participants were chosen, we analyzed the data and then determined which participants to invite next. After the findings became redundant, we concluded that the complexity of the concepts had been fully captured and, thus, additional data may not need to be collected. This saturation was attained at the end of the fourth focus group discussion (i.e., 10 participants). Focus groups were conducted in August 2022.

The extreme geographical distance between the researchers and the respondents made the use of face-to-face interviewing prohibitively expensive. As a result, interviews were conducted online using Zoom, a proprietary web-based video chat software. It is based on the open source Extensible Messaging and Presence Protocol (XMPP) which allows any user of the XMPP clients to communicate with other users. The software automatically transcribed conversations; hence the loss of important data was minimal. After conducting the focus group discussions, two doctoral students independently transcribed the interview responses and later compared responses. The responses were entered into

[1] Stern, P. N. (1980), "Grounded Theory Methodology: Uses and Processes," *Image*, Vol. 12, pp. 20-23.

Strauss, A. L., and Corbin, J. (1998), Basics of Qualitative Research: Grounded Theory Procedures and Techniques, 2nd edition, Newberry Park, CA: Sage Publications, Inc.

[2] McCracken, Grant. The long interview. Vol. 13. Sage, 1988.

LIWC-22 (i.e., Linguistic Analysis and Word Count - 22) software to analyze their cadence, social contextualization, and psychological meaning (c.f., Tausczik and Pennebaker, 2010[3]). Finally, the principal investigator on this team looked through the transcribed results to identify overall themes.

The following individuals (Table 1) participated in the discussions (respondent numbers are anonymized in the subsequent writeup to ensure secrecy). Respondents reported an average of 21 years of overall industry experience, most of which were in decision making positions within their respective organizations.

Table 1: Focus Group Participants

Respondent	**Organization**
Antoine Liddell	Spire Energy
Ed Seoane	Birmingham Airport
Rashard Howard	CSX
Brenda Perryman	Transit Mos
Matt Lawrence	Spire Energy
John Murray	Cooper T Smith
Thomas Schaller	Spire Energy
Tyler Pearson	City of Birmingham
Jason Burroughs	CB Transystem
Cody Gilliland	Watco

Note that the LIWC-22 presents various output measures, including “logical / formal thinking,” “language of leadership status,” “perceived honesty / genuineness,” and “Tone.” In the current study, the *Tone* score is the most relevant for our purposes. Specifically, *Tone* reflects a sentiment (thought, feeling, ...) rather than an emotion. While positive tone does relate to positive emotion, the LIWC dictionary also includes words like “birthday” or “funeral,” reflecting a positive or negative tone - LIWC-22 even recognizes a smiley like ":)" as a positive tone. On the other hand, emotion includes words that strongly suggest a positive (negative) emotion. For example, the word “laughter” suggests positive emotions. “*Tone*” is a composite variable ranging from 0 to 100. A value >50 means positive tone, a value below 50 a negative tone.

[3] Tausczik, Yla R., and James W. Pennebaker. "The psychological meaning of words: LIWC and computerized text analysis methods." *Journal of Language and Social Psychology* 29.1 (2010): 24-54.

Insights from Focus Group Discussions

Based on the analyses of focus group discussions, three major themes emerged. Specifically, respondents alluded to the following four issues that they felt would determine future supply chain realignment and configuration that are discussed in more detail below.

(i) Labor availability / shortages
(ii) Regulatory and environmental concerns surrounding sourcing, distribution, and transportation
(iii) Technology

Labor Availability/Shortages

Labor availability and the shortages thereof was the leading issue raised by the respondents. All 10 respondents raised this issue. LIWC-22 scores for the respondents are reported in Table 2. 8 out of the 10 respondents raised this as an issue without any prompting by the interviewers. As can be seen, *all* the participants responded to this issue in a "logical thinking" manner, indicating that their responses were likely well thought out and nuanced rather than off the cuff. At the same time, *none* of the respondents responded to this issue with a positive tone. This indicates that respondents were either slightly negative (7 / 10) or very negative (3 10) regarding their confidence in their being able to navigate the challenges of labor availability in the future (note that the questions were framed asking respondents to look ahead to the year 2030 – a planning horizon of 7-8 years).

Table 2: Focus group participant responses on labor availability

	Logical, formal thinking	**Language of Leadership/ Status**	**Perceived honesty, genuineness**	**Degree of positive (negative) tone**
Respondent 1	78.28	12.77	95.23	49
Respondent 2	97.37	40.06	85.33	49
Respondent 3	89.52	40.06	85.33	49
Respondent 4	56.86	21.49	32.56	49
Respondent 5	58.81	1	85.33	49
Respondent 6	77.78	2.18	95.23	45.42
Respondent 7	26.1	4.83	24.1	46.74
Respondent 8	16.08	40.06	55.62	49
Respondent 9	89.52	40.06	99	49
Respondent 10	79.1	24.36	66.7	45.42

This lends further validity to the assessment that BJCPE consider partnering with local educational institutions to offer training and certification programs for aspiring frontline logistics and operations personnel. At the current time, no such "hands on" opportunities exist in the south. For example, there is currently no Domestic Maritime Center of Excellence (CoE) in the state of Alabama. Even though Mississippi has three such centers, including one that is over 200 miles inland, the closest such CoE location is over 250 from the Birmingham Port. The US Department of Transportation's Maritime Administration division periodically calls for applications for designating locations with the CoE designation, and we recommend that BJCPA consider partnering with local education providers to achieve said designation. This may be congruent with extant training programs at the port, including the Parker Towing Training Program and the Watco National Training Program.

Some responses from the focus group participants in the general area of labor availability are listed below –

- Barging is still a physical activity. You need people who [can] get their hands dirty, understand the challenges in the physical movement of goods, and know how all of that works.
- One critical need of the future is to build a talent pool that is trained to realize the full benefits of these new capabilities, both individually and as a business.

Regulatory and Environmental Concerns

Regulatory and environmental concerns were raised by several individuals as the second major issue that may cause realignment in supply chain and logistics in the next few years, with 6 out of the 10 respondents raising this as an issue. At the same time, the tone score for respondents when talking about this issue was more varied than it was for labor. While one respondent had no comments on this issue at all, some were very positive about their organization's preparedness to handle regulatory and environmental changes in the future. At the same time, however, other respondents were very negative (Table 3). Indeed, the variance between the scores for Regulatory and Environmental Concerns (Std. Dev = 35.1) is over 20 times higher than it was for labor (Std. Dev = 1.55).

Table 2: Focus group participant responses on regulatory and environmental concerns

	Logical, formal thinking	Language of Leadership / Status	Perceived honesty, genuineness	Degree of positive (negative) tone
Respondent 1	72.58	1.79	74.58	38.04
Respondent 2	26.1	1.71	85.33	20.23
Respondent 3	26.1	4.83	24.1	96.74
Respondent 4	70.71	7.67	69.24	93.46
Respondent 5	1	1	98.61	20.23
Respondent 6	54.26	86.82	11.89	99
Respondent 7	NA	NA	NA	NA
Respondent 8	24.95	56.95	47.03	20.54
Respondent 9	58.88	51.64	16.9	89.98
Respondent 10	45.8	3.65	87.29	60.52

It is the opinion of our group that Birmingham Port should, therefore, consider increased tonnage of cargo by expanding the product portfolio that it supports. Currently, a substantial majority of its revenue comes from two product categories – i.e., steel (i.e., iron ore), and coal. While global coal demand is expected to be at an all-time high at the time of writing this report (early 2023), projections by leading industry thinktanks such as the International Energy Agency suggest that this increased demand is likely to start plateauing out by 2025 on account of environmental concerns. Therefore, expansion into other product categories is likely to be highly critical for BJCPA, especially considering that currently the port only utilizes approximately 5% of its total capacity. Because controlled storage is often important for many other commodities in domestic and international trade, it is therefore important for the port to expand its ability to handle such cargo. For example, when one categorizes the freight into that needing controlled (i.e., sheltered from the elements), versus that not needing controlled storage, between 87 % and 95 % of the freight (by volume) headed into the Greater Birmingham area calls for storage that is protected from the elements / weather controlled.

Some sample responses from respondents in the general area of regulatory and environmental compliance are presented below –

- *As logistics and procurement professionals, we must talk about economics and the environment in supply chains*.

- *What if you wake up one day and find out that there is a viral tweet that your second vendor upstream sources products from an endangered rain forest that you had no idea about. It could be very problematic for business and your image.*

Technology

Technology was the third major theme that emerged when considering the manner in which supply chains would realign in the coming years. Technology was an issue that was raised by 7 out of the 10 respondents organically (i.e., without any prompts), while 1 more respondent addressed technology after a prompt from the interviewers. Unlike the previous two themes, however, the tone score for technology was uniformly positive and consistent (Table 3). The variance between respondents on this issue was very limited (Std. Dev. = 6.47).

Table 3: Focus group participant responses on technology

	Logical, formal thinking	**Language of Leadership / Status**	**Perceived honesty, genuineness**	**Degree of positive (negative) tone**
Respondent 1	53.16	60.57	22.27	91.69
Respondent 2	62.1	40.06	99	99
Respondent 3	NA	NA	NA	NA
Respondent 4	15.41	3.95	14.61	99
Respondent 5	39.7	1	99	99
Respondent 6	45.12	8.2	91.44	99
Respondent 7	NA	NA	NA	NA
Respondent 8	24.96	58.55	21.16	99
Respondent 9	22.98	40.06	89.15	99
Respondent 10	94.72	16.49	11.1	81.12

Results, therefore, suggest that respondents were generally uniformly positive about the role that technology will have in supply chain realignment in the future. Respondents especially discussed the importance of end-to-end supply chain visibility brought on by technology that would be a net benefit to their operations. Such visibility was desired in terms of not only parts and supplies required to, for example, repair gas lines, but also in terms of the positioning of raw materials and even bulk products when in transit. Some sample respondents are presented below –

- *Technology is really useful because it allows you to automate. Anything that you automate, frees up a team members to focus more on other, more valuable things.*
- *Technology is not just for Fortune 500 businesses. It is a pressing need for every business that is dealing with today's supply chain complexities.*

Secondary Analyses-Cross Sectional Survey

Introduction to the Survey

Subsequent to the focus groups, a 40-question survey instrument was designed and circulated to respondents. The aim of this survey was to gather more focused data on the general issues that had been raised in the focus groups. Respondents were therefore asked questions regarding the three broad themes in the study – i.e., labor, environment, and technology. In addition, they were also asked about their current awareness of the facilities available at Birmingham Port, their current level of engagement with said port, and their future anticipated engagement. Finally, they were also asked to respond to a question that asked them to suggest pathways for increased engagement with Birmingham Port. (See Appendix 2 for the entire survey instrument.).

The survey was developed at and hosted on the Qualtrics account of Auburn University. Responses were solicited by authorities from BJCPA, Birmingham Business Alliance, and the Harbert College's Department of Supply Chain Management's contact list in the Greater Birmingham area. After several rounds of mailing, we successfully received 52 responses. We present below, the results from the survey.

Table 4: Respondent Profile

Average number of years company has been in business	10.13
Average number of years respondent has been with company	5.67
Average number of employees in company	152

Half of the respondents indicated that their companies engaged in substantial amounts of product movement around the Greater Birmingham area, while another 41% indicated that they move a

reasonable to moderate amount of the same. [4] Most respondents indicated that they anticipated their business would grow aggressively over the next decade (Table 5).

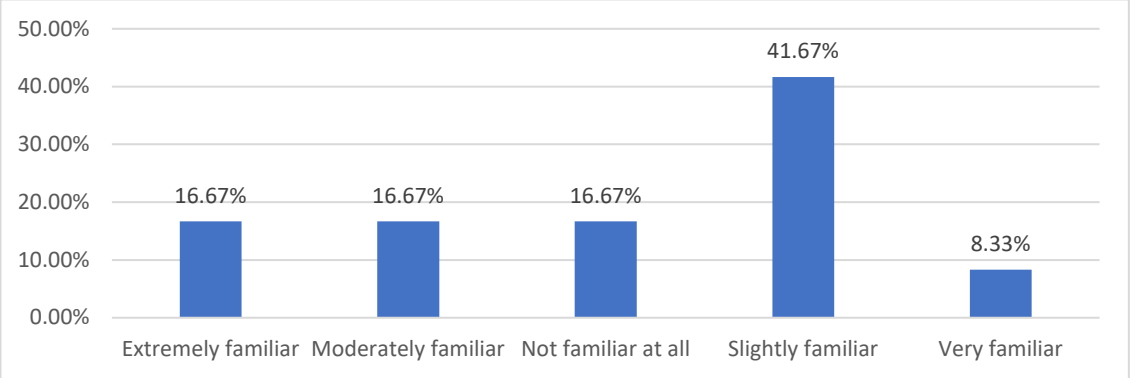
Table 5: Amount of movement of product and anticipated business growth

Please rate the amount of movement of products that your company / business engages in and around the Birmingham (AL) metro area.	Percentage
Substantial Amount	50%
Reasonable to Moderate Amount	41%
We anticipate that our business will grow aggressively in the next decade.	98%

Awareness of the Port

Despite this anticipated growth in business and high movement of cargo in the local area, it appears that most respondents are unfamiliar with the existence of the port or of the services the port can provide for their business. Indeed, only 8.3% of respondents indicated being very familiar about the existence of Birmingham Port. This is the smallest percentage group out of all the 5 categories across which responses were possible (Figure 3).

Figure 3: How familiar are you with the existence of Birmingham Port

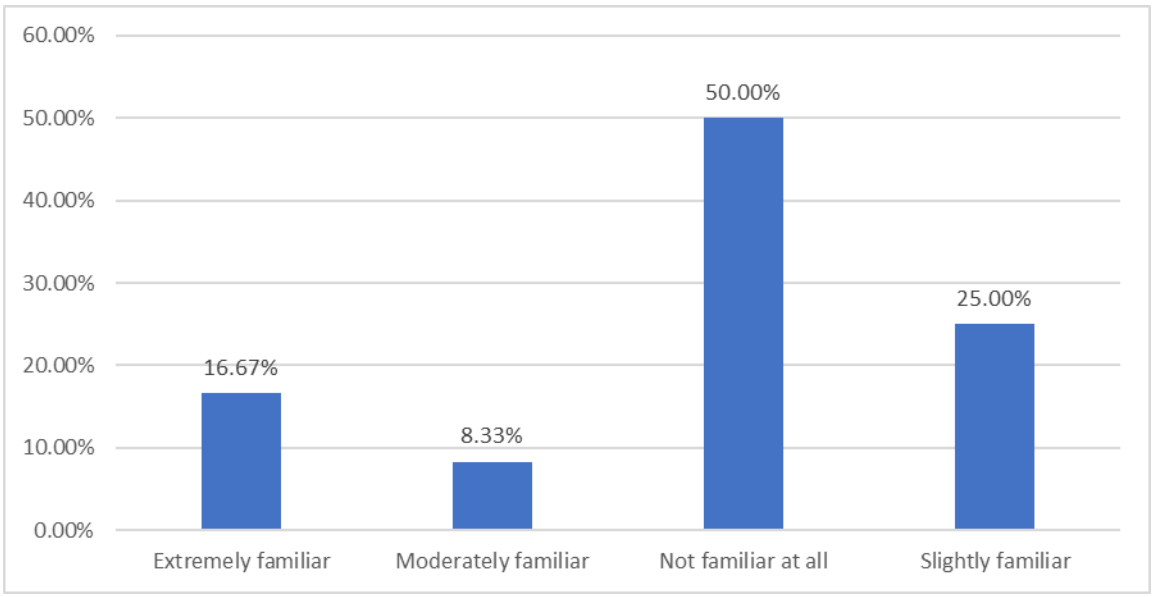


A similar result is obtained for the question regarding how familiar respondents are with the services that Birmingham Port can provide for their business. Consider, for example, that none of the respondents indicated that they were very familiar with the services that Birmingham Port could

[4] Note that there are about 5076 businesses in the Birmingham Metro area that meet the criteria to be participants in our study, as per the US Census. Assuming a precision rate of 10%, Cochran's formula would require us to have minimum 98 respondents. Our number of respondents is below this threshold. Therefore, this means that while meaningful, these results should be interpreted with some caution.

provide for their business. In addition, the share of respondents who indicated "slightly familiar" fell from the previous question. Further, the "not familiar at all" group was by far the largest one, with half of all respondents falling into this category (Figure 4). This is indeed concerning, since the respondents, as we have discussed before, had been with the same company in the same city as the port and in the same role for an average of more than 5 years. This also suggests that the port suffers from a serious lack of visibility in the business community. Next, we explore the reasons for this lack of awareness of the port and / its services.

Figure 4: How familiar are you with the services that the Birmingham Port can provide for your business?



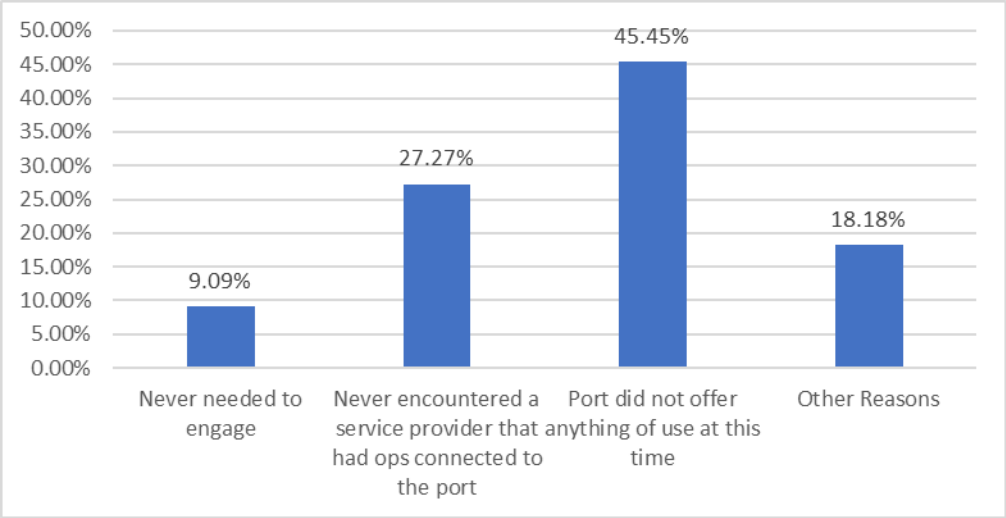
Reasons for Lack of Awareness

Respondents who indicated no awareness at all were directed to a secondary question with an open-ended verbal response regarding the reasons for their lack of familiarity. Not all respondents answered this question. We however, had 11 responses in this category which were manually coded into three categories –

(i) Respondent had never needed to engage with any new logistics service providers.
(ii) Respondent had never encountered a logistics service provider that had operations connected to the port.
(iii) Respondent had not explored services at the port because they felt that the port did not offer anything that would be of use to them.

Note that these categories emerged rather naturally on reading the verbal responses. The breakdown of responses in these three categories is presented in Figure 5.

Figure 5: Reasons for lack of familiarity



Some of the sample verbal responses provided by respondents are included below. Overall, these results indicate a rather alarming lack of awareness, and perception of usefulness by the respondents.

- *Not too familiar with the port. Didn't even know we had one until a few weeks ago. Would recommend advertising and letting people know you're there and what service you can provide.*
- *Improved visibility within the business community. I'm really talking about the part of the business community that makes stuff, like manufacturers, construction & movers of larger commodity items. The Birmingham Port also needs for the greater Birmingham community (read local governments) to work together. The leadership structure is fragmented & there is no single leader. If that continues then there needs to be much greater cooperation on mutually beneficial issues... such as the Birmingham Port, which will benefit all within the 7-county metro-area.*
- *We know little about what Birmingham Port does. I recall barge traffic from Mobile being the only offering. We are a seasonal business and bring containers from Asia to Mobile and trucks to Irondale. Transit time is usually important, or we lose sales opportunities. If the mini-land bridge rates from LB/LA to Birmingham become competitive again, we might have more interest.*
- *The port needs to partner with a marine operator to subsidize a shift boat in the Port Birmingham area to help drive raw materials into and out of the area. There is currently not enough volume through the port for a private company to invest in this need as the immediate return is negative. Without the buy in from government entities pushing for manufacturing growth, it will be hard to see this much needed service provided by private funding.*
- *We do not see a path where we can engage with Birmingham port.*

Recommendations & Concluding Remarks

This study has carried out a multi-method investigation regarding Birmingham Port's current the capabilities and potential, an assessment of the local business community's estimate of how their supply chains may realign in the coming years, and their level of current and anticipated engagement with the port. Based on our findings, it appears that currently the port faces several opportunities for growth. Some of these may need outside assistance (e.g., public funds) while others may involve more proactive outreach on the part of BJCPA. We summarize these in brief bullet points below. Moreover, some are likely more immediate (i.e., Opportunity 1 – 3) than others (i.e., Opportunity 4).

Opportunity # 1 – Increasing the diversity of cargo at the port: As we have mentioned previously, the port currently only handles a handful of different types of cargo. One reason could be that it has no protected storage at the current time. Additionally, industry leaders in the city cite lack of familiarity with the port because the port does not offer the services they desire. The port needs to find ways to increase / diversify its cargo handling capability. Creating a protected storage facility is likely to be a step in the right direction towards addressing this problem.

Assuming said type of protected storage is created, the following industries and businesses are the largest importers of products in the Birmingham Metro area that may be potential customers[5] along with the items they mostly import / export.

At the current time, with the exception of four businesses on the below list, all the listed businesses import their inventory from ports other than the port of Mobile. The port of Savannah, GA is the biggest contributor, with 6 out of the 16 companies primarily engaging with

[5] Note that this identification of customers and imported products is made based on data from Import Genuis. We have restricted our analyses to companies that import non-containerized cargo because as we have discussed in this report, the Black Warrior river currently has limited ability to handle container cargo unless substantial infrastructural commitments are made. Those are obviously beyond the scope of the current study.

that port. There is, therefore, opportunity for the Birmingham Port to engage with these local businesses in the foreseeable future.

Table 6: Most common instances of import of non-containerized cargo in the Birmingham Metro area (July 2022 – Jan 2023). Data from *Import Genius*

Commodity	Companies
Metal Products (e.g., barbed wire, fencing, unfinished metals, ores, & other metal byproducts)	Basic Tech Solutions, 201 Beacon Pkwy W, Ste 300 Birmingham Alabama 35209, USA
	Fondmetal Automotive USA, 600 S Adams Rd Suite 220 Birmingham AL 35235 USA
	Plantation Prestige Commercial, 5510 Hwy 280, Suite 207 Birmingham AL 35242 USA.
	Wurth Construction, 144 Industrial Drive Birmingham Alabama 35211 USA
	American Cast Iron Pipes, Central Stores 1501 31st Avenue Birmingham AL 35207 USA
Rubber products	Diamond Rubber Products, 4000 50th Street Sw. Birmingham Al 35228 Birmingham AL 35228 USA
Plastic (raw and finished)	Seagate Steamship, Suite 205 244 West Valley Avenue Birmingham Al United States
	Extruflex North America, 508) 169 Business Center Dr Birmingham AL 35244, USA
Others (e.g., industrial cylinders, drums, chemicals, and other industrial supplies)	Tarantin Industries, AL, 240 Oxmoor Court, Suite 268 Birmingham AL 35209 USA
	Berger USA, 3491 Mary Taylor Rd Birmingham AL 35235 USA
	Nelson Brothers, 820 Shades Creek Parkway Suite 2000 Birmingham AL
	Diversified Contractors, 3350 Ball St Birmingham AL 35234
	Porter Warner Industries, 270 Center St. North Birmingham Jefferson, Alabama, USA
	Cap Stone Global Sourcing, 19 Inverness Center Parkway, Suite 350, Birmingham, AL, 35242, USA
	Birmingham Hot Metal Coatings, 1513 Industrial Blvd Al 35221 Birmingham USA
	Homeland Vinyl Products, 3300 Pinson Valley Parkway P.O. Box 170729 Birmingham AL, USA

Similar to imports, the following is the list of non-container needing cargo that is currently out of the metro Birmingham area. None of this cargo is currently outbounded from the port of Birmingham. There is, therefore, substantial potential for Birmingham to partner with the listed businesses and / or focus on the listed cargo categories / HS codes to ceate additional revenue opportunities.

Table 7: Most common instances of import of non-containerized cargo in the Birmingham Metro area (July 2022 – Jan 2023). Data from *Import Genius*

Commodity	Companies
Construction Materials	B. L. Harbert International, 1031 London Drive Birmingham AL USA 35211
Iron & Steel	Jefferson Iron & Metal, 3940 Montclair Rd. Po Box 131449 Birmingham AL 35213
	American Cast Iron Pipes, Central Stores 1501 31st Avenue Birmingham AL 35207 USA
	Oxylance Inc., 2501 27th ST., North Birmingham AL - 35234
	US Pipe and Foundry, 3300 1st Avenue North Birmingham AL 35222
	McWayne International, 1201 Vanderbilt Road Birmingham AL - 35234
Coal & Coke	ABC Coke, P O BOX 10246 Birmingham AL 35202 US
Plastic (raw and finished)	Vulcan Salvage, 535 Mill Springs Road Birmingham AL 35244

Opportunity # 2 – Lack of training facilities in the catchment areas: The catchment area around the port (i.e., the Greater Birmingham area) does not have any large material handling / port operations training facility. At the same time, local business leaders are nearly unanimous in suggesting that hiring skilled labor for material handling operations is likely to be a major challenge in the future. We recommend that the port consider pursuing the Domestic Maritime Center of Center of Excellence (CoE) certification from the US Department of Transportation's Maritime Administration, in addition to other certifications in the material handling space. This will allow it to establish a training arm for young people interested in the requisite (i.e., material handling) trades. This will not only result in increased revenue streams, but it is also likely to increase visibility of the port in the local community – an area that local business leaders indicated the port needs to do better in.

Opportunity # 3 – Improved visibility in the community: The fact that half of all industry professionals indicated that they had no familiarity with the port's operations and its abilities, (and one indicated that they did not even *know* that there *was* a port), is a cause for concern. The BJCPA should seek opportunities to put itself in front of the community, making the local business and consumer community aware of their existence and the work that they do.

Opportunity # 4 – In the long term, the port should look into the possibility of improving connectivity to the metro Birmingham area. At the current time the connection to the port is through a relatively long, winding, one lane road. If traffic on said connector were to increase over time, this could lead to serious traffic backlogs on the connection. This may be a longer-term project, but may be something that may be worthy of being looked into, in the future.

APPENDICES

Appendix A – Focus Group Script

Opening Commentary

Welcome participants, thank them for their time, and introduce what we are doing with the research

Key Discussion Questions

a) What is your primary operational challenge (what keeps you up at night)?
    a. How are you responding to this challenge?
    b. How will these challenges evolve over the next decade?

b) How are your operational strategies and practices changing?
    a. Where are you investing funds in operations?

c) Has your experience with Covid impacted your firm's strategies with respect to sourcing & procurement, manufacturing, or distribution?
    a. If so, in what way?

d) What are the major issues that you feel will determine future supply chain realignment and reconfiguration?

e) What distribution (inbound and outbound) capabilities will your firm need to develop in preparation for 2030?
    a. What will your future investments focus on?

f) (If not addressed before) Does localized sourcing / distribution figure in your plans (for 2030)? If yes, in what way?

g) What are the primary challenges in your 2030 plans?

Wrap Up

h) Outside of your own business, what major trends do you foresee in your sector for 2030 and beyond?

Appendix B – Survey Instrument

1. Please tell us about the industry sector that your company / business represents

2. How many employees does your company have?

3. How many years has your company been in business?
    a. Less than 5 years
    b. 5 to 10 years
    c. 10 to 20 years
    d. Over 20 years

4. How many years have you been with your current company?
    a. Less than 1 year
    b. 1 to 5 years
    c. 5 to 10 years
    d. Over 10 years

5. How long (in years) have you been in your current role in this company?
    a. Less than 1 year
    b. 1 to 5 years
    c. 5 to 10 years
    d. Over 10 years

6. What is your job title?

7. Please rate the amount of movement of products (raw material as well as finished goods) that your company / business engages in and around the Birmingham (AL) metro area.
    a. Very limited amount
    b. Moderate amount
    c. A reasonable amount
    d. Substantial amount

8. How familiar are you about the existence of Birmingham Port?
    a. Not familiar at all
    b. Slightly familiar
    c. Moderately familiar
    d. Very familiar
    e. Extremely familiar

9. How familiar are you regarding the services that Birmingham Port can provide for your business?
    a. Not familiar at all
    b. Slightly familiar
    c. Moderately familiar
    d. Very familiar

e. Extremely familiar

10. It is challenging to get skilled manpower for our business.
    a. Strongly agree
    b. Somewhat agree
    c. Neither agree nor disagree
    d. Somewhat disagree
    e. Strongly disagree

11. It is challenging to manage expectations and career paths for our current employees.
    a. Strongly agree
    b. Somewhat agree
    c. Neither agree nor disagree
    d. Somewhat disagree
    e. Strongly disagree

12. Inflation has made raw material harder to source at the right price.
    a. Strongly agree
    b. Somewhat agree
    c. Neither agree nor disagree
    d. Somewhat disagree
    e. Strongly disagree
13. We anticipate that our business will grow aggressively in the next decade.
    a. Strongly agree
    b. Somewhat agree
    c. Neither agree nor disagree
    d. Somewhat disagree
    e. Strongly disagree

14. We anticipate that population migration to the Birmingham metro area will create business opportunities.
    a. Strongly agree
    b. Somewhat agree
    c. Neither agree nor disagree
    d. Somewhat disagree
    e. Strongly disagree

15. We believe that the general business climate in the Birmingham metro area will be positive over the next decade.
    a. Strongly agree
    b. Somewhat agree
    c. Neither agree nor disagree
    d. Somewhat disagree
    e. Strongly disagree

16. We believe that there is likely to be an increase in manufacturing commodities (i.e. manufacturing raw materials) being traded in our area in the next decade.
    a. Strongly agree
    b. Somewhat agree
    c. Neither agree nor disagree
    d. Somewhat disagree
    e. Strongly disagree

17. For your business to increase engagement with Birmingham port, what needs to happen?
    a. Improved visibility of the port
    b. Improved road connectivity
    c. Improved rail connectivity
    d. We do not see a path where we can engage with the Birmingham port

18. What is your biggest supply chain management challenge at the current time?
    a. Labor/talent
    b. Raw materials
    c. Rising costs
    d. Something else

19. If you answered “something else” in the previous question, please elaborate.

20. What is your second biggest supply chain management challenge at the current time?
    a. Labor/talent
    b. Raw materials
    c. Rising costs
    d. Something else

21. If you answered “something else” in the previous question, please elaborate.

22. Looking forward to 2030, please provide some suggestions that you feel Birmingham port needs to prioritize as avenues for growth.

23. Would you please consider sharing your email address with us so that we may follow up with you in case we need clarification regarding your responses?

Appendix C – Auburn Project Team

David Mixson (Project Manager) currently serves as Associate Director of Administration and Economic Development for the Government & Economic Development Institute at Auburn University. He also serves as Auburn's Economic Development Administration University Center Director, a role he has held since 2006. Over his 25-year career in university economic development, Mr. Mixson has assisted communities, cities, associations, non-profits, and small businesses with challenges requiring innovative and creative thinking and application. He has won numerous grants totaling over $2.7 million assisting communities and businesses over the last 13 years. Mr. Mixson holds a Bachelor of Science in Business Administration from Auburn University with a major in business management. He completed a Master of Business Administration degree from Auburn University and is a member of the Beta Gamma Sigma Business Honor Society, and the Economic Development Association of Alabama. He is a graduate of the University of Oklahoma's Economic Development Institute and the Auburn University Intensive Economic Development Training Course and has taught the Economic Development and Competition course in Auburn University's Political Science Department. He is an Innovation Engineering Black Belt through the Eureka Ranch International and is trained in the Business Model Canvas and Lean Startup methodologies. He has served as the NASA Southeast Regional Technology Transfer Center state affiliate, manager of the Alabama Manufacturer of the Year Award, and on the Board of the Educational Association of University Centers. He is the recipient of the Alabama Technology Network' Partner Award in 2000 and 2008, and Auburn University's Professional award in 2010 and the College of Businesses' Star award in 2012. Prior to joining Auburn University, Mr. Mixson worked for Total Systems Services of Columbus, Georgia as a Project Support Manager and Project Analyst.

Shashank Rao, Ph.D. (Supply Chain and Operations Lead) is the Jim W. Thompson Full Professor of Supply Chain Management at Auburn University. After spending the first two decades of his life in Africa, he obtained his M.S. in Statistics and Ph.D. in Operations and Supply Chain Management from the University of Kentucky. Prior to entering the academy, Dr. Rao was a Relationship Manager at Citigroup N.A. His research has been cited over 1750 times, and he has co-authored a textbook on Transportation Management, which is the prescribed textbook on the topic for the CSCMP SCPro certification. He has also served as a consultant or expert witness to major corporations and legislatures including Walmart, Target, Aptar Pharma, and the U.S. Department of Labor. He also serves on the Editorial Review Board of the Journal of Operations Management, and the Journal of Supply Chain Management and is an Associate Editor of the Journal of Organizational Computing and Electronic Commerce, and the Journal of Business Logistics. He is one of less than 10 researchers in the world to have published in the "research quartet" of the leading SCM journals (i.e., JOM, POM, JBL and DSJ) prior to turning 40.