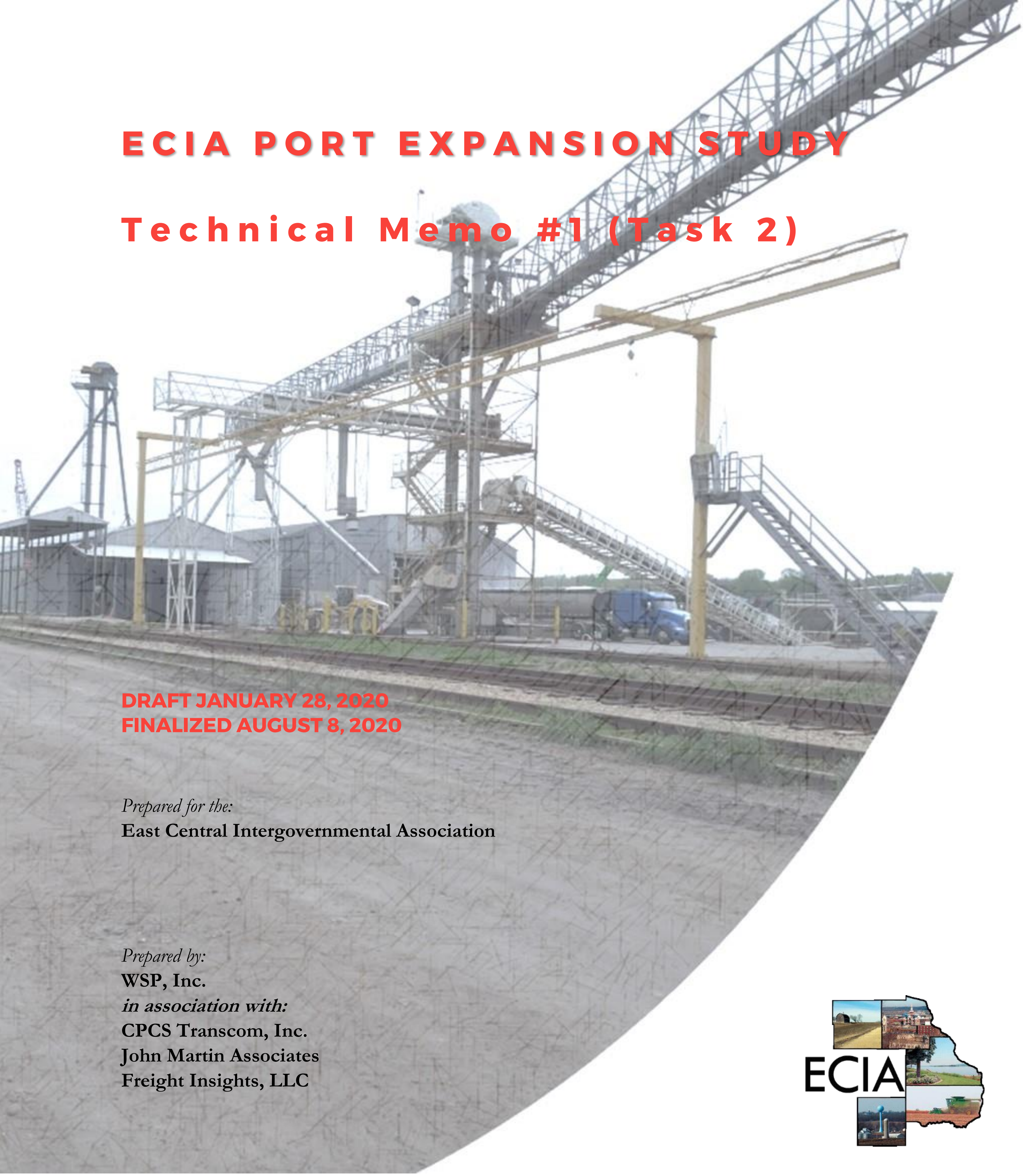

ECIA PORT EXPANSION STUDY

Technical Memo #1 (Task 2)

DRAFT JANUARY 28, 2020
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ECIA

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1 Introduction

1.1 ABOUT THE ECIA PORT EXPANSION STUDY

The East Central Intergovernmental Association (ECIA), in partnership with the states of Illinois and Iowa, local and regional governments, and local marine terminal operators, is conducting a study of the potential to expand and enhance the physical and operational capabilities of marine freight terminals in Dubuque, IA and East Dubuque, IL.

ECIA's Eight County Freight Study previously found the region is highly dependent on over-the-road trucking to meet the needs of its local industries and consumers, even though it is directly served by barge transportation services on the Upper Mississippi River. The study noted that marine transportation may not be the best option for many kinds of freight, but opportunities may exist to expand the ranges and volumes of commodity types handled on the river, providing better freight transportation options and services for the region.

Building on those findings, the ECIA Port Expansion Study is intended to:

- Provide more multi-modal transportation options for regional shippers to connect them to the international and domestic transportation system and associated worldwide markets;
- Serve as a catalyst for economic development in Iowa, Illinois and the local region;
- Evaluate potential market demand for freight to move via the Mississippi River from existing port facilities;
- Document the primary characteristics required for a successful and sustainable operation, including business logistics, transportation access, infrastructure and other factors;
- Identify port expansion opportunities to capture demand, generate economic benefits and achieve the overall goals of the study and its stakeholders;
- Position improvement projects for grant funding through Benefit-Cost Analysis; and
- Provide input for regional and local plans by the Dubuque Metropolitan Area Transportation Study (DMATS), ECIA and others.

1.2 OVERALL WORKPLAN

The study is being conducted over a 14-month period, and consists of eight primary task areas, summarized below.

Task 1. Stakeholder Engagement

- Objective: Establish and implement a program for two-way communication among and between study managers, stakeholders and the consultant team, to best inform the study process and support consensus findings.
- Key tasks:
  - Work with ECIA to establish study group.
  - In collaboration with ECIA. identify up to 20 targets for individual interviews.
  - Participate in up to six additional meetings as directed.

Task 2a. Data Collection / Inventory – Ports

- Objective: Identify the most "mission critical" information for the region's port assets, establish the number of port locations to be addressed, collect the relevant data and summarize the key information in a simple and useful framework.
- Key tasks:
  - Work with ECIA to determine the port sites to be studied.
  - Conduct a 3 to 4-day site tour.
  - Create functional layout diagrams of each port location.
  - Utilize information from the Army Corps, operators and/or other data as available to profile water conditions at each location.
  - Develop a concise inventory of planned port improvements upriver and downriver.

Task 2b. Data Collection / Inventory – Highway / Rail Access

- Objective: Identify the most "mission critical" information for the region's highway and rail infrastructure linking port locations and their existing/potential customers.
- Key tasks:
  - Assemble and review key transportation planning documents.
  - Update and expand the regional highway system GIS created for the Eight County Freight Study.
  - Update and expand the regional rail system GIS created for the Eight County Freight Study.
  - Prepare concise 'access profiles' for each port location.

Task 2c. Data Collection / Inventory – Land Use and Industry Locations

- Objective: Identify the most "mission critical" data for regional land use and industry locations, focusing on land uses and development patterns that directly support, or would be supported by, port activity.
- Key tasks:
  - Assemble and review key regional/local land use plans and studies, along with relevant property and industry location datasets.
  - Update and expand the regional land use/industry location GIS mapping created for the Eight County Freight Study.
  - Prepare concise 'land use profiles' for each port location, based on the GIS mapping.

Task 3. Market Analysis

- Objective: Document the primary characteristics and components of current market demand by water and the growth potential for commodities that could be served by study area ports in the future, through a 2040 horizon.
- Key tasks:
  - Update the commodity flow data presented in the Eight County Freight Study, providing a general market context for marine cargo activity for current year and forecast year 2040 conditions.
  - Develop summaries of current and historic marine freight traffic at each location from operator information, U.S. Army Corps of Engineers data and other sources as applicable.
  - Describe primary market demand drivers and service requirements.
  - Perform market-focused stakeholder interviews.
  - Estimate the "total landed logistics cost" for commodities and origin-destination service pairs with the potential to support port expansion, including current water commodities as well as truck or rail diversion commodities.
  - Estimate port market demand by commodity, handling type and origin-destination pair.
  - Consider the changing competitive landscape.
  - Address aspirational opportunities.

Task 4. Capacity Analysis and Program Level Recommendations

- Objective: Match available port, access and service capacity to potential demand, to identify shortfalls which represent opportunities for improved port facilities and services in the year 2025 and 2040 timeframes.

- Key tasks:
  - Review and compile capacity analyses.
  - Compare the capacity estimates against the market demand forecasts at a regional level.
  - Develop an area-wide recommended programmatic solution to compete for the identified market opportunities. The solution program may include: additional vessel berths, transfer equipment, open or covered storage, etc.; terminal operating improvements; and / or navigation channel, rail, or highway access improvements. Types of improvements (terminal, access, etc.) and quantities (acres, berths, etc.) to meet identified needs will be specified.

Task 5. Needs Assessment by Port Location

- Objective: Develop location-specific port improvement recommendations.
- Key tasks:
  - Prepare SWOT Analysis for each individual port location, detailing its marine infrastructure, water depth and navigability, highway and rail access and other relevant factors identified in previous tasks.
  - Allocate the area-wide improvement program (from Task 4) to individual port locations.
  - Create plans and layout diagrams for improved marine terminals and access systems at individual port locations.

Task 6. Study Recommendations

- Objective: Evaluate the benefits and costs of the proposed port location-level improvement programs.
- Key tasks:
  - Perform limited Benefit-Cost Analysis (BCA) for all options.
  - Perform detailed "Grant Grade" Benefit Cost Analysis for three (3) port location-level improvement programs.
  - Develop and offer prioritized recommendations.

Task 7. Final Report and Documentation

- Task-level documents
- Final Report and Executive Summary
- Study presentations

1.3 TECHNICAL COMMITTEE AND OUTREACH (TASK 1)

The study is being directed by a Technical Committee consisting of representatives from:

- ECIA
- State of Iowa
- State of Illinois
- City of Dubuque
- City of East Dubuque
- Greater Dubuque Partnership
- Blackhawk Hills Regional Council
- Northwest Illinois Economic Development Corporation
- Logistics Park Dubuque / Alliant Energy
- Gavilon LLC
- Newt Marine

Over the duration of the study, six Technical Committee meetings are planned at key milestones, to review progress to date and guide next steps.

Additionally, as part of Task 1, interviews were conducted with 20 individuals/organizations with important perspectives and information relevant to the study. These interviews addressed both public and private sector perspectives, and provided many additional contacts to be followed up in the Task 3 Market Analysis work. Table 1 following lists the interviews performed in Task 1.

Table 1: List of Organizations Interviewed in Task 1

Adkins Energy	Grant County (WI) EDC
Atten Babler	Greater Freeport Partnership
Blackhawk Hills Regional Council	Illinois Soybean Association
City of Dubuque	Jo Carroll County
City of East Dubuque	Logistics Park Dubuque
City of Prairie DuChien	Newt Marine
City of Rochelle	Northwest Illinois Economic Development
Department of Fish and Wildlife	(Private Developer)
Dubuque Economic Development	Savanna Local Redevelopment Authority
Gavilon	USACE Rock Island

1.4 ABOUT THIS TECHNICAL MEMO

This Technical Memo is intended to summarize and document work completed under Task 2 of the study work plan:

- Task 2a. Data Collection / Inventory – Ports
  - Task 2a.1: Work with ECIA to determine the port sites to be studied. Our proposal assumes up to ten (10) distinct locations will be addressed in three geographic clusters (one in Dubuque and two in East Dubuque) based on GIS mapping prepared for the Eight County Freight Study, but one or two additional potential locations could be added if desired by study partners.
  - Task 2a.2: Conduct a 3 to 4-day site tour to collect essential data, perform visual inspections and meet with operators to understand the day to day cargo operations at each of the port locations under study. Prepare high-level evaluations of facility conditions.
  - Task 2a.3: Utilize WSP's proprietary PRIME planning tool to create functional layout diagrams of each port location, indicating the main functional areas of each port (site dimensions and boundaries, berth configuration, transfer equipment, open storage, covered storage, service buildings, truck gate and road access, rail service and access, etc.). Based on this information and on known (from operators) or reasonably assumed (from industry standards) operating factors, PRIME will calculate the current marine cargo handling capacity of each location by type of cargo, along with the number of truck and rail trips generated by this cargo.
  - Task 2a.4: Utilize information from the Army Corps, operators and/or other data as available to profile water conditions at each location, addressing: authorized and actual channel and berth depths; dredging activities (last dredging, scheduled frequency of dredging, rate of siltation if known, quality of dredged materials if known and historic dredged material disposal volumes and costs); vessel operating constraints (dimension and type) based on upstream and downstream constraints due to lock dimensions, channel depths, or overhead structures; and seasonal operating factors (closures due to ice, flood, etc.).
  - Task 2a.5: Develop a concise inventory of planned port improvements upriver and downriver from the study area that could impact planning for study area ports, through discussions with operators and study participants and supplemented where necessary with additional outreach to state or regional governments in Iowa, Illinois, Wisconsin and Minnesota, This includes projects that could potentially compete for business, as well as projects that could build stronger trading routes for study area ports.

- Task 2b. Data Collection / Inventory – Highway / Rail Access
  - Task 2b.1: Assemble and review key transportation planning documents, including the Regional Transportation Improvement Plan; Illinois and Iowa State Freight Plans, the Eight County Freight Study and others identified by study partners. Extract and summarize information relevant to port service, development and expansion planning.
  - Task 2b.2: Update and expand the regional highway system GIS created for the Eight County Freight Study to document: roadway functional classifications; designated truck routes; tolled facilities; vehicle counts by type; highway bottlenecks; truck crash locations and frequencies; and available performance metrics for bridge and pavement condition and roughness. For "last mile" access between major truck roads and port locations, perform supplemental analysis and mapping to identify potential geometric constraints related to roadway design, vertical or horizontal clearances, or weight limitations. (Note that port-related trip generation is addressed separately using the PRIME tool).
  - Task 2b.3: Update and expand the regional rail system GIS created for the Eight County Freight Study to document: ownership and usage rights for tracks and terminals; service volumes and operating status; number of tracks; rated weight capacity; and known vertical constraints and bridge conditions. For "last mile" access between rail lines and port locations, perform supplemental analysis and mapping to highlight the condition of existing connections, or – in cases where connections do not exist – potential opportunities to provide those connections. (Note that port-related trip generation is addressed separately using the PRIME tool).
  - Task 2b.4: Prepare concise 'access profiles' for each port location based on the GIS mapping, describing truck and rail access conditions, strengths, weaknesses, etc.
- Task 2c. Data Collection / Inventory – Land Use and Industry Locations
  - Task 2c.1: Assemble and review key regional/local land use plans and studies, along with relevant property and industry location datasets. Extract and summarize information relevant to freight-generating industrial activity and current/potential ports utilization.
  - Task 2c.2: Update and expand the regional land use/industry location GIS mapping created for the Eight County Freight Study to document: industrially zoned land; locations of industries engaged in manufacturing, warehouse/distribution, value-added processing and / or transportation or logistics services; functional characteristics of these industries (output and employment ranges, etc.) as available from Census-sourced data. For last mile conditions at or near each port locations, perform supplemental analysis and mapping to identify: nearby industries that are, or could be, "anchor tenants" for ports; zoning or land use constraints to expanded port

operations; and sensitive land use clusters located between ports and their primary highway or rail access corridors.

- Task 2c.3: Prepare concise 'land use profiles' for each port location, based on the GIS mapping.

This Technical Memo document is organized as follows:

1. This Introduction
2. Data Collection and Inventory for Ports
3. Data Collection and Inventory for Highway and Rail
4. Data Collection and Inventory for Land Use and Industry Locations
5. Synthesis Analysis by Commodity Type
6. Next Steps

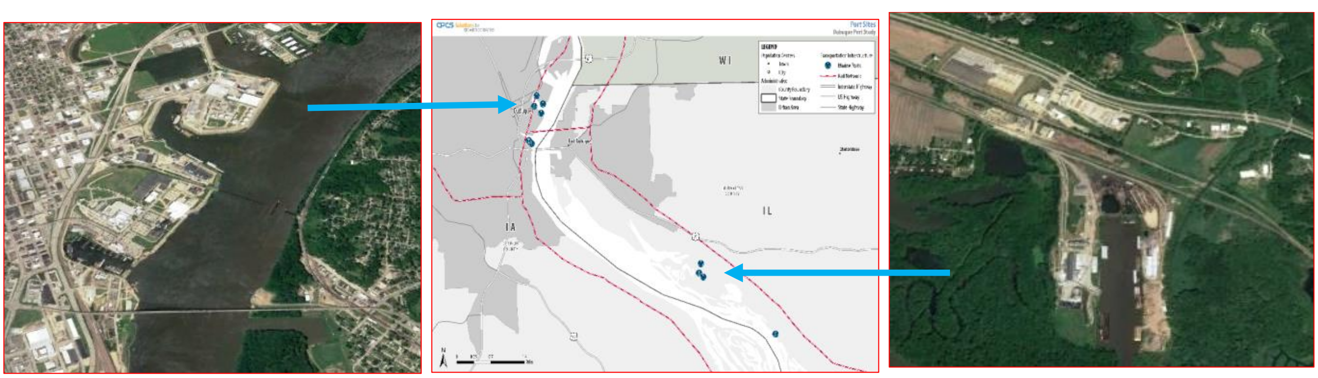
2 Data Collection and Inventory for Ports

TASK 2A OF THE ECIA PORT EXPANSION STUDY ADDRESSED DATA COLLECTION AND DATA INVENTORY WORK FOR STUDY AREA MARINE TERMINALS. TWO TERMINAL COMPLEXES – GAVILON IN THE CITY OF DUBUQUE AND LOGISTICS PARK DUBUQUE IN EAST DUBUQUE – WERE DESIGNATED FOR DETAILED ANALYSIS. THE PRIMARY PHYSICAL AND OPERATIONAL CHARACTERISTICS OF THESE TERMINALS WERE DOCUMENTED AND INPUT TO AN INTERACTIVE PLANNING & PERFORMANCE MODELING SOFTWARE TOOL. TERMINAL PERFORMANCE WAS PLACED IN THE CONTEXT OF HISTORIC UPPER MISSISSIPPI RIVER TRAFFIC AND EXPANSION PLANS AT POTENTIALLY COMPETING PORT FACILITIES.

2.1 PORT SITES STUDIED

As directed by ECIA, the study focuses on two port complexes: the Gavilon facility in the City of Dubuque, and the Logistics Park Dubuque (LPD, formerly IEI Barge Services) complex in East Dubuque. Both ports are members of the study Technical Committee. Newt Marine, also a member of the study Technical Committee, has operations at both facilities. Other port complexes upriver and downriver, as well as inland truck/rail complexes that compete for waterborne freight commodities, are also considered in the study to the extent they impact market forecasting and improvement plans for Gavilon and LPD.

Figure 1: Focus Areas for ECIA Port Expansion Study



Gavilon / Port of Dubuque

Logistics Park Dubuque

2.2 SITE INSPECTIONS AND EVALUATIONS

The consultant team conducted site tours for both facilities and interviewed respective representatives to understand the operations and workings of both terminals. These site visits were performed on October 30th and 31st, 2019. The team also collected operational and market data to perform capacity analysis and model calibration, including:

- Current terminal layout
- Current throughput mixes
- Current modal splits
- Historic volumes
- Dwell time information

While detailed engineering assessments were not performed, both facilities appear to be in excellent operating condition, appropriately-suited for their current cargo-handling activities via water, rail, and truck. Based on these observations, WSP performed initial capacity analyses for both facilities in for their existing condition. The summary of data collected and capacity analysis in not provided as it is business sensitive information. In later tasks, further capacity analysis will be performed and opportunities to increase capacity for existing and potential new commodity types and handling types will be explored.

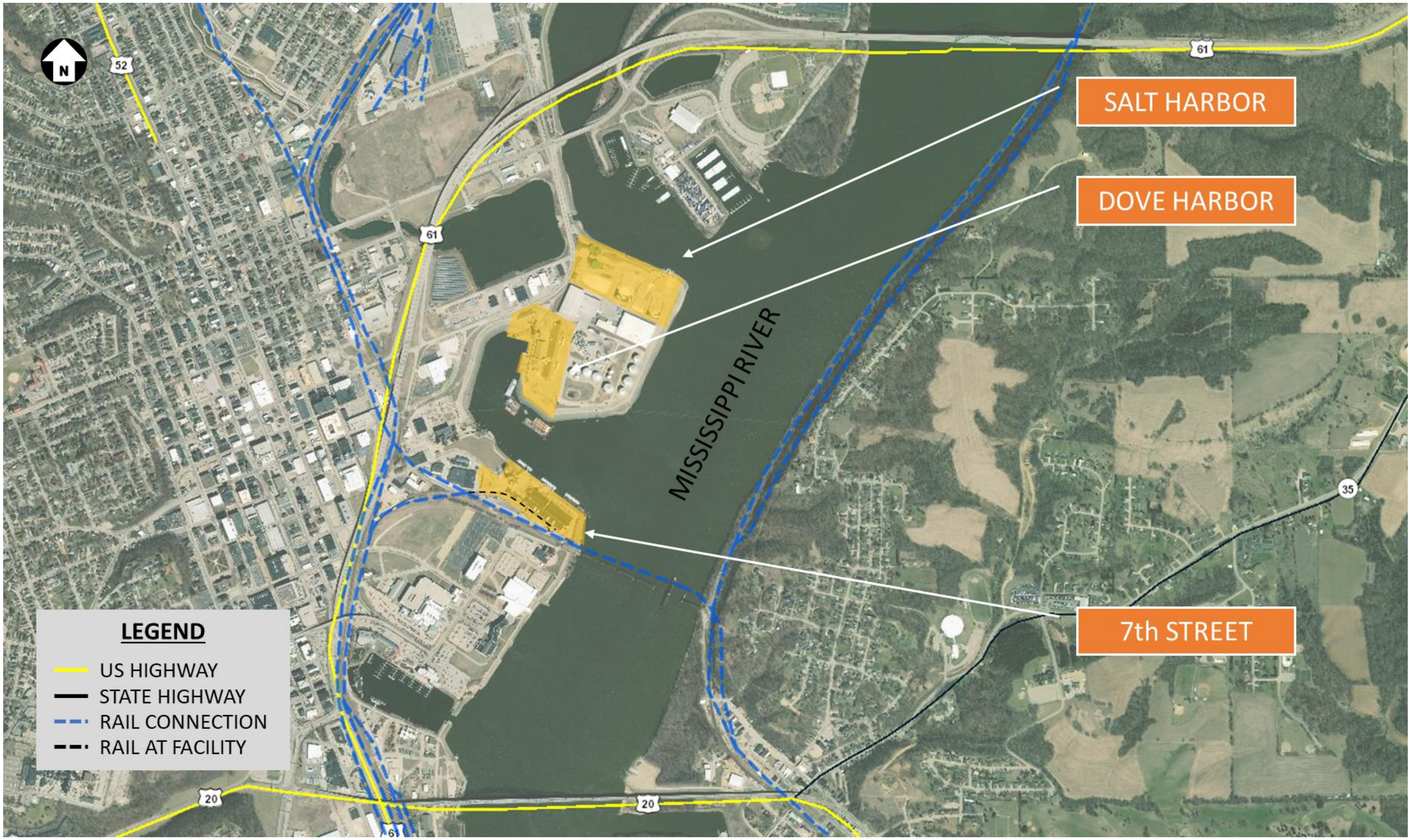
2.3 FUNCTIONAL LAYOUTS AND OPERATIONS

2.3.1 Gavilon Dubuque

Gavilon's facility is located at Port of Dubuque in Dubuque, IA and is divided into three separate operating areas -- Salt Harbor (12.3 acres), Dove Harbor, 12.7 acres) and Seventh Street 13.0 acres), for a total operating area of around 38 acres. Each operating area is leased from the City of Dubuque, which owns the underlying property; Gavilon owns the fixed and mobile assets (structures, cargo handling equipment, etc.) on the operating areas.

Gavilon provides transfer to and from barges on the Upper Mississippi River, with connections to all points reachable by barge. The facilities are connected to US 20, US 52 and US 61 via Kerper Blvd. US 20 provides East-West connectivity. Similarly, US 52 and US 61 provides North-South connectivity to the terminal. The Seventh Street facility is served by Canadian National (CN) Class I railroad with a direct move to the south, and an indirect move to the north. Figure 2 following shows the location and connectivity for Gavilon Terminal.

Figure 2: Gavilon Terminal Location and Connectivity



Source: Google Earth and WSP

Gavilon handles the following commodities at their terminal: grains (primarily corn and soybeans); fertilizers (in both dry and liquid forms); steel reinforcing bars (or “rebars”); steel coils; and de-icing salt. These commodities are either export or imports, and are highly seasonal depending on crop harvesting, weather condition, and river access. Table 2 following summarizes the transportation connections and operating areas associated with these commodities.

Table 2: Gavilon Commodity Transport Characteristics

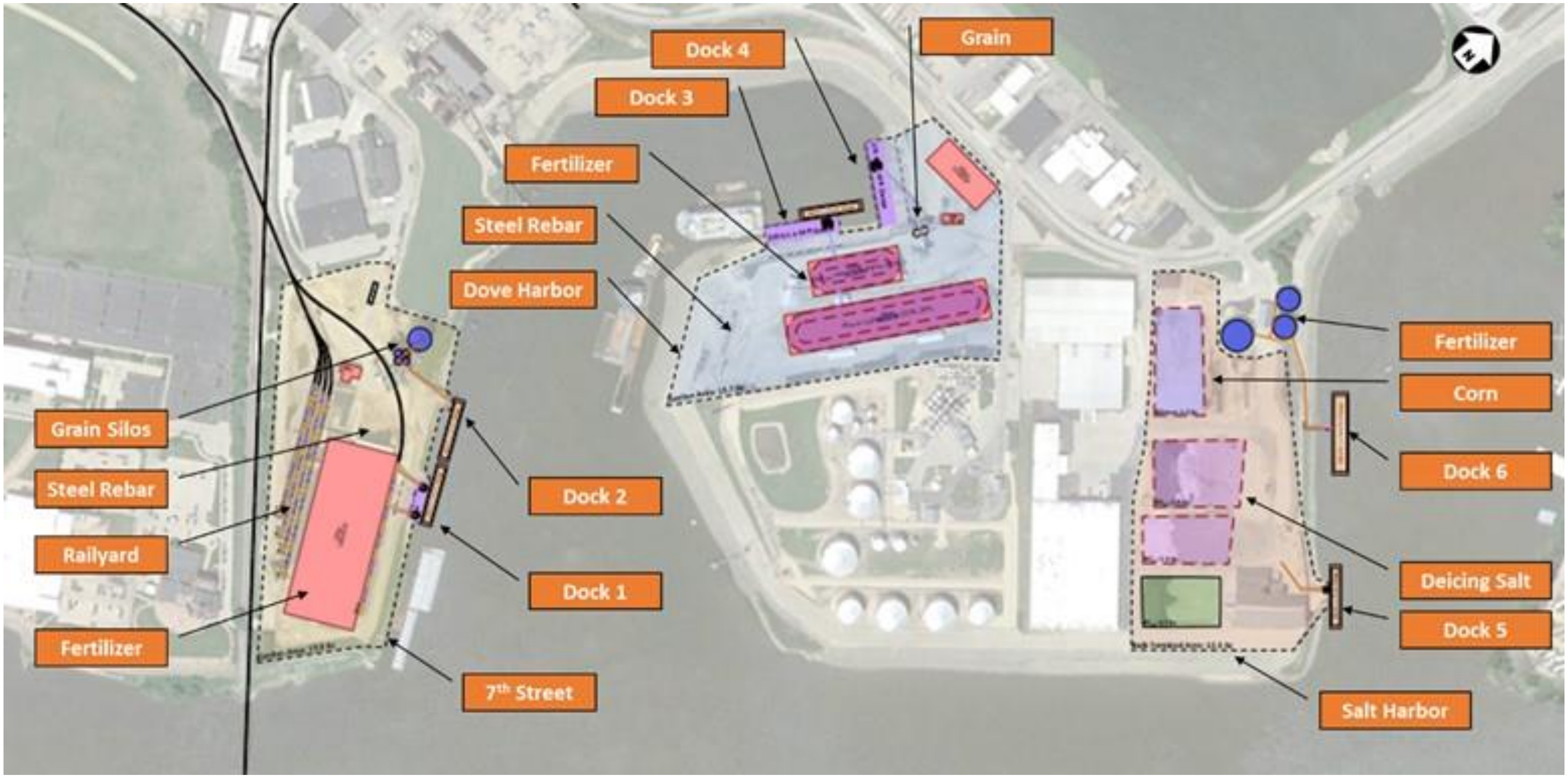
Commodity	Import Mode(s)	Export Mode(s)	Operating Area(s)
Grain (Corn & Soybean)	Truck/Rail	Barge	7th Street, Dove Harbor
Fertilizer (Dry)	Barge	Truck/Rail	7th Street, Dove Harbor
Fertilizer (Liquid)	Barge	Truck	Salt Harbor
Steel Rebar	Barge	Truck	7th Street, Dove Harbor
Deicing Salt	Barge	Truck	Salt Harbor

The primary activities at each operating area are as follows:

- Gavilon’s 7th Street location handles grains, fertilizers and steel rebars. It is the only location that has access to rail service. The rail yard can handle 42 railcars. There are two docks at this facility. Dock 1 handles fertilizer and steel rebars, and Dock 2 handles grains. Fertilizer is stored in warehouses, grain is stored in silos, and steel rebars are stored in any available open space. This facility covers about 13 acres.
- Gavilon’s Dove Harbor facility handles grains, fertilizers and steel rebars. There is rail infrastructure available at Dove Harbor, however, CN rail does not provide service to this facility due to lack of cargo. There are two docks at this facility. Dock 3 handles fertilizer and steel rebars, and Dock 4 handles grains. Similar to 7th Street facility, Fertilizer is stored in warehouses, grain is stored in silos, and steel rebars are stored in any available open space. This facility covers about 12.7 acres.
- Gavilon’s Salt Harbor facility handles, de-icing salt, dried corn, and liquid fertilizer. There is no rail service available. There are two docks at this facility. Dock 5 handles de-icing salt and corn, and Dock 6 handles liquid fertilizers. De-icing salt and corn are stored in open pads, whereas, liquid fertilizer is stored in three storage tanks. This facility covers about 12.3 acres.

Figure 3 following shows the location of various commodity storage and docks at all three facilities for Gavilon.

Figure 3: Gavilon Facilites



Source: Gavilon and WSP

The primary commodity movements are as follows:

- Grains are exported out from this terminal where they arrive via truck or rail at the terminal and are loaded on to the barge. About 65% grain arrive via truck and 35% by rail. Rail is primarily used for soybeans. Grains are handled at Dock 2 of 7th Street facility and Dock 4 of Dove Harbor. Grains arriving by truck or railcars are dumped in the loading pit and loaded into the silos. If needed, grains are dried in the dryer. It is then loaded into the barges via barge loader. Grain is mainly handled between the months of March and November. During the winter months, there is no loading and unloading of barges as the river freezes and barge navigation is not possible.
- Dry fertilizer is imported via barges and loaded onto trucks and railcars to be transported out from the terminal. Fertilizer is handled at Dock 1 of 7th Street facility and Dock 3 of Dove Harbor. Fertilizer arrives at the terminal via barges which is unloaded into the hopper by an excavator. It is then transferred to the storage warehouse via conveyer. Fertilizer is then loaded onto a truck or on railcars to be transported out of the terminal.
- Steel rebar is imported via barges and loaded onto truck by forklifts. Steel rebar is handled at Dock 1 of 7th Street facility and Dock 3 of Dove Harbor. Steel rebar are unloaded from the barge and stored in available empty space around the terminal. These rebars are then loaded onto flatbed trucks by forklifts to be transported out of the terminal.
- De-icing salt arrives at the terminal via barge. The salt is unloaded using an excavator and dropped into a hopper. The hopper is connected to mobile conveyers, which transport the salt to their stockpiles behind the berth. De-icing salt is handled at Dock 5 of Salt Harbor. The salt primarily arrives in summer months and stays on the terminal till start of winter season, when it is transported to various cities and counties.

2.3.2 Logistics Park Dubuque

Logistics Park Dubuque (LPD) is located at East Dubuque, IL. LPD was formerly known as IEI Barge Services. LPD is situated about 4 miles downriver from the Gavilon facility. LPD is a single contiguous operating area of approximately 90 acres. LPD's parent company, Alliant Energy, owns the underlying property as well as the fixed and mobile assets (structures, cargo handling equipment, etc.).

LPD provides transfer to and from barges on the Upper Mississippi River, with connections to all points reachable by barge. The facility is connected to US 20 via Barge Terminal Road. US 20 provides East-West connectivity. The facility is served by Canadian National (CN) Class I railroad and has space for approximately 185 railcar spots. There is also BNSF main line passing near the terminal. Figure 4 following shows the location and connectivity for LPD Terminal.

LPD handles the following commodities: grains (corn and soybeans); fertilizers (dry only); cottonseed; and de-icing salt. These commodities are either export or imports, and are highly seasonal depending on crop harvesting, weather condition, and river access. Table 3 following summarizes the transport characteristics of these commodities.

Figure 4: LPD Terminal Connectivity

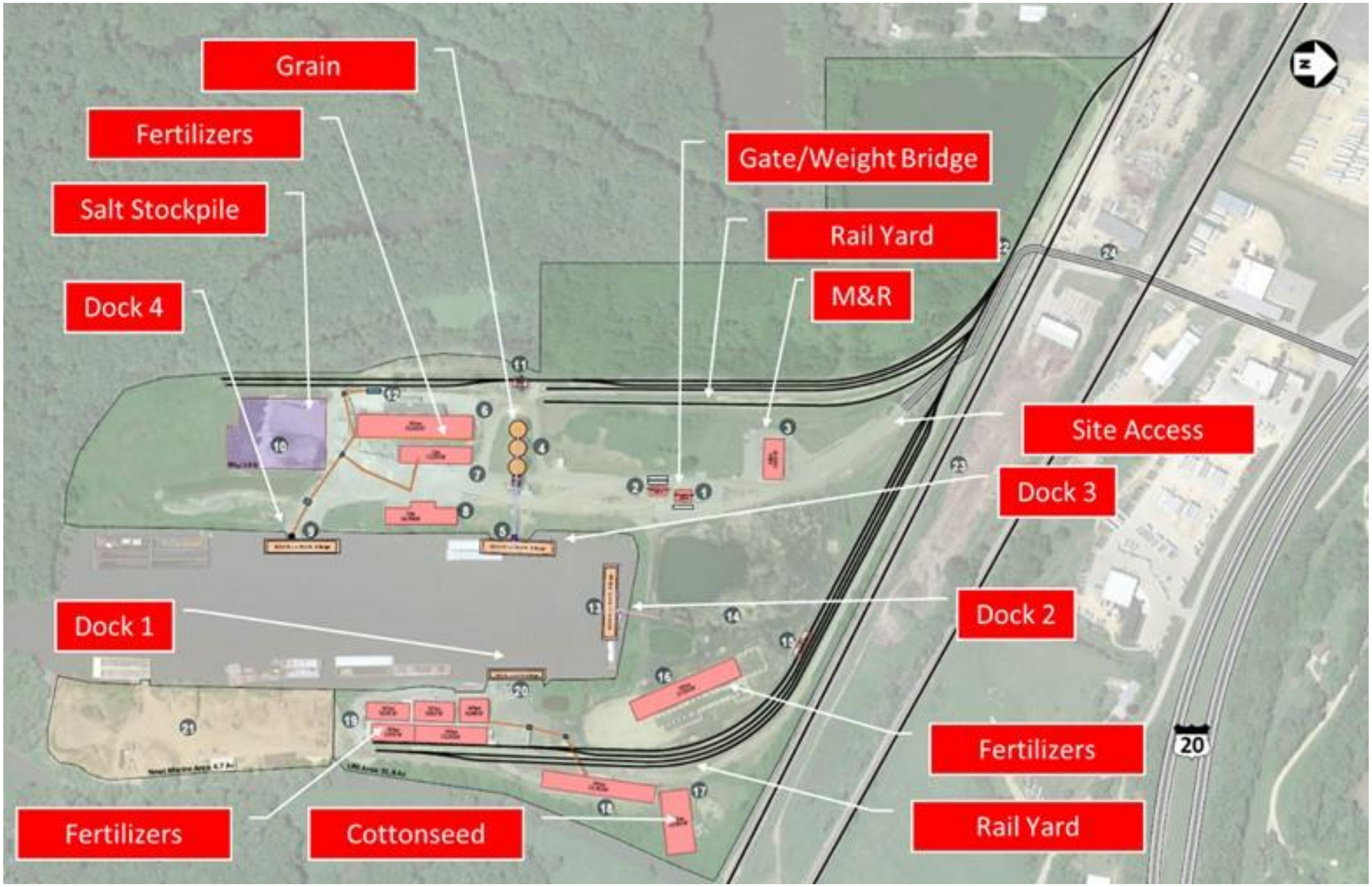
Source: Google Earth and WSP

Table 3: LPD Commodity Transport Characteristics

Commodity	Import Mode	Export Mode	Terminal
Grain (Corn & Soybean)	Truck/Rail	Barge	Dock 3
Fertilizer (Dry)	Barge/Rail	Truck/Rail	Dock 1 and 4
Cottonseed	Barge	Truck	Doc 1
Deicing Salt	Barge	Truck	Dock 4

The LPD facility covers about 90 acres. There are four docks at the terminal. Dock 1 handles fertilizers and cottonseed. Dock 2 is currently not used. It was used as coal dock until 2015. Dock 3 handles grains, and Dock 4 handles fertilizers and de-icing salt. Figure 5 following shows the facility map for LPD.

Figure 5: LPD Facilites



Source: LPD and WSP

The primary commodity movements are as follows:

- Grains are exported out from this terminal where they arrive via truck at the terminal and are loaded on to the barge. Grains are handled at Dock 3 of the terminal. Grains arriving by truck are dumped in the loading pit and loaded into the silos. The grain silos have a capacity of 300,000 bushels (three silos with 100,000 bushels capacity each). It is then loaded into the barges via barge loader. Grain is mainly handled between the months of March and November. During the winter months, there is no loading and unloading of barges as the river freezes and barge navigation is not possible.
- Dry fertilizer is imported via barges or rail and loaded onto trucks to be transported out from the terminal. The modal split for fertilizer import is about 60% by barge and 40% by railcars. Fertilizer is handled at Dock 1 and 4 the facility. Fertilizer arrives at the terminal via barges which is unloaded into the hopper by an excavator. Fertilizer that arrives via rail goes straight into the hopper, and is transferred to the storage warehouse via conveyor. Fertilizer is then loaded onto a truck to be transported out of the terminal.
- Cottonseed arrives inbound primarily via barge, and is shipped out via truck. Cottonseed is handled at Dock 1 of the facility and stored in warehouse.
- De-icing salt arrives at the terminal via barge. The salt is unloaded using an excavator and dropped into a hopper. The hopper is connected to mobile conveyers, which transport the salt to their stockpiles behind the berth. De-icing salt is handled at Dock 4 of the facility. LPD has storage for about 70,000 tons of salt at their facility. The salt primarily arrives in summer months and stays on the terminal till start of winter season, when it is transported to various cities and counties.

2.4 WATER CONDITIONS

2.4.1 Key Factors for Planning

Based on review of public data and on interviews with terminal operators, the US Army Corps of Engineers, and the US Department of Fish and Wildlife, water depths and operating conditions at the LPD and Gavilon sites are considered adequate and appropriate for marine cargo activities within current operating areas. However, the Department of Fish and Wildlife cautioned that in the future, introducing operations such as cargo storage, cargo transfer or barge fleeting within protected areas not currently used for those activities would trigger an involved review and permitting process. This suggests that future master planning should focus on the use of existing water areas and non-protected lands for near-term improvements, and possibly for long-term improvements as well depending on opportunities and needs.

2.4.2 Navigation Structures and Dimensional Restrictions

The Upper Mississippi is roughly 1300 miles in length from Northern Minnesota to its confluence with the Ohio River. About 850 miles, as far north as Minneapolis-St. Paul, is navigable because of a system of 29 lock and dam structures, managed by the US Army Corps of Engineers, providing a "stairway of water" between higher and lower land elevations (799 feet to 398 feet above sea level). The Gavilon and LPD facilities are located between Lock and Dam 11 (Dubuque) and 12 (Bellevue).

Each dam creates a pool of water behind it at a certain elevation, and lock structures (which function essentially like elevators) at each dam are used to transfer vessels between the different water elevations. Through a combination of maintenance dredging and water management, nine-foot navigation depths and a minimum 300-foot wide channel are maintained over the Upper Mississippi.

These depths are suitable to accommodate barges, towboats, and small self-powered craft, but not larger vessels or ocean-going cargo ships. International freight moving to or from non-US markets must transfer from shallow-draft barges to deeper-draft ocean-going vessels. Several large "transload" ports have developed in Southern Louisiana between Baton Rouge and New Orleans, where the Lower Mississippi River is deep enough to accommodate those vessels. Transloading is also be accommodated at Chicago, where the Illinois River system meets Lake Michigan.

The southernmost lock on the Upper Mississippi is at Granite City, IL, near St. Louis, just south of the confluence of the Mississippi and Missouri rivers. Below this lock, the Ohio River confluence, the Lower Mississippi is not controlled by lock and dam structures, and the US Army Corps of Engineers maintains a nine-foot channel depth as far as Baton Rouge through dredging as necessary. From Baton Rouge to the Gulf of Mexico, the river naturally deepens, and limited dredging is performed to maintain a minimum 35-foot navigation channel.

From Dubuque, waterborne cargo can move north as far as Minneapolis St. Paul or south as far as the Southern Louisiana ports via barge on the Mississippi River. Waterborne cargo can also reach many other parts of the US via major systems including the Illinois River (to Chicago IL), Ohio River (to Pittsburgh PA), Missouri River (to Sioux City IA), Arkansas River (to Tulsa OK), Red River (to Shreveport LA), Tennessee-Tombigbee Waterway (to Mobile AL), and Gulf Intracoastal Waterway. These systems provide nine-foot navigation depths through dredging and – for the Illinois, Ohio, Arkansas, and Tennessee-Tombigbee – are managed with lock and dam structures. See Figure 6 following.

Figure 6: Navigable Inland and Coastal Waterways of the United States

Source: US Army Corps of Engineers Institute of Water Resources

A standard dry or liquid cargo barge on the inland waterway system is 195 feet long and 35 feet wide, with a draft of nine feet, although larger barges up to 290 feet by 50 feet may be used. Barges are typically lashed together into "tows." On the Upper Mississippi, 15 barge tows are common; on the Lower Mississippi, tows of 30 or more barges may be assembled because the tow size is not constrained by lock dimensions.

Controlling dimensions of Locks 11 and 12 are as follows:

- Width = 110 feet at #11 and #12
- Length = 600 feet at #11 and #12
- Maximum Lift = 11 feet at #11; 9 feet at #12

Both Locks are wide enough to accommodate a standard 15-barge (three wide by five long tow), but neither is long enough to accommodate a full tow. As a result full tows must be cut into sections on the near side of the lock, locked through separately, and then reassembled on the far side of the lock. All but three locks on the Upper Mississippi are 600 feet in length; the exceptions are #19 (Keokuk), Melvin Price (East Alton), and #27 (Granite City), which are 1200 feet in length. In addition to the lock structures themselves, many highway and rail bridges span the Upper Mississippi and connecting waterways, but barge and towboat design and operating practices allow for generally unimpeded navigation.

Figure 7: Lock and Dam 11 (Dubuque) and 12 (Bellevue)

Source: US Army Corps of Engineers Rock Island DIstrict

2.4.3 Seasonality and Closures

Sections of the Upper Mississippi are closed to navigation each winter due to ice and/or for winter maintenance. Lock 15 (Rock Island) closed to all traffic on December 12, 2019 and is scheduled to reopen on March 5, 2020; during the closure, no freight can move between Dubuque and points downriver of Lock 15. Additionally, Lock 19 at Keokuk closed to all traffic on December 16, 2019 and is scheduled to reopen February 28, 2020. In addition to scheduled maintenance closures, the Corps reports daily on closures, presence of channel ice, special operating requirements, etc. for each lock in the system.

Outside of winter months, the Corps periodically closes sections of the inland waterway system for significant repairs and maintenance activities. Major closures of the Illinois River are planned for July through October of 2020 for work at five lock and dam locations (LaGrange, Peoria, Starved Rock, Marseilles, and Dresden Island). A future closure for work at Dresden Island and Brandon Road is planned for the summer of 2023. During these closers, cargo normally moved over the Illinois River will need to be moved via other waterways, moved via other transportation modes (rail and/or truck), or stockpiled until the river reopens for navigation.

The Corps reports that critical maintenance on the Upper Mississippi Lock and Dam system has progressed well, and the overall reliability of the built infrastructure has improved significantly as a result. Unfortunately, the reliability of the river system as a whole was significantly worse in 2019 due to extended high-water closures – excessive rainfall raised water levels to the point where flooding occurred, and navigation was not possible over much of the system. Flood events are cyclic, but if they become more severe and/or more frequent, waterborne commerce will be further impacted. The freight community is likely to respond to increasing unreliability by utilizing other transportation modes (rail and/or truck) for time-sensitive cargo, while continuing to utilize water for less-sensitive cargo; ports that can offer extensive long-term storage for cargo, allowing it to "wait out" closure events, may therefore have an increasing advantage in attracting and retaining customers.

2.4.4 Dredging

The US Army Corps of Engineers is responsible for dredging of Federal channels, but not for deepening or maintenance between channels and marine terminal berths. LPD performs maintenance dredging within the harbor to accommodate navigable water depths of 9 feet or more. To date there have been no issues in terms of dredging between the LPD harbor and the main channel. Under terms of its lease, Gavilon performs maintenance dredging at its facilities, under the City of Dubuque's permit with the Corps of Engineers.

2.5 COMPETING FACILITIES

The identification of 'competing' facilities has several components.

- Underlying demand for particular commodity movements.
- Degree of attraction to, or preference for, a particular mode – water, rail, or truck – based on logistics factors, service availability (all year vs. seasonal), and service route connectivity.
- Location and all-in cost (reflecting transportation and handling) of alternative port facilities providing comparable services.
- Specific needs associated with different commodities.

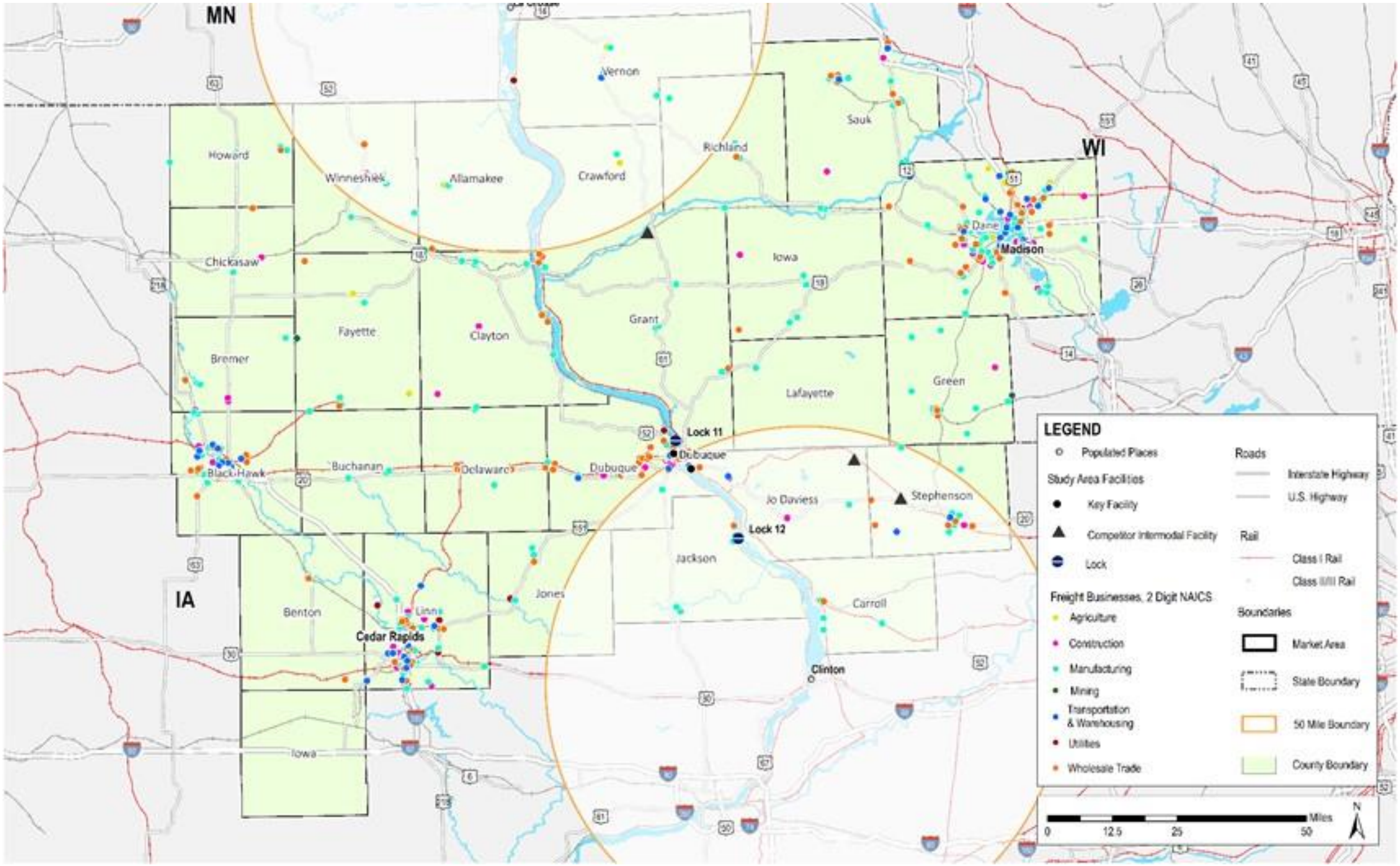
To provide an understanding of the terminal sites' relationship to their primary market areas, and the current or potential future impact of competing facilities, regional highway and rail networks were mapped, along with nearby truck-barge and truck-rail terminals that could handle any of these commodities, within a reasonable distance.

Based on feedback from study stakeholders, the 'competitive distance' for most commodities is generally between 50 and 75 miles from the study area terminals. Lower-value, higher-volume goods such as grains or raw chemicals are often not economically feasible to ship by truck for longer distances, as trucking's cost per ton-mile is relatively higher compared to barge and rail service. Shipping these low-value, high volume commodities by truck can make up a large portion of the cost to the end-user, and eat into relatively thin profit margins. Additionally, both Illinois and Iowa have extensive intermodal service in the form of grain elevators and other terminals, which limits a barge terminal's ability to capture traffic from further inland. Higher-value or specialized cargo may be willing to move longer distances to access required handling capabilities – for example, the region's intermodal containers may move between 150 and 200 miles to reach intermodal rail terminals in eastern Illinois – but this is not typical for river commodities. Study stakeholders recommended the lower end of this range (50 miles) for analysis of grain and fertilizer movements.

Figure 8 following illustrates the Gavilon and LPD facilities Primary Market Area, showing their east-west geographic reach (generally between Cedar Rapids and Madison), areas of competitive overlap (50-mile radius circles centered on major ports at LaCrosse, WI and Clinton, IA), primary highway and rail links, lock and dam locations, and major clusters of freight generating industries. This market delineation is used extensively in Section 4 to describe the market potential for specific commodities, so it is important to understand the various designations:

- The Counties shaded in green represent the general target market area geography. For some commodities, the market may be somewhat larger, and for others somewhat smaller, but this is considered a good overall representation.
- Where the circles centered on LaCrosse and Clinton do not overlap the shaded counties, these counties should have a clear geographic preference for Dubuque and East Dubuque, other factors being comparable.
- Where the circles centered on LaCrosse and Clinton do overlap the shaded counties, these counties will have a choice between geographically-attractive facilities – the study area versus LaCrosse, and the study area vs. Clinton – so competitive performance becomes especially important in capturing markets in these counties.

Figure 8: Primary Market Area, Competing Facilities, Transportation Infrastructure, and Industry Clusters



Source: CPCS Transcom analysis of National Transportation Atlas Database, US Army Corps of Engineers Master Dock Plus. 2019, and Reference USA.

Primary data sources show a total of thirteen truck-barge and rail-barge connections in the immediate study area, as listed in Table 4 following. (By "immediate study area", we mean the Primary Market Area excepting facilities at or near competing port facilities in LaCrosse, WI and Clinton, IA). Three data sources were used to create this list of transfer points:

- National Transportation Atlas Database (NTAD), which provides information on the location of and connections associated with intermodal transfer points, including barge terminals and grain elevators.
- US Army Corps of Engineers' (USACE) Master Dock Plus, which provides information on the location and owner of docks on inland waterways, including industrial terminals.
- Google Earth and Google Maps were used to validate, filter, and update data from NTAD and Master Dock Plus.

Within the market area, there were additional river docks and intermodal facilities listed in the USACE dock data and NTAD. However, some of the points in these two data sets were not relevant to this study, and docks or terminals were removed or combined if:

- The dock or terminal did not handle commodities relevant to the study, or if materials were consumed on-site. For example, docks dedicated to coal-fired power plants or aggregate producers were removed.
- Cargo movements were not supported at the site. The USACE Master Dock data also listed recreational boat launches and riverboat piers, which were removed.
- Entries in the USACE and/or NTAD were clearly out-of-date or listed previous owners.

Table 4: Truck-Barge and Rail-Barge Terminals within the Immediate Study Area

Facility Name or Operator	Location	Transportation Connections	Relevant Commodities Handled
Gavilon	Prairie du Chien, WI	Barge, Rail	Grain
Prairie Sand and Gravel	Prairie du Chien, WI	Barge	Other Dry Bulk
Bunge Grain	McGregor, IA	Barge, Rail	Grain
Consolidated Grain and Barge	Clayton, IA	Barge	Grain
Flint Hills Resources	Dubuque, IA	Barge, Rail	Petroleum
Cargill	Dubuque, IA	Barge, Rail	Grain
Gavilon	Dubuque, IA	Barge, Rail	Grain
Gavilon	Dubuque, IA	Barge, Rail	Fertilizer, Other Dry Bulk
Newt Marine Services Dubuque River Terminal	Dubuque, IA	Barge, Rail	Fertilizer, Metals, Other Liquid Bulk
Cargill	East Dubuque, IL	Barge	Grain
Logistics Park Dubuque	East Dubuque, IL	Barge, Rail	Fertilizer, Metals, Other Dry Bulk
CVR Energy	East Dubuque, IL	Barge, Rail	Fertilizer, Chemicals, Natural Gas
Consolidated Grain and Barge	Savanna, IL	Barge	Grain

Obviously, since the list includes the study area ports and some of their tenants, not all the listed facilities are competitors. Newt Marine is a tenant of Gavilon and LPD; Cargill is a former customer of Gavilon and a current customer of LPD. Looking at the remaining facilities listed in Table 4:

- Consolidated Grain and Barge and Bunge Grain are direct competitors for grain.
- Flint Hills Resources (adjacent to Gavilon) handles liquid asphalt and is not a direct competitor for current Gavilon or LPD commodities.
- Prairie Sand and Gravel is competitive for sand and gravel, but these commodities are not currently being handled by Gavilon or LPD. Prairie Sand and Gravel does not have any announced plans for expansion.
- CVR Energy (former East Dubuque Nitrogen) is investing to expand capacity of ammonia at its facility. CVR will use its own barge dock, so it not a customer for Gavilon or LPD but it is also not a competitor for commodities being handled at Gavilon or LPD.

Outside the immediate study area, major competitors include:

- The Port of LaCrosse, Wisconsin and the massive ADM facility at Clinton, Iowa. These facilities can compete strongly for waterborne freight throughout a substantial portion of the primary market area, as shown in Figure 8. ADM is currently planning to invest $196 million at Clinton to update machinery and expand the facility, supporting the production of a variety of corn products including sweeteners, beverage alcohol, ethanol, and animal feed, potentially making it an even stronger attractor for regional freight.
- ADM Cedar Rapids (corn processing, dry corn milling for ethanol). Although ADM Cedar Rapids is not served by water – it is a truck and rail facility – it competes directly for freight that could otherwise move via water through the study area ports. Although not shown in Figure 8, a 50-mile circle centered on the facility would reach nearly to the City of Dubuque, covering much of the primary market area on the Iowa side. In 2019, ADM announced plans to spin off the ethanol production facility as a subsidiary, possibly due to business pressures.

Recent competitive developments in the railroad industry are also worth noting.

- In Spring of 2019, the Union Pacific Railroad announced it would close its Global III intermodal rail terminal in Rochelle, IL. Intermodal customers who formerly used that facility now must use alterative facilities in or close to the City of Chicago, at additional cost for mileage, drive time, and congestion. This was the Dubuque region’s closest intermodal ramp, and local businesses are impacted. However, the consultant team understands the City of Rochelle is exploring options to restore service through Global III via a shortline operator.
- A new intermodal service has recently opened at the Butler Intermodal Terminal in Shell Rock, IA, serving industrial customers in nearby Waterloo and adjoining market areas. Butler will receive inbound international containers from the Ports of Los Angeles and Long Beach. The Butler service, and a potentially reinstated Rochelle service, should generally benefit the region’s freight shippers by reducing the need to dray to Chicago area rail terminals, although neither operation should impact marine transportation opportunities or competitiveness.

Previous plans anticipated establishing intermodal rail service at Cedar Rapids, but the consultant team is advised these plans will not be advancing.

- River transportation is not an ideal replacement or substitute for intermodal rail capacity. There is very little intermodal infrastructure on the inland waterways – the only operating terminals are small/specialized facilities at Paducah KY, Memphis TN, and Baton Rouge, IL. Within the past several years, the City of Muscatine and a local business partnered on a feasibility study to construct a container-on-barge port facility in Muscatine, but staff at the Bi-State Regional Council report that the project is not advancing at present. Previously, the Port of LaCrosse Harbor and Waterfront Plan (2011) explored the potential for container on barge services, but did not advance them due to questions about market and financial feasibility. Generally speaking, the US intermodal rail network and inland waterway networks serve different purposes: the intermodal network is designed to offer relatively fast and reliable east-west service to a wide range of network destinations at a higher cost, while the inland waterways offer lower-cost north-south service to a limited number of network destinations with lower speed and reliability. The possibilities for container on barge service in the study area will be addressed as part of Task 3.

3 Data Collection and Inventory for Highway and Rail Access

TASK 2B OF THE ECIA PORT EXPANSION STUDY ADDRESSED DATA COLLECTION AND DATA INVENTORY WORK FOR HIGHWAY AND RAIL ACCESS TO STUDY AREA MARINE TERMINALS. BOTH TERMINALS HAVE SUBSTANTIAL CONNECTIONS TO ROAD AND RAIL NETWORKS, WITHOUT MAJOR IMPEDIMENTS TO TRUCK OR RAIL MOBILITY, BUT THERE ARE OPPORTUNITIES TO IMPROVE BOTH TRUCK AND RAIL ACCESS THAT SHOULD BE CONSIDERED AS STUDY RECOMMENDATIONS ARE DEVELOPED.

3.1 DATA AND DOCUMENT REVIEW

This section provides a brief overview of the transportation connections relevant to each of the two port facilities as well as noteworthy infrastructure constraints that may be relevant to the service, development, and expansion of these facilities. Information for this assessment came from findings from key transportation planning documents such as the Eight County Freight Study, Illinois State Freight Plan, Iowa State Freight Plan, and regional transportation plans.

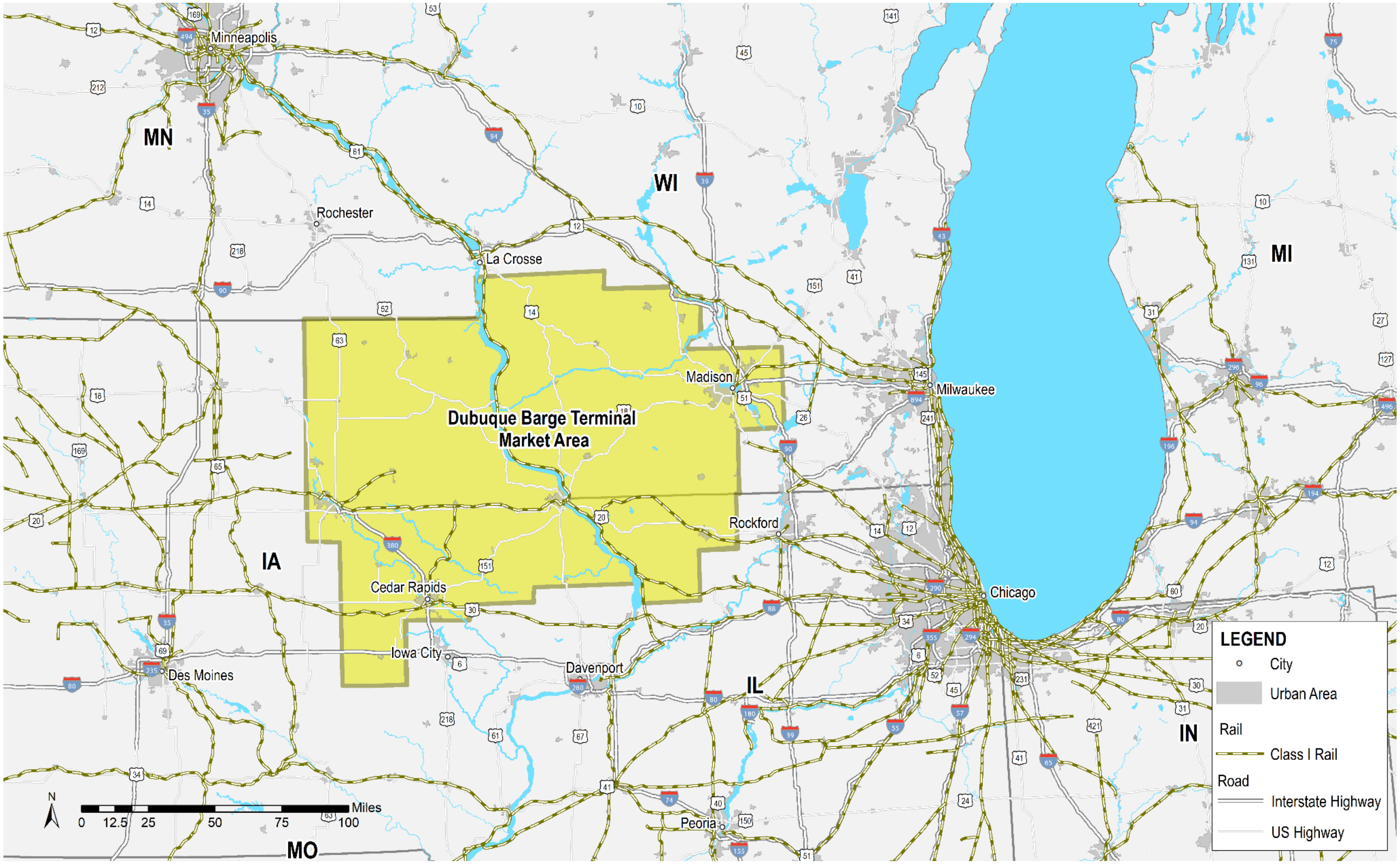
Figure 9 shows how the market area for these facilities sits in relation to regionwide transportation infrastructure in Iowa, Illinois, Wisconsin, and Minnesota. Further discussion of road and rail connection is provided below, and discussion of the market area is provided in Section 5 of this document. Discussion of the transportation needs and characteristics of specific goods is also provided in Section 5.

3.2 REGIONAL HIGHWAY SYSTEM

The Dubuque region lacks interstate highway connections; therefore, US highways serve as the main routes for truck movement into and out of the region. Key regional highway connections for Dubuque's terminals include:

- **US-20**, which provides connections east to Rockford and West to Waterloo.
- **US-151** is another major route, providing connections to Madison in the North, and Cedar Rapids in the South.
- **US-52** which provides connections south to Savanna and north into Northeast Iowa. This route provides one of the most direct routes to the Twin Cities, as well as access to I-88, I-39, and southwestern areas of Chicagoland.
- **US-61** which connects Dubuque with I-80 in Iowa.

Figure 9: Primary Market Area and Regional Transportation Connections



Source: CPCS Transcom analysis of National Transportation Atlas Database

LPD is located just off US-20 and is connected to US 20 via Barge Terminal Road. US-20 provides east-west access and connections to US-61/US-151, US-52, and other important routes. Turning movements from US-20 into and out of LPD terminal have been noted as operational impediments warranting investigation.

Gavilon's facilities are accessed via Kerper Boulevard (Dove Harbor and Salt Harbor) and Seventh Street (Seventh Street Terminal). Kerper Boulevard provides connections to US-61/US-151 at two points directly, and at two points via 11th Street and the 16th Street Extension; these routes are well-suited for truck traffic. Seventh Street access to US-61 is not direct, but largely traverses industrial areas, although the redeveloping Millwork District is close by; stakeholder interviews did not identify truck/auto conflicts as an issue. Via US-61/US-151, Gavilon can access US-20, US-52, and other important routes.

From a regional perspective, major constraints on truck traffic that could be relevant to both ports are focused on US-20 east of Dubuque, which has a 47-mile stretch of mostly two-lane road with limited opportunities for passing. An additional constraint on this route, which is close to both ports is the Julien Dubuque bridge, which is only two lanes wide

Another truck mobility constraint directly relevant to both ports is the discrepancy between Illinois' and Iowa's maximum weight limits for agricultural operations. Illinois' lower weight limits relative to Iowa means that Illinois' weight limit becomes the *de factor* limit for trucks crossing the border, and prevents full loading of trips originating in or destined for Iowa from Illinois. While concerns about safety, congestion, and weight limits are important to consider, they do not present hard barriers to truck movement on the region's key connecting routes.

3.3 REGIONAL RAIL SYSTEM

The Dubuque area is served by three Class I railroads, which provide extensive access to much of the Midwest and western United States. These three railroads include:

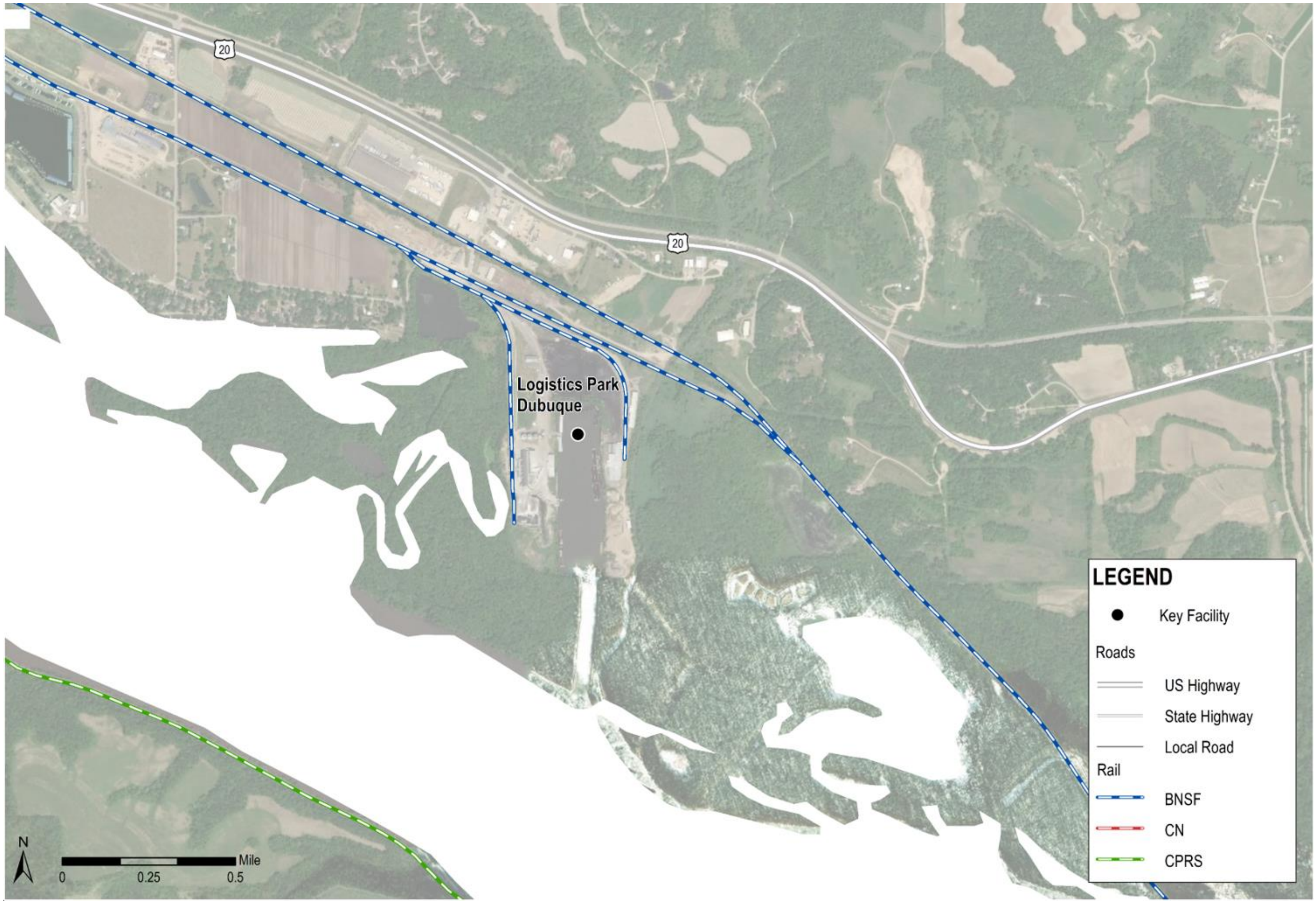
- The **BNSF** which runs on the east bank of the Mississippi and provides trackage (but not service) to Logistics Park Dubuque. This BNSF line connects to La Crosse and the Twin Cities in the north, Davenport to the south, and Chicago to the west.
- The **Canadian National** (CN) which runs east-west through the region, providing connections to Chicago and Waterloo. The CN connects directly with Gavilon Dubuque and provides service to Logistics Park Dubuque via BNSF trackage.
- The **Canadian Pacific** (CP) which runs on the west bank of the Mississippi, which includes trackage adjacent to Gavilon Dubuque.

In addition to these rail lines, the Dubuque area has one railroad bridge which is owned by CN and supports the movement of about eight trains per day. The area also has a switching yard for each of the three railroads. Previous studies found no mobility constraints with the Dubuque area's railroads. However, both Gavilon and LPD have identified potential rail improvements that could benefit local/on-terminal accessibility and service. These will be explored in detail as part of the development of study recommendations.

3.4 ACCESS PROFILES

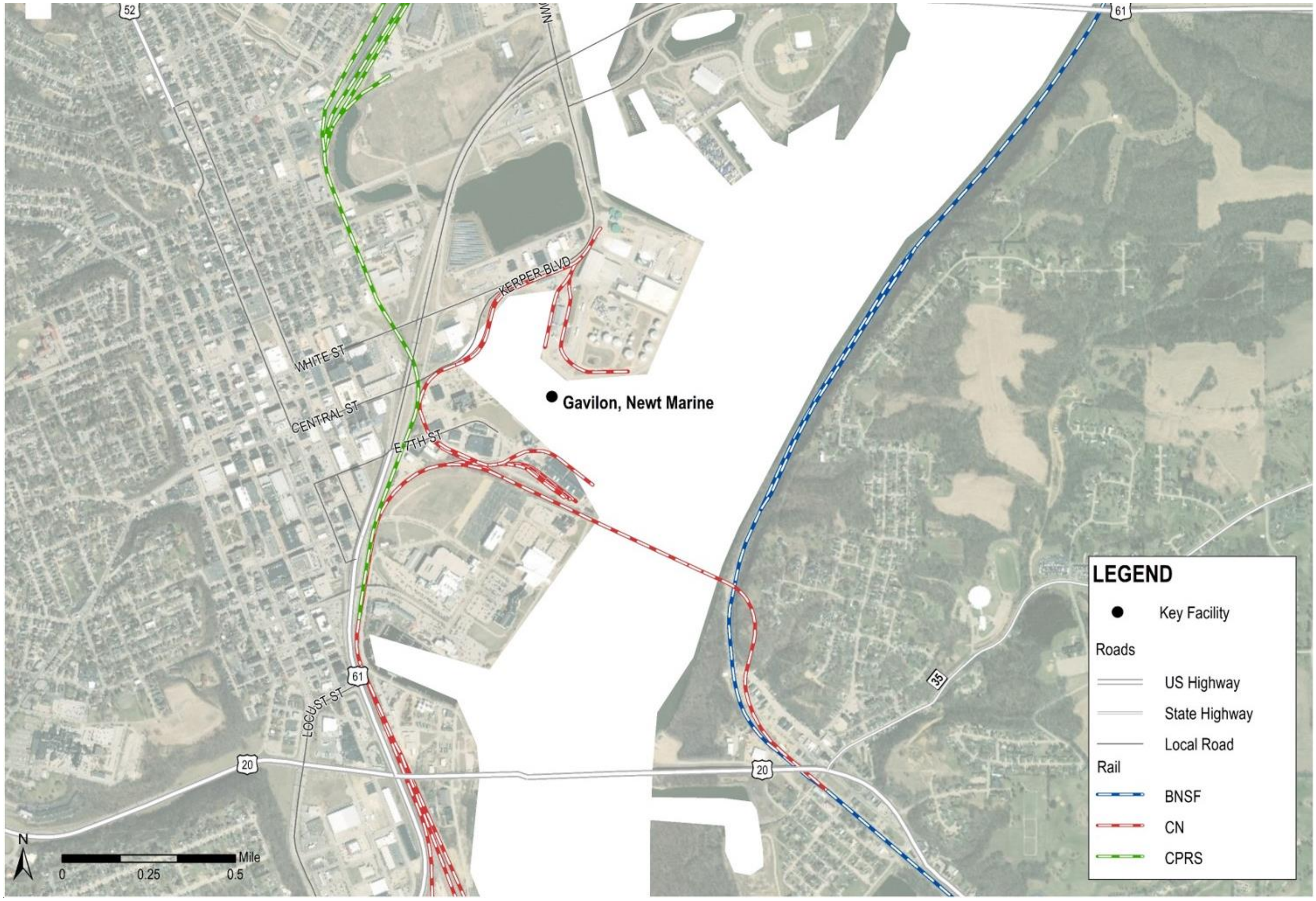
To provide context future discussions of access and mobility, Figure 10 illustrates the transportation connections immediately surrounding Logistics Park Dubuque, while Figure 11 shows the transportation links for Gavilon Dubuque. Of note, Logistics Park Dubuque is served by the BNSF and has nearby access to US-20. Gavilon Dubuque has nearby connections to US-61, 20, and 151, and service from the CN and CP. Access issues related to specific commodity groups are addressed in more detail in Section 5 of this Technical Memo.

Figure 10: Access Profile, Logistics Park Dubuque



Source: CPCS Transcom analysis of National Transportation Atlas Database

Figure 11: Access Profile, Gavilon



Source: CPCS Transcom analysis of National Transportation Atlas Database

4 Data Collection and Inventory for Land Use and Industry Locations

TASK 2C OF THE ECIA PORT EXPANSION STUDY ADDRESSED DATA COLLECTION AND DATA INVENTORY WORK FOR LAND USE AND INDUSTRY LOCATIONS RELEVANT TO MARINE TERMINAL PLANNING AND OPERATIONS. BASED ON A REVIEW OF BUSINESS DATA, THERE ARE MULTIPLE FIRMS AROUND DUBUQUE AND THE GREATER REGION WHO COULD POTENTIALLY UTILIZE BARGE SERVICE. GAVILON IS BOUNDED BY NEARBY NON-INDUSTRIAL USES WHICH CONSTRAIN FUTURE EXPANSION, WHILE LOGISTICS PARK DUBUQUE IS LESS CONSTRAINED AND MAY HAVE POTENTIAL FOR PHYSICAL EXPANSION.

4.1 DATA AND DOCUMENT REVIEW

The study team utilized multiple datasets to map and understand the location of businesses and land uses relevant to the port facilities. The goal of this work was to extract and summarize information relevant to freight-generating industrial activity, and current and potential port utilization. Three key sources used for this analysis include:

- ReferenceUSA data on the location of business establishments, as well as their industrial specializations and number of employees.
- Land use data from Jo Daviess county, which was used to map land uses adjacent to Logistics Park Dubuque.
- Land use data from the City of Dubuque, which was used to map land uses adjacent to Gavilon Dubuque.

These data sources were supplemented with a literature review of local land use plans and studies for further context about the economic role and development of areas around the ports.

4.2 NEARBY INDUSTRIES

Based on a review of ReferenceUSA, In Dubuque and Jo Daviess Counties, there are about 91 firms with more than 20 employees that are engaged in activities that could potentially utilize barge transportation. Table 5 lists the number of firms engaged in general types of industries in the counties surrounding each port.

Table 5: General Freight-Related Firms with more than 20 employees in Dubuque and Jo Daviess Counties

Industry Classification and NAICS Code	Count of Firms
Agriculture (11)	1
Utilities (22)	2
Construction (23)	44
Manufacturing (33, 34, 35)	44
Wholesale (42)	44
Transportation and Warehousing (48, 49)	26

Most of these freight-reliant firms are associated with construction and manufacturing activity, and Table 6 provides a list of the top 10 potentially barge-relevant sub-industries, by employment.

Table 6: Specific Industries by Employment

Industry Classification and NAICS Code	Estimated Employment
Electric Power Generation and Distribution (221)	2,075
Merchant Wholesalers, Durable Goods (423)	1,783
Specialty Trade Contractors (238)	1,249
Miscellaneous Manufacturing (339)	1,189
Merchant Wholesalers, Nondurable Goods (424)	1,125
Fabricated Metal Product Manufacturing (332)	1,042
Furniture and Related Product Manufacturing (337)	780
Machinery Manufacturing (333)	578
Highway, Street, and Bridge Construction (237)	478
Building Construction (236)	457

Some of these particular sub-industries may be more barge-relevant than others. For example, highway, street, and bridge construction may use large volumes of aggregates that are well-suited to transport by barge, and some inputs to fabricated metal product manufacturing are already being transported by barge in the area. In addition to this local breakdown, business data for the Primary Market Area was tabulated. Table 7 below lists the number of firms in the market area with employment greater than 50 people, and which are engaged in potentially-barge-related activity.

Table 7: Potentially Barge-Relevant Establishments in the Primary Market Area

Industry Classification and NAICS Code	Count of Firms
Agriculture (11)	13
Mining (21)	4
Utilities (22)	17
Construction (23)	128
Manufacturing (33, 34, 35)	359
Wholesale (42)	164
Transportation and Warehousing (48, 49)	59

Of note, manufacturing, wholesale trade, and construction continue to stand out as particularly strong potential areas for industrial specialization. The baseline understanding of the local and greater regional economies provided by analysis like this provided a context for the in-depth investigation of barge-specific sub-industries. The results of this deeper analysis are provided in Section 5 of this Technical Memo.

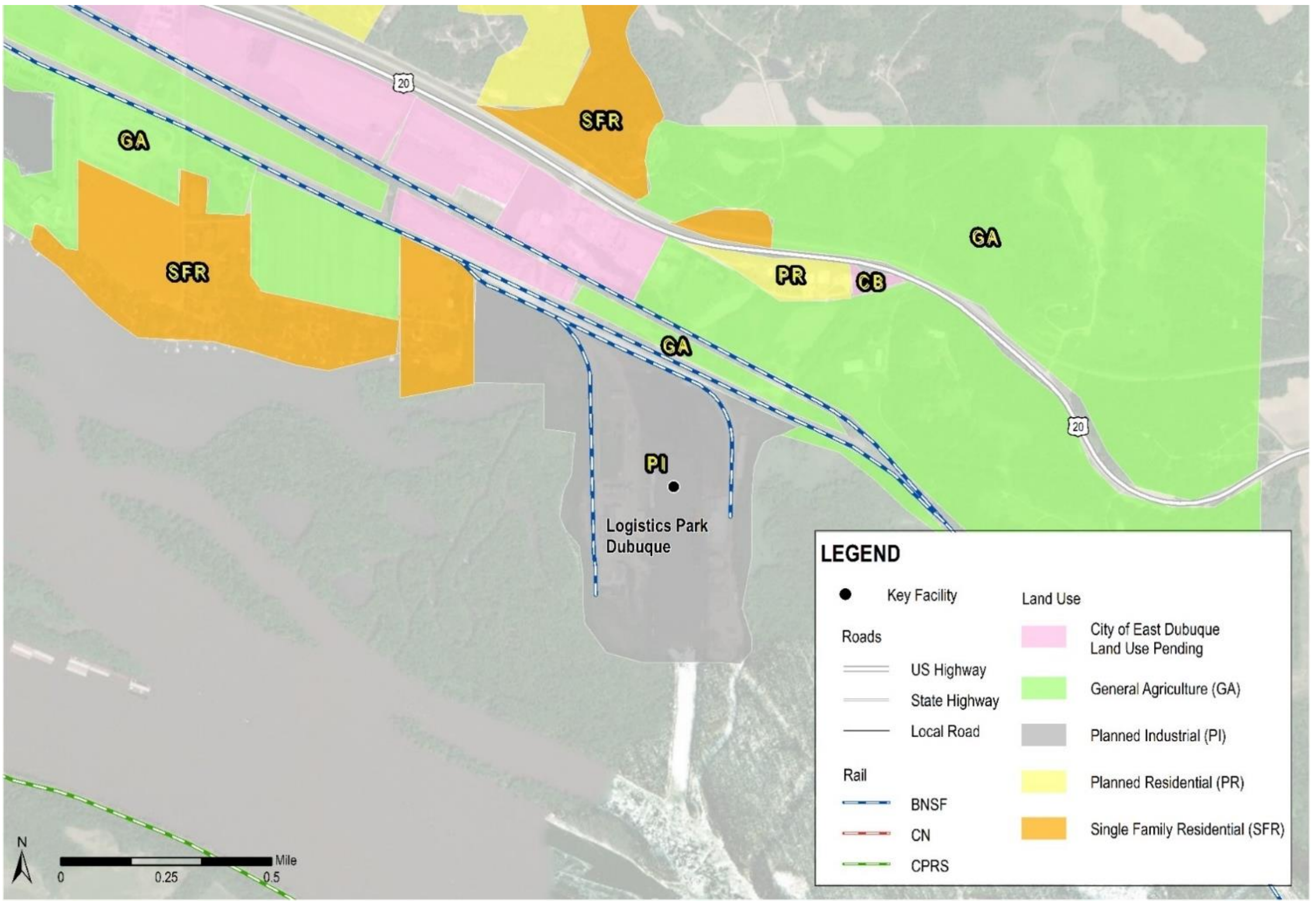
4.3 LAND USE PROFILES AND SITE ACCESS

Land use data for the City of Dubuque and Jo Daviess County provides insights into the neighboring tenants for each port. Studying land use patterns can help reveal areas for future development, or areas of potential conflict.

Logistics Park Dubuque is shown in Figure 12. This port sits at the far southeastern edge of East Dubuque, and is bordered primarily by undeveloped agricultural land and light industry (designated as "land use pending"). West of the site, there are riverfront properties designated as single family residential. Nearby single-family development and potential protected river bottoms could be sensitive areas relevant to future development, but the agricultural and light industrial lands could represent expansion opportunities. There are no sensitive areas on the road connection between the port and US-20. However, the intersection of Barge Terminal Road and US 20 is known to have operational issues, and potential improvements may be identified by this study and/or other regional and state planning.

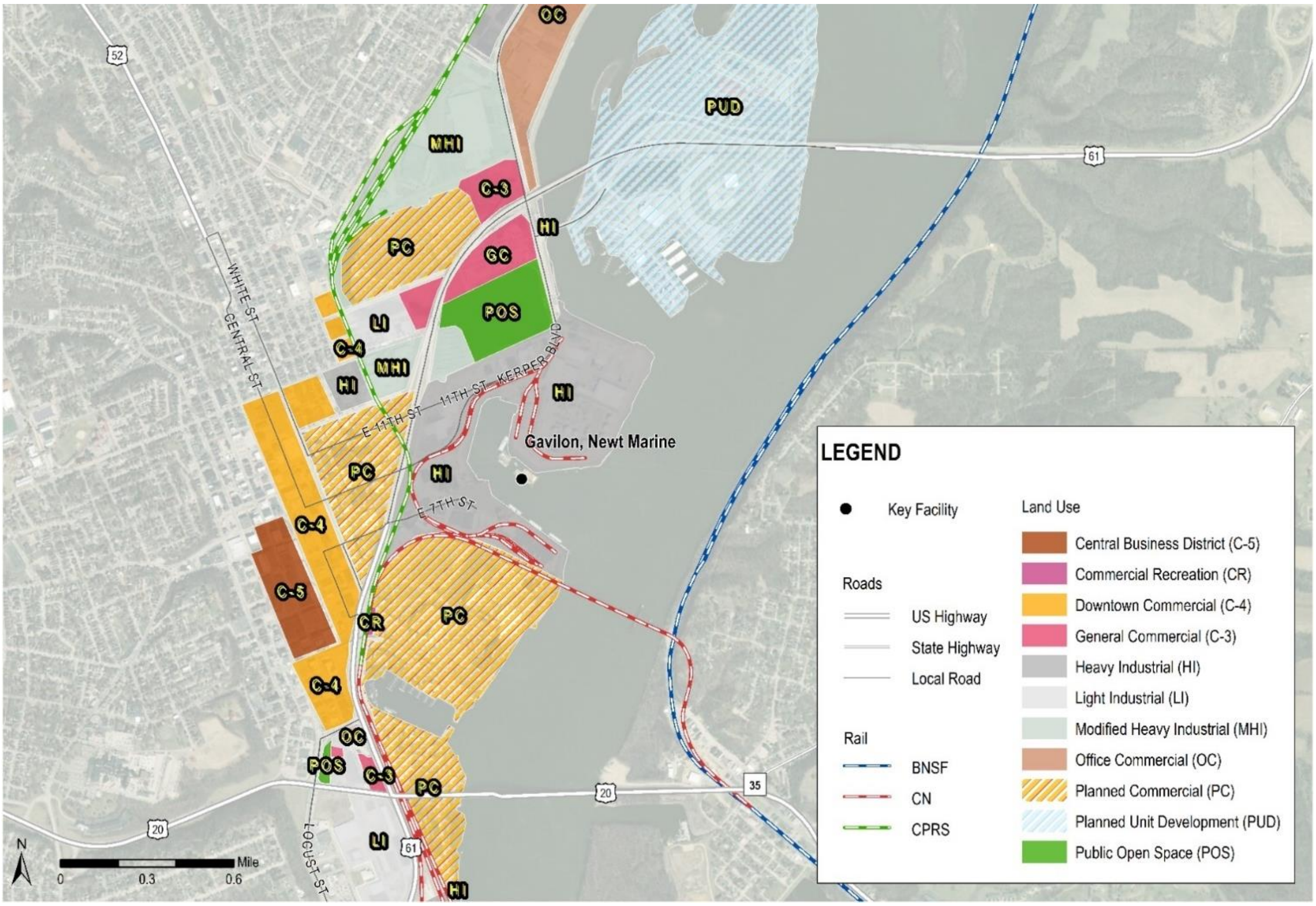
The Gavilon Dubuque terminal is shown in Figure 13. The Dove Harbor, Salt Harbor, and Seventh Street operating areas are nested within a cluster of compatible industrial properties, but this cluster is bounded by property designated for commercial development to the south (Port of Dubuque) and west (Millwork District), and to the north by designated public open space (wetlands). Over the long-term, it is possible that more of the heavy industrial area may become attractive for commercial development, further reducing the footprint available for terminal operations. However, at least within the near-term, reconfiguration and optimization of terminal functions and access within the existing heavy industrial area is viable. Potential access improvements responding to existing conditions and potential new development will be addressed in later phases of the study.

Figure 12: Land Use, Logistics Park Dubuque and Vicinity



Source: Jo Daviess County

Figure 13: Land Use, Gavilon and Vicinity



Source: City of Dubuque

5 Synthesis Analysis by Commodity Type

THIS SECTION OF THE TECHNICAL MEMO PERFORMS A SYNTHESIS ANALYSIS, LOOKING AT A WIDE RANGE OF COLLECTED DATA – COMMODITY TRENDS, TRANSPORTATION ASSETS, FACILITIES, AND ECONOMIC CONDITIONS – AS IT APPLIES TO NINE MAJOR COMMODITY GROUPS OF CURRENT OR POTENTIAL INTEREST TO THE REGION'S MARINE TERMINALS. PRELIMINARY FIINDINGS ABOUT MARKET OPPORTUNITIES AND COMPETITIVE FACTORS ARE PRESENTED FOR EACH COMMODITY, AS A LEAD-IN FOR THE FULL MARKET ANALYSIS TO BE COMPLETED IN TASK 3.

Sections 2, 3 and 4 present information on the region's ports, commodities, competitors, highway and rail access, and land use/industry locations. In performing these analyses, it became apparent that the information would be most useful when synthesized and focused on the issues and market opportunities associated with specific commodities.

This type of analysis is a very useful bridge between facility and infrastructure data collection (the primary purpose of Task 2) and market opportunity analysis (the primary purpose of task 3). The initial market opportunity implications from this analysis will be reviewed, tested, and refined through substantial additional work (interviews, data analysis, and modeling) in Task 3.

For most commodity types, the synthesis analysis addresses:

- Commodity trends -- US Army Corps' of Engineers (USACE) and USA Trade Online data was used to provide a brief overview of the trends of each commodity's shipment on the Mississippi River, building on the commodity data introduced in Section 2.
- Commodity transportation profiles – these include description of the transportation needs associated with each commodity, building on the transportation data introduced in Section 3.
- Facilities profiles -- these analyses combine facility and land use data, building on material presented in Sections 2 and 4 and in some cases significantly expanding on it.
- Related economic activity – these analyses address the larger economic context for production, consumption, and movement of each commodity type.
- Summary – finally, specific implications for the study area ports are identified; these should be interpreted as 'working hypotheses' drawn from available data, and will be subjected to substantial additional review and possibly modification as part of Task 3.

The commodity types and movement directions addressed in the Synthesis Analysis are:

1. Outbound grain
2. Inbound fertilizer
3. Outbound biofuels and distillers dried grain (DDG)

4. Inbound metal products, including scrap, steel coil, pig iron, and rebar (to feed manufacturing processes)
5. Inbound chemical manufacturing feedstock
6. Inbound plastics, polymers, and rubber products
7. Inbound lumber (to feed manufacturing process, e.g. windows)
8. Outbound liquefied natural gas (LNG)
9. Inbound project cargo/manufactured products (e.g., windows, mining equipment, wind turbines, solar panels, and other project cargo)

Intermodal containers – which are a handling type, not a commodity type – are also important, and will be addressed in detail in the Task 3 market analysis.

Table 8: Relevant Data Sources for Synthesis Analysis

Commodity	Data Sources	Purpose
Outbound Grain	USDA National Agricultural Statistics Service Production by County	Estimating agricultural production in market area.
	USDA CropScape	Mapping distribution of agricultural production in market area.
Inbound Fertilizer	USDA National Agricultural Statistics Service Production by County	Estimating agricultural production in market area.
	USDA Economic Research Service Fertilizer Use and Price Records	Estimating fertilizer tonnage required to support production in market area.
Metal Products	ReferenceUSA	Identifying firms in the market area engaged in the production or consumption of metal products as part of further manufacturing.
Outbound Ethanol	National Renewable Energy Laboratory Renewable Fuels Atlas	Mapping ethanol production facilities in market area.
Chemicals	ReferenceUSA	Identifying firms in the market area engaged in chemical manufacturing, or consumption of primary chemicals for manufacturing.
Liquefied Natural Gas	US Energy Information Administration	Location of LNG pipelines, terminals, and market hubs.
Plastics, Polymers, and Rubber	ReferenceUSA	Identifying firms in the market area engaged in the production of plastics, or consumption of plastics as part of further manufacturing.

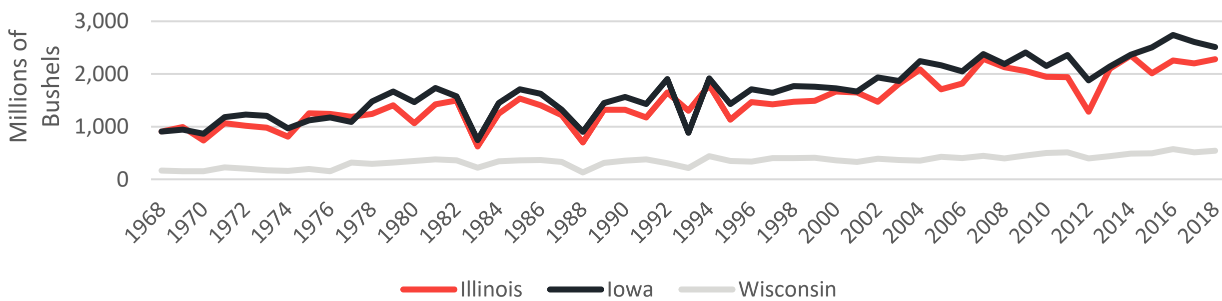
5.1 OUTBOUND GRAIN

5.1.1 Commodity Trends

The major agricultural commodities that use the Mississippi River maritime system are corn and soybeans. Data from the United States Department of Agriculture (USDA) indicates that in 2018, Iowa was the top producer of corn and 2nd biggest producer of soybeans. Illinois was the top producer of soybeans and 2nd biggest producer of corn. Wisconsin was relatively less important for both crops and was ranked 9th for corn and 14th for soybean production.

Corn – Corn production in Iowa, Illinois, and Wisconsin has more than doubled over the past 50 years, and in 2018, Iowa produced 2.5 billion bushels, while Illinois produced over 2.2 billion. Figure 14 illustrates these crop trends over time. According to the USDA, the dominant uses for corn in the US are ethanol production, followed by animal feed, and last, for human consumption as cereals, alcohol, high fructose corn syrup, etc.

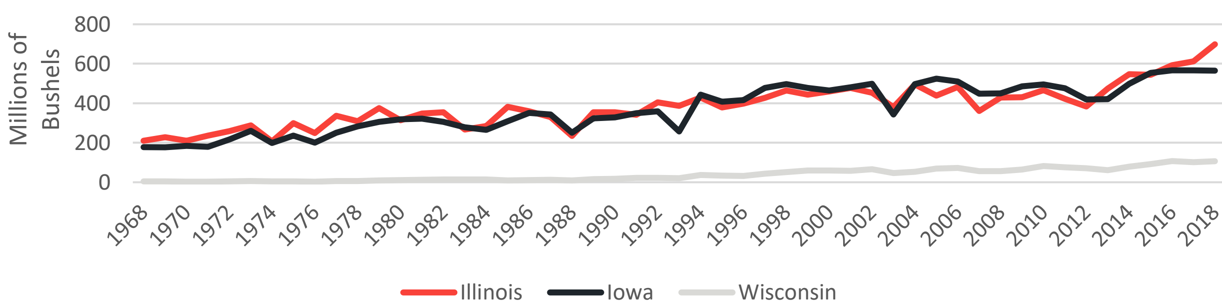
Figure 14: Corn Production in Iowa, Illinois, and Wisconsin



Source: CPCS analysis of USDA National Agricultural Statistics Service Data

Soybeans – Soybeans are the second-largest crop carried on the Mississippi River. Like corn, soybean production in Iowa, Illinois, and Wisconsin has increased significantly in the past 50 years (see Figure 15).

Figure 15: Soybean Production in Iowa, Illinois, and Wisconsin



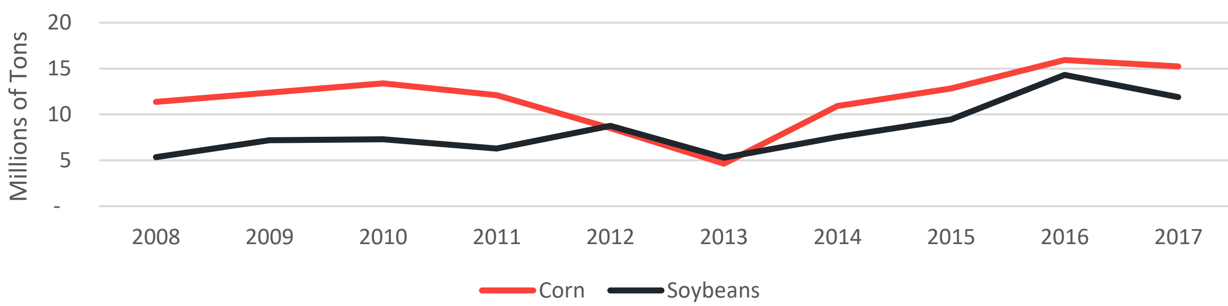
Source: CPCS analysis of USDA National Agricultural Statistics Service Data

5.1.2 Transportation Profile

Exports are important for both corn and soybeans: about 10-20 percent of US corn production is exported to other countries, and between 45 and 50 percent of US soybean production is exported.[1] A major challenge for this export trade (and grain in general) is cost-effective shipping, which can influence whether or not US agricultural products are competitive in foreign markets.[2] Waterborne transportation is preferred for corn and soybean shipping since marine transport has the lowest cost-per-ton of movement relative to rail or trucking. This low cost is important because corn and soybeans move in large volumes, and have relatively low value per ton. Therefore, shippers must minimize their transportation costs, which eat into thin profit margins.

For exports, shipping corn to East Coast ports is typically not feasible given typically lower margins on that commodity. By comparison, the higher price-per-bushel of soybeans (relative to corn) gives shippers the flexibility to use a limited amount of rail service.[3] Since water is often the only option for export shipping, the river is a critical corridor for exports. Figure 16 illustrates the tonnage of corn and soybeans shipped down the Upper Mississippi River (north of the confluence with the Ohio River) over the past 10 years. Soybean shipment tonnages have been growing, but corn tonnages vary from year-to-year, based on market price and export demand.

Figure 16: Corn and Soybeans Shipped out of the Upper Mississippi River

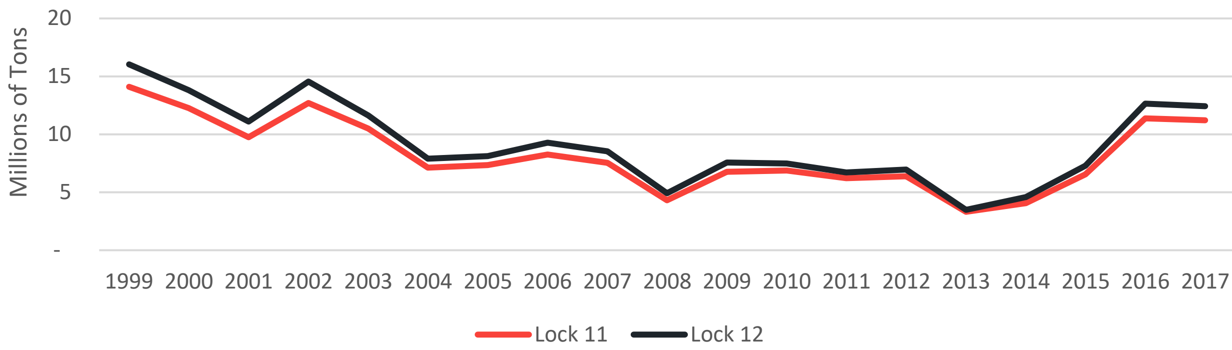


Source: CPCS Transcom analysis of US Army Corps of Engineers' Waterborne Commerce Statistics Data.

Locks 11 and 12 make up the "pool" where an expanded barge facility would be located. The US Army Corps of Engineers (USACE) provides limited information on the commodities traveling through each of these locks. Figure 17 shows how tonnage through these locks around Dubuque has increased drastically in the past 4-5 years but lags behind historic highs in the early 2000s.

[1] USDA Economic Research Service. 2017.
[2] USDA Corn Transportation Profile. August 2014.
[3] Ohio Maritime Strategy. Ohio Department of Transportation. 2018.

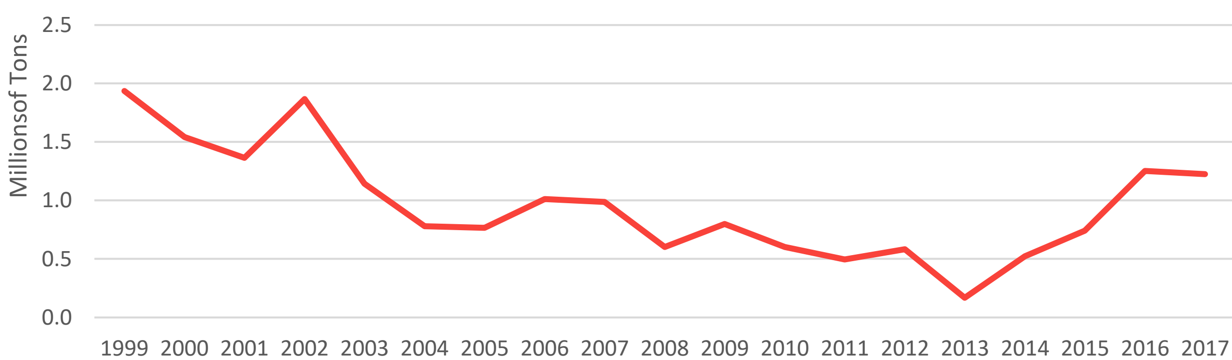
Figure 17: Agricultural and Farm Products Shipped Through Locks Around Dubuque



Source: CPCS Transcom analysis of US Army Corps of Engineers Lock Performance Monitoring System Data. 2019.

Since agricultural products are overwhelmingly downbound, comparing tonnage through Locks 11 and 12 provides a rough estimate of agricultural products loaded in the Dubuque area.[4] Figure 18 illustrates the difference in tonnage reported between Lock 11 and Lock 12. This graph suggests that the tonnage of agricultural products loaded in the Dubuque area has changed dramatically over the past 20 years, similar to river-wide trends.

Figure 18: Difference in Tonnages of Agricultural Products Shipped Through Locks 11 and 12



Source: CPCS Transcom analysis of US Army Corps of Engineers Lock Performance Monitoring System Data. 2019.

5.1.3 Facilities Profile

Based on a review of NTAD and USACE data, six grain-handling barge terminals were identified within the immediate study area. These facilities are listed in Table 9 and visualized in Figure 19.

[4] Perry et al. Modal Investment Comparison: The Impact of Upper Mississippi River Lock and Dam Shutdowns on State Highway Infrastructure. Mid-America Freight Coalition. 2017.

Table 9: Barge Grain Transload Terminals

Facility Name	Location	Connections	Storage Capacity (Bushels)	Rail Car Capacity
Gavilon	Prairie du Chien, WI	Barge, Rail	150,000	25
Bunge Grain	McGregor, IA	Barge, Rail	1,000,000	25
Consolidated Grain and Barge	Clayton, IA	Barge, Rail	7,600,000	50
Gavilon	Dubuque, IA	Barge, Rail	2,020,000	45
Cargill (LPD)	East Dubuque, IL	Barge	2,800,000	100+
Consolidated Grain and Barge	Savanna, IL	Barge	188,000	N/A

Source: Capacity information from Wisconsin Southern Railroad, Canadian National Railroad, US Department of Agriculture Farm Service Agency.

Rail-served grain elevators have the potential to be competitors to a barge terminal, but likely only if they have the capacity to serve the unit trains that are capturing increasing volumes of rail's grain traffic. In Iowa's portion of the barge terminal market area, there are no strictly rail-served elevators with a railcar capacity greater than 50 cars, except for two elevators in Cedar Rapids.[5] In Illinois, there are two-unit train-capable facilities in the market area, and in Wisconsin, there is one rail-only elevator in the study area capable of handling 50 cars or more. Note that while LPD offers railcar capacity, Cargill is not currently using it.

Table 10: Large (50+ Railcar Capacity) Rail-Only Elevators in Market Area

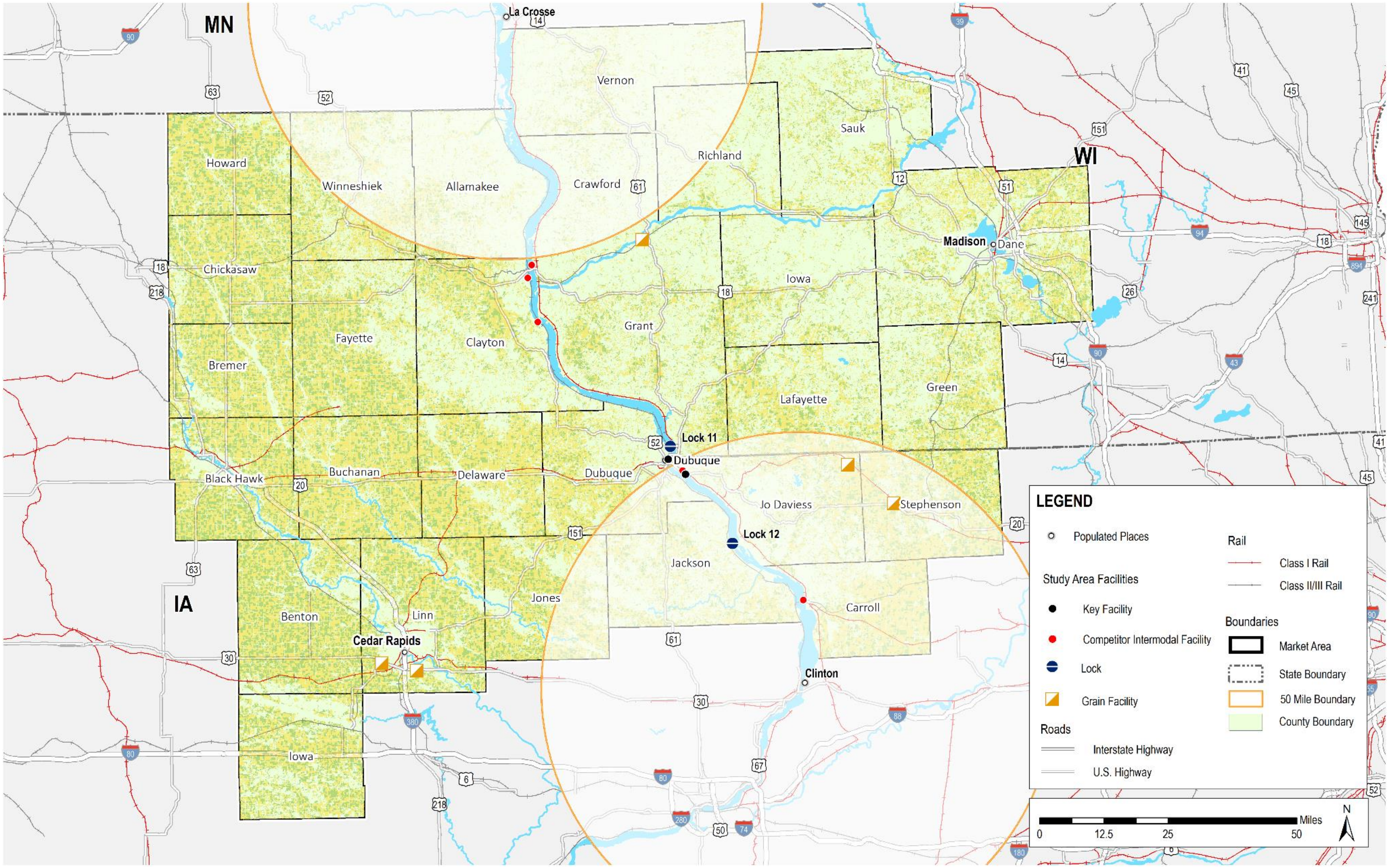
Facility Name	Location	Capacity (Bushels)	Rail Car Capacity
Gavilon	Warren, IL	1,800,000	122
Alliance Commodities Pearl City Elevator	Lena, IL	2,200,000	100+
United Cooperative	Boscobel, WI	4,000,000	50
Cargill	Cedar Rapids, IA	N/A	100+
ADM	Cedar Rapids, IA	4,000,000	100+

Source: Capacity information from Wisconsin Southern Railroad, Canadian National Railroad, Iowa Department of Transportation. US Department of Agriculture Farm Service Agency.

The market area's relative lack of rail-served elevators capable of handling modern unit trains (compared to other areas of Iowa and Illinois) suggests that barge-served elevators would be the primary competitors for a new or expanded terminal in the Dubuque area.

[5] Iowa DOT Grain Facilities Rail Map. 2016.

Figure 19: Market Area, Crop Production, and Potential Competitor Facilities

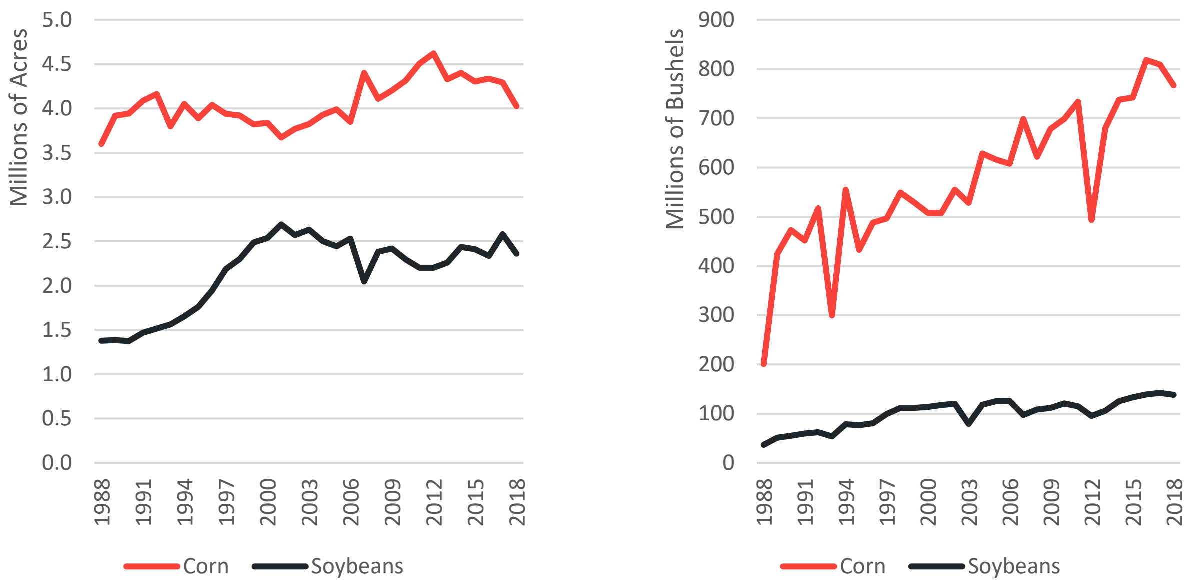


Source: CPCS Transcom analysis of USDA CropScape, USACE Master Dock Plus, National Transportation Atlas Data. 2019.

5.1.4 Related Economic Activity

Figure 20 illustrates the trends in the cultivation and production of corn and soybeans within the 26 counties that make up the market area. Over the past 10 years, the amount of corn and soybeans being produced in the market area has more than doubled, following trends similar to Iowa, Illinois, and Wisconsin as a whole. However, during the same time period, the volume of barge-borne corn, soybeans, and other agricultural products has either remained steady or declined.

Figure 20: Market Area Cultivation (Left) and Production (Right) of Corn and Soybeans



Source: CPCS Transcom analysis of National Agricultural Statistics Service Data. 2019.

5.1.5 Summary, Outbound Grain

Ultimately, this market data presents a mixed outlook for the feasibility of a grain handling facility. The volume of corn and soybeans produced in the market area has grown over the past 20 years, which could suggest a greater demand for barge terminals to support export shipments. However, historic trends paint a more mixed picture, with wide swings in tonnage of agricultural commodities carried by barge from the Dubuque area, and potential excess storage capacity (1 million + bushels) with the facilities that are currently in the region.

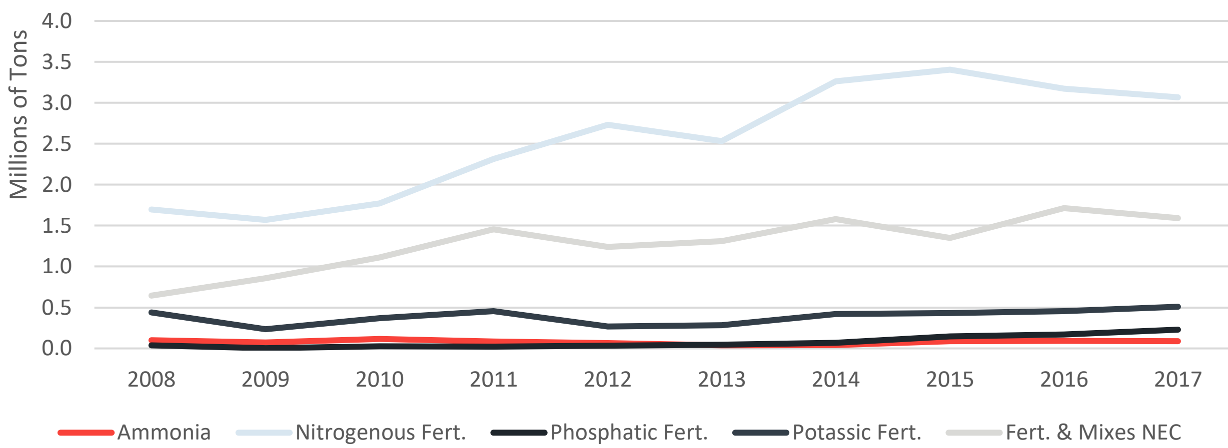
Based on the distribution of agricultural land in the market area, and the concentration of existing outbound grain facilities along the river, it appears that the strongest competition for a grain-related barge facility would be from existing river facilities: less competition would come from rail-served elevators. The natural market area for such a facility would likely extend northwest and northeast of Dubuque, areas which have a relatively low count of major barge or rail terminals.

5.2 INBOUND FERTILIZER

5.2.1 Commodity Trends

The counties in the market area surrounding Dubuque are major producers of soybeans and corn. Most of this agricultural production is possible thanks to a supply of fertilizers that support high crop yields, some of which arrives via barge. Over the past 10 years, the volume of fertilizers unloaded at terminals on the Upper Mississippi River increased by 37 percent (see Figure 21).

Figure 21: Fertilizer Unloaded at Upper Mississippi River Terminals



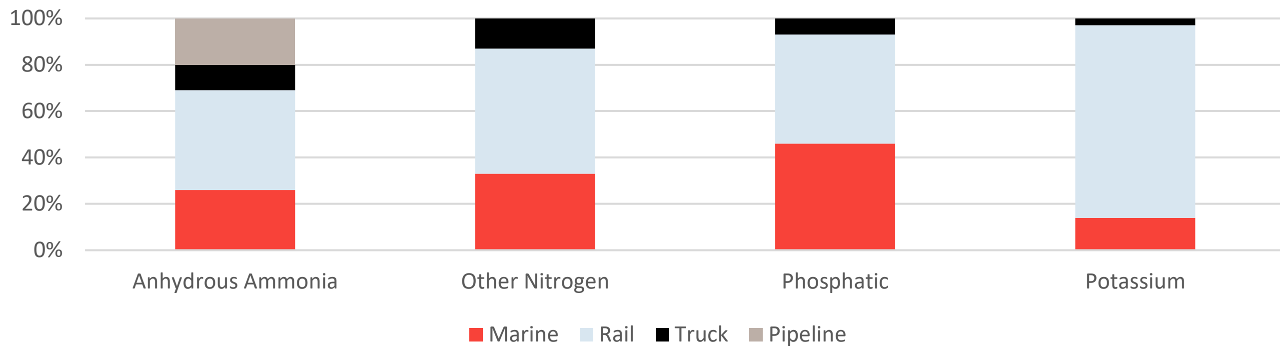
Source: US Army Corps of Engineers Waterborne Commerce Statistics. 2018.

5.2.2 Transportation Profile

The transportation profile of fertilizer varies from grain due to a relatively higher per-ton value for fertilizer. For example, in 2018 the global price of corn ranged between $150 and $170 per ton, and soybeans ranged between $310 and $370.[6] By comparison, anhydrous ammonia cost $600-700 per ton, and phosphate prices ranged between $500 and $550 per ton.[7] Fertilizer's higher value-per-ton means that shipping costs can make up less of the total price of fertilizer, and utilizing trucking or rail for longer distances is economically feasible. Figure 22 lists the United States' 2017 percentage of the mode used for each type of fertilizer, per ton-mile, and illustrates how marine and rail modes make up the largest share of fertilizer carried, per ton-mile.

[6] Federal Reserve Bank of St. Louis. 2019.
[7] Schnitkey, Gary. "Fertilizer Prices higher for 2019 Crop." *Farmdoc Daily*. University of Illinois. September 25, 2018.

Figure 22: Modal Share of Fertilizers, 2017



Source: State of the Industry 2018. *The Fertilizer Institute*. 2018.

Anecdotally, it appears that the shipping radius for fertilizer from a barge terminal may depend on crops available for backhaul to the terminal. In the case of a Mississippi River terminal in Missouri, 50 miles was noted as the most efficient trucking distance for fertilizer without cargo to backhaul. Backhauling corn would expand the trucking radius for fertilizers to 80 or 90 miles, and backhauling more valuable soybeans allowed for expanded trucking distances to about 140 miles.[8] One complicating factor of this backhaul-based system is the fact that outbound crop shipments are often seasonal, and may not occur at the same time as inbound fertilizer shipments. Travel time to and from a fertilizer dealer or distributor can also be a critical factor, as most trucking of fertilizers occurs in spring, prior to planting, with relatively little truck transportation needed for the rest of the year.[9] With a limited planting window each spring, large volumes of fertilizer must be trucked out in a short amount of time. These general trucking distances for fertilizer align with transportation data from The Fertilizer Institute, whose members make up about half of the United States' fertilizer manufacturing capacity. Among these members, the median truck distances for shipments over the past three years ranged between 125 and 185 miles.

Table 11: Nationwide Fertilizer Trucking Distances (in Miles)

Fertilizer Type	2015	2016	2017	Average	Median
Anhydrous Ammonia	156	159	117	144	156
Other Nitrogen	121	240	177	179	177
Phosphatic	181	389	185	252	185
Potassium	168	185	104	152	168
Other	125	208	122	152	125

Source: State of Industry 2018. The Fertilizer Institute. 2018.

[8] Truck, Rail or Barge Delivery… It's a Matter of Miles. *Ag Professional.* April 17, 2011.
[9] State of the Industry 2018. *The Fertilizer Institute*. 2018.

While the market area for this study has been set at 75 miles, it is important to keep in mind that the ultimate market area for a fertilizer terminal at the site could be larger if sufficient backhaul is available at the right time. However, that expanded market area also means that existing terminals in Clinton or La Crosse could also compete with a new terminal in Dubuque over large areas of Iowa, Illinois, and Wisconsin.

5.2.3 Facilities Profile

Within the immediate study area, there are at least 4 barge terminals that handle the transshipment of fertilizer or dry bulk materials to trucks for further distribution in the region. Table 12 provides a list of these facilities, and Figure 23 illustrates their distribution in the region, along with agricultural activity.

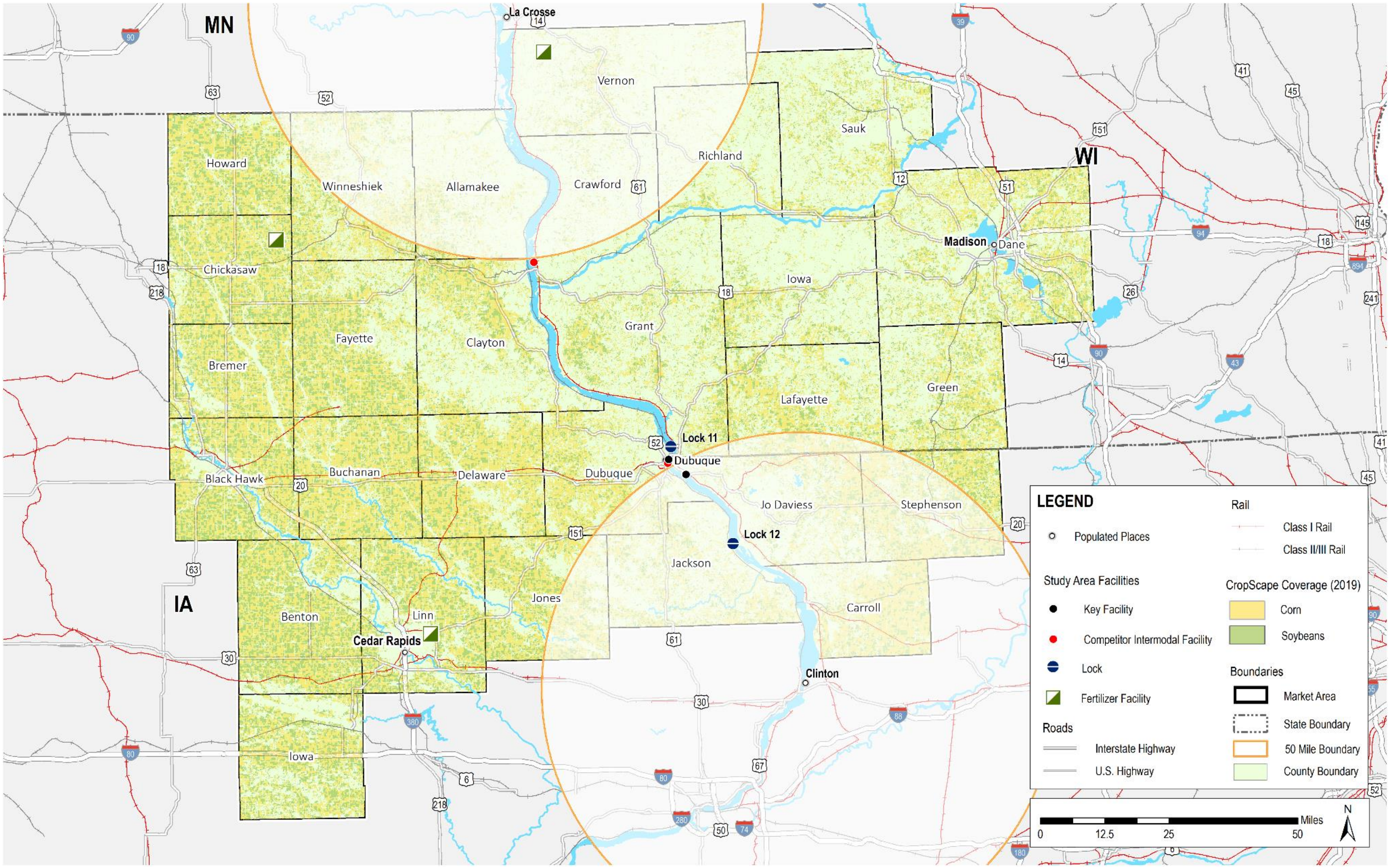
Table 12: Fertilizer Transload Facilities

Facility Name	Location	Connections	Relevant Commodities Handled
Prairie Sand and Gravel	Prairie du Chien, WI	Barge	Dry Bulk
Gavilon	Dubuque, IA	Barge, Rail	Fertilizer, Dry Bulk
Dubuque River Terminal	Dubuque, IA	Barge, Rail	Fertilizer, Dry Bulk
Logistics Park Dubuque	Dubuque, IA	Barge, Rail	Fertilizer, Dry Bulk

Source: CPCS Transcom analysis of National Transportation Atlas Data, US Army Corps of Engineers Master Dock Plus, and Google Earth.

In addition to these transloading facilities, the distribution of fertilizer products is supported by a network of facilities owned by major fertilizer companies as well as local businesses such as farmers' co-operatives. These specialized transload and distribution points are not shown.

Figure 23: Fertilizer-Handling Transload Facilities in the Market Area

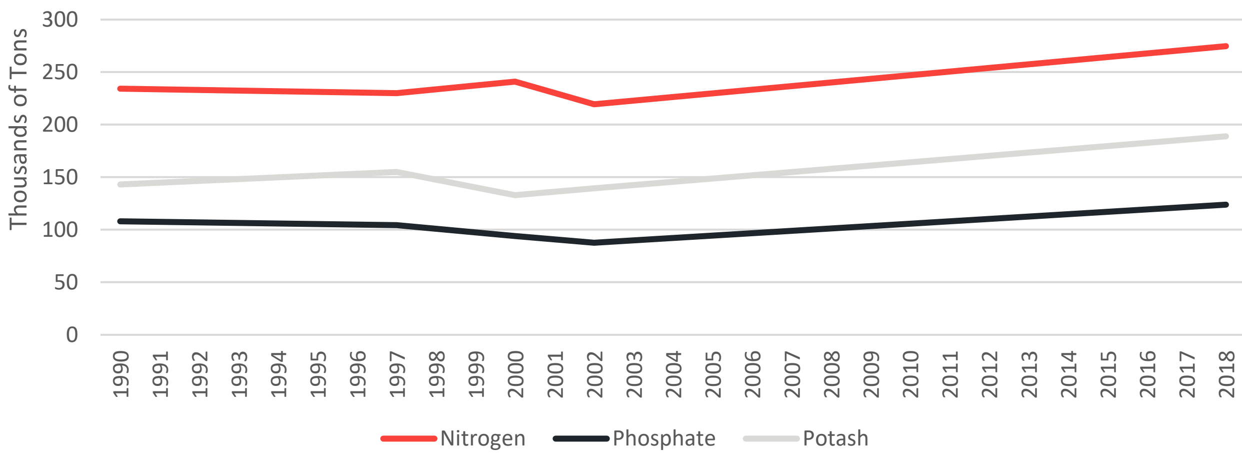


Source: CPCS Transcom analysis of USACE Master Dock Plus, National Transportation Atlas Data, and USDA CropScape.

5.2.4 Related Economic Activity

Based on USDA annual records on the percentage of crop acreage receiving fertilizer, the average amount of fertilizer applied per acre, and the total acreage of crops planted, longer-term estimates of fertilizer use can be created. The volume of fertilizer used in the market area increased by about 21 percent in the past 30 years. Figure 24 shows the estimated nitrogen, phosphate, and potash use in the market area from 1990 to 2018. Much of this increase has been driven by increased fertilizer consumption in Iowa's portion of the market area, particularly for corn farming. Table 13 lists the fertilizer consumption associated with each crop.

Figure 24: Estimated Fertilizer Application for Corn and Soybeans Planted in Market Area



Source: CPCS Transcom analysis of USDA Agricultural Survey data. 2019.

Table 13: Estimated 2018 Fertilizer Use in Market Area

Crop	Acres Cultivated	Nitrogen (Tons)	Phosphate (Tons)	Potash (Tons)
Corn	3,449,963	270,588	108,106	136,458
Soybeans	1,853,836	4,131	15,763	52,447
	TOTAL	274,719	123,869	188,905

Source: CPCS Transcom analysis of USDA CropScape and National Agricultural Statistics Service Data. 2019.

In the eight-county area around Dubuque (Carroll, Jo Daviess, Stephenson, and Whiteside counties in Illinois, and Clinton, Delaware, Dubuque, and Jackson counties in Iowa), fertilizers are the second-leading commodity group moving in the region (by tonnage), with the majority of fertilizer tonnage (63 percent) moving by rail. However, only 0.2 percent of this eight-county region's fertilizer tonnage moved by water. This relatively low share water-borne tonnage relative to rail may be due to the fact that the eight-county area sources fertilizers from a wide range of states that do not border the Mississippi River.

This eight-county area does not directly correlate for the market area in this study but provides some insight into the volume and modal share of fertilizer moving into, out of, and through the Dubuque area. A large volume of fertilizer is outbound from the area, particularly because Jo Daviess County is home to a large nitrogen fertilizer production plant.

Table 14: Fertilizer Tonnage and Value, 2014

		Eight County Region Direction			
Measure	State-to-State Mode	Inbound	Internal	Outbound	Grand Total
Tons 2014	Truck - FAF	942,515	195,602	3,068,427	4,206,544
	Rail - FAF	1,153,566	397,034	5,688,990	7,239,590
	Multiple - FAF	44,869	227	2,998	48,094
	Water - FAF	21,979		815	22,794
	Total	2,162,929	592,863	8,761,230	11,517,022
Value 2014 (USD)	Truck - FAF	448,404,356	80,554,774	1,320,773,154	1,849,732,283
	Rail - FAF	170,925,632	18,533,498	279,068,750	468,527,880
	Multiple - FAF	21,390,432	106,975	1,426,232	22,923,640
	Water - FAF	11,846,420		340,471	12,186,891
	Total	652,566,839	99,195,247	1,601,608,607	2,353,370,694

Source: WSP Analysis of FHWA Freight Analysis Framework version 4 (FAF4) data for the Eight County Freight Study.

In addition to the transloading terminals and the large fertilizer manufacturing plant in East Dubuque, a scan of business information from ReferenceUSA identified three additional businesses with 50+ employees engaged in fertilizer production or mixing. These facilities are listed in Table 15 and shown in Figure 23.

Table 15: Additional Fertilizer Facilities

Name	Location	Industry
Chaseburg Farmers Union Co-Op	Chaseburg, WI	Fertilizer Manufacturing
Ag Vantage Farm Service	Marion, IA	Fertilizer Mixing
Cash Inc.	Lawler, IA	Fertilizer Manufacturing

Source: ReferenceUSA. 2019.

5.2.5 Summary, Inbound Fertilizer

Like grain, the outlook for fertilizer appears to be mixed. Relative to outbound grain, the barge terminal's market area for fertilizer is potentially larger than what was presented in this snapshot. However, that expanded market area also means that a greater share of a Dubuque terminal's market area would also lie within the competitive range of existing facilities in Clinton and La Crosse. Currently, very little fertilizer appears to be moving into the general area by barge, which could indicate opportunities for modal shift to barge, but only if fertilizer will be sourced from terminals on the Mississippi or Ohio River systems. Fertilizer being sourced from other regions is still likely to travel by rail, given its higher value, and the fact that shifting from rail to barge would increase shipping costs.

Note that in reviewing the various sources of volume and capacity data for fertilizer, some potential discrepancies were identified, and these will be addressed as part of the larger Task 3 Market Analysis.

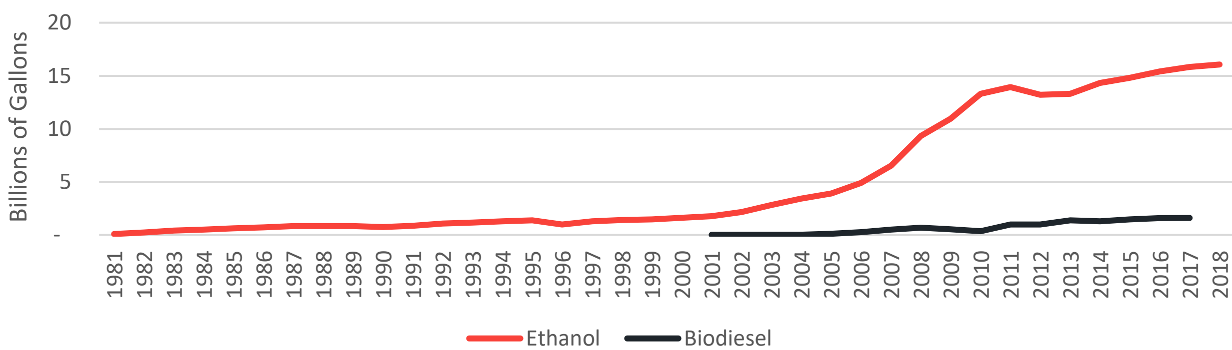
5.3 OUTBOUND BIOFUEL AND DDG

5.3.1 Commodity Trends

(1) Biofuel Trends

Over the past 20 years, biofuels have emerged as a major agricultural product, and the production of these fuels is concentrated in the Midwest. Iowa is the top producer of ethanol in the United States, with Illinois 3rd, and Wisconsin 9th. In particular, Iowa has 41 ethanol plants capable of producing a total 4 billion gallons each year, making up 19 percent of the United States' production capacity. By comparison, Illinois' 13 plants are capable of producing about 1.9 billion gallons per year.[10] Figure 25 shows how ethanol and biodiesel production grew rapidly after 2000, but growth in production is slowing. Ethanol's slowing growth is largely due to the fact that US gasoline consumption has been flattening, which translates to flattening demand for ethanol as a gasoline fuel additive.

Figure 25: US Biofuel Production



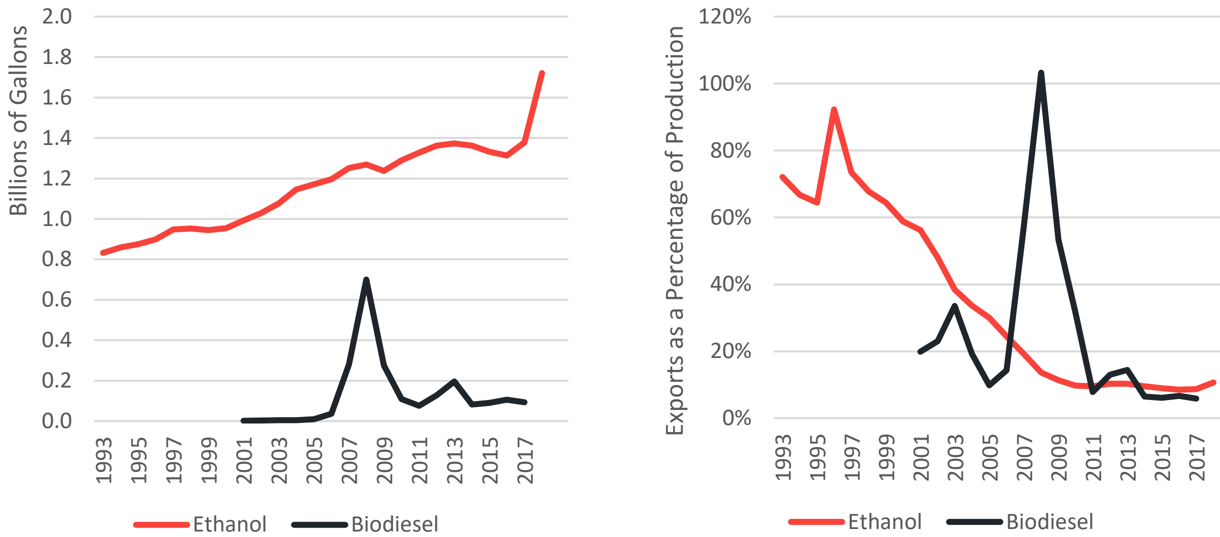
Source: USDA Economic Research Service. Note: 2018 biofuel production data is unavailable.

A small portion of these biofuel products is exported to foreign markets, particularly overseas to countries including Brazil, India, and China. These exports are important to consider because New Orleans is an export point for 21 percent of US ethanol exports, and has direct connections to the Mississippi River. However, Texas ports with substantial petrochemical terminals

[10] US Energy Information Administration

represent the majority of export activity, with Houston, Galveston, and Port Arthur making up 52 percent of the US biofuel export tonnage.[11] Figure 26 shows how overall export tonnage has changed over time. While the volume of exports has grown over time, the share of production exported has declined since the 1990s, thanks to increasing domestic use of biofuels.

Figure 26: Ethanol and Biodiesel Exports (Left) and Exports as a Share of Total Production (Right)

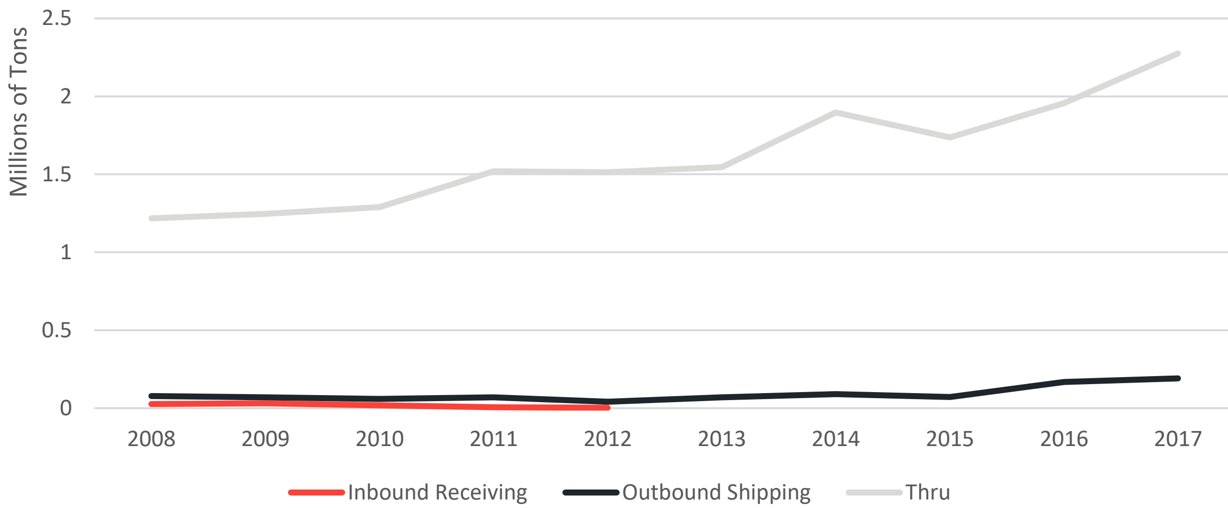


Source: USDA Economic Research Service. Note: some imported biodiesel is re-exported, and in 2008, biodiesel exports (including re-exports of imports) exceeded domestic production.

The USACE does not provide data on the specific tonnage of ethanol or biodiesel moving on the Mississippi River. Instead, these products are classified under a broader category of "alcohols." Based on statistics for "alcohols," increasing volumes of biofuels are shipped on the Upper Mississippi River.

[11] 2018 US Ethanol Exports and Imports Statistical Summary. Renewable Fuels Association, 2019.

Figure 27: Shipments of Alcohols (including ethanol and biodiesel) on the Upper Mississippi River

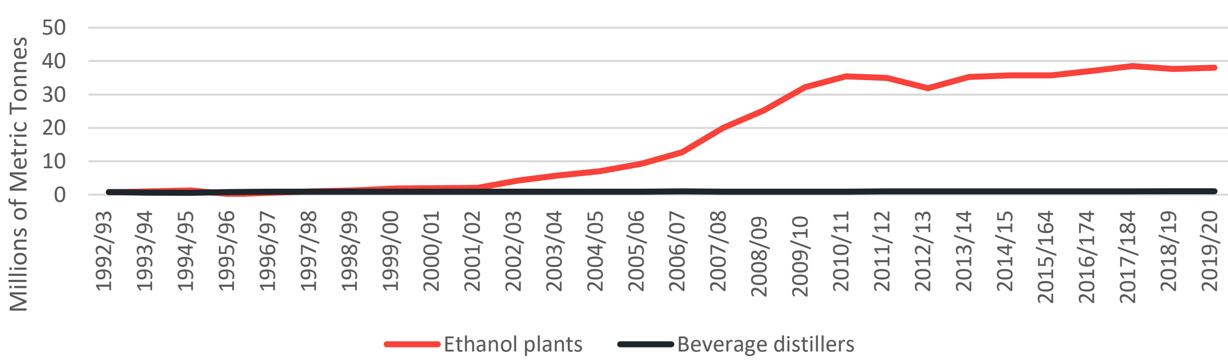


Source: CPCS analysis of USACE Waterborne Commerce Statistics.

(2) DDG Trends

Distiller's Dried Grains (DDG) is a by-product of distillation processes, and nearly all of the United States' DDG production is associated with dry-milled ethanol production. Thanks to its relatively high nutritional content and relatively low cost, DDG has become an important feed input for the livestock industry. DDG production rapidly increased during the mid- to late-2000s as new ethanol plants were constructed, and production has leveled off around 40 million metric tons per year. Figure 28 illustrates this rapid growth in ethanol-related DDG production over the past 20 years.

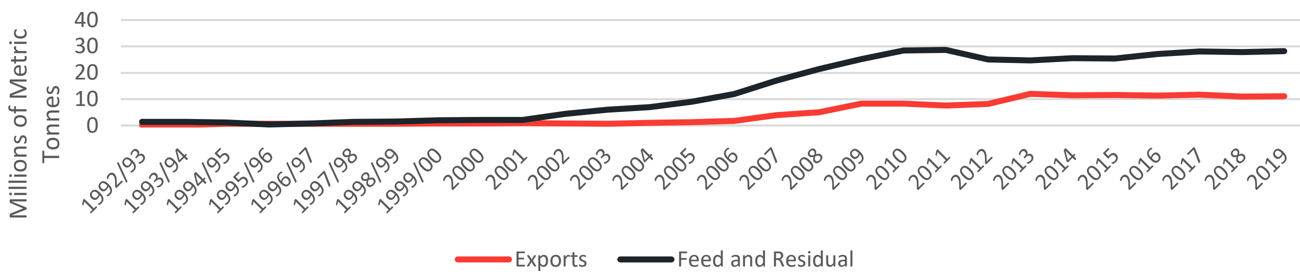
Figure 28: Distillers Dried Grains Production, by Marketing Year



Source: USDA Economic Research Service.

Most of the DDG produced in the United States is used for animal feed and about one-third is exported to foreign markets including Mexico, Asia, and Europe. Figure 29 illustrates how DDG exports grew throughout the 2000s, but have remained relatively flat since 2013. This export trend is important because, as noted, a major maritime export point for DDG is New Orleans.[12]

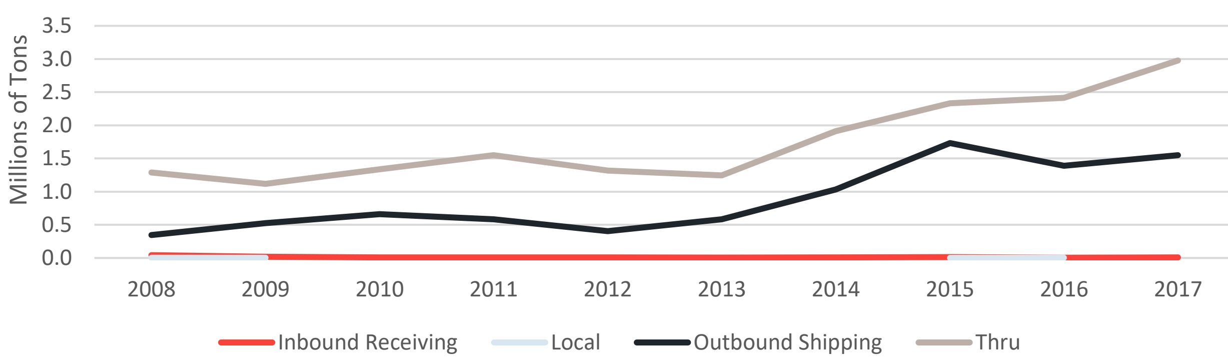
Figure 29: DDG Exports and Domestic Consumption by Year



Source: USDA Economic Research Service Bioenergy Statistics. 2019.

USACE Waterborne Commerce Statistics data does not provide a separate classification solely for DDG. DDG can be classified as animal feed, milled products, or processed grains, so DDG-specific movements on the Mississippi River cannot be isolated. Figure 30 provides an overview of these potentially-relevant animal feed and grain product movements on the Mississippi River over the past 10 years.

Figure 30: Animal Feed Preparations and Milled Grain Products Transported on the Upper Mississippi River



Source: CPCS analysis of USACE Waterborne Commerce Statistics.

5.3.2 Transportation Profile

(1) Ethanol and Biodiesel

An estimated 10 percent of ethanol is moved by barge, with rail capturing between 60 and 70 percent of ethanol tonnage, and trucks capturing the remainder.[13] This modal share breakdown

[12] Fatka, Jacqui. Distillers Grain Exports at Near-Record Levels in 2018. Feedstuffs. March 8, 2019.
[13] Ethanol Transportation Backgrounder. USDA. 2007.

reflects the fact that the majority of the ethanol produced in the United States is consumed domestically, and areas of higher fuel consumption, particularly the east and west coasts do not have direct barge access. Therefore, shipping ethanol by unit train is a more feasible option. Additionally, relatively few ethanol refineries are located adjacent to the Upper Mississippi River.

(2) Distillers Dried Grains

The price of DDG is relatively low and is currently between $120-140 per ton for Iowa and $155-163 per ton in Chicago. This relatively low value means that DDG, like grains, cannot be affordably shipped long distances by truck. Previous research by the USDA found that wet distiller's grains traveled an average of 61 miles from ethanol plants to feedlots, and the average length of haul for DDG was longer, about 80 miles. It is important to note that these estimates are for truck shipments from ethanol plants to end-use feedlots, not plant to transfer point. Additional transportation costs are incurred when moving between modes, adding to overall shipment costs. Therefore, the true average trucking distance between ethanol plants and transshipment terminals is likely to be lower.

Rail and barge are preferred for the movement of DDG over longer distances. Unlike grain and fertilizer shipments, which are concentrated during certain seasons, DDG shipments are more predictable and consistent across the year. In particular, this regularity combined with high volumes produced by ethanol plants makes DDS a favorable commodity for long-distance unit train shipment, as railroads can be guaranteed regular blocks of cars. The DDG production (and equivalent railcar- and barge-loads) of relevant facilities in the market area is described in detail further below.

5.3.3 Facilities Profile

Within the immediate study area, there is one barge terminal that handles liquid bulk and which could be relevant to biofuels, as well as four terminals that handle dry bulk, and which could be relevant to DDGs. It is unlikely that any of these facilities are currently handling biofuels or DDGs because all biofuel plants in the region already have rail access. Existing biofuel plants are described in the following section.

Table 16: Ethanol or Biodiesel Transload Facilities

Facility Name	Location	Connections	Relevant Commodities Handled
Flint Hills Resources	Dubuque, IA	Barge, Rail	Liquid Bulk

Source: CPCS Transcom analysis of National Transportation Atlas Data, US Army Corps of Engineers Master Dock Plus, and Google Earth.

Table 17: DDG Transload Facilities

Facility Name	Location	Connections	Relevant Commodities Handled
Prairie Sand and Gravel	Prairie du Chien, WI	Barge	Dry Bulk
Gavilon	Dubuque, IA	Barge, Rail	Dry Bulk
Dubuque River Terminal	Dubuque, IA	Barge, Rail	Dry Bulk
Logistics Park Dubuque	Dubuque, IA	Barge, Rail	Dry Bulk

Source: CPCS Transcom analysis of National Transportation Atlas Data, US Army Corps of Engineers Master Dock Plus, and Google Earth.

5.3.4 Related Economic Activity

There are two biodiesel and seven ethanol production facilities in the market area. Together, these plants produce an estimated 50 million gallons of biodiesel, at least 895 million of ethanol, and at least 1.2 million tons of DDG. These facilities are listed in Table 18 and Table 19 shown in Figure 31.

Table 18: Biodiesel Refineries in Market Area

Facility Name	Location	Annual Production (gallons)	Rail Connections
Western Dubuque Biodiesel	Dubuque, IA	30m	CN
REG Madison	DeForest, WI	20m	CP

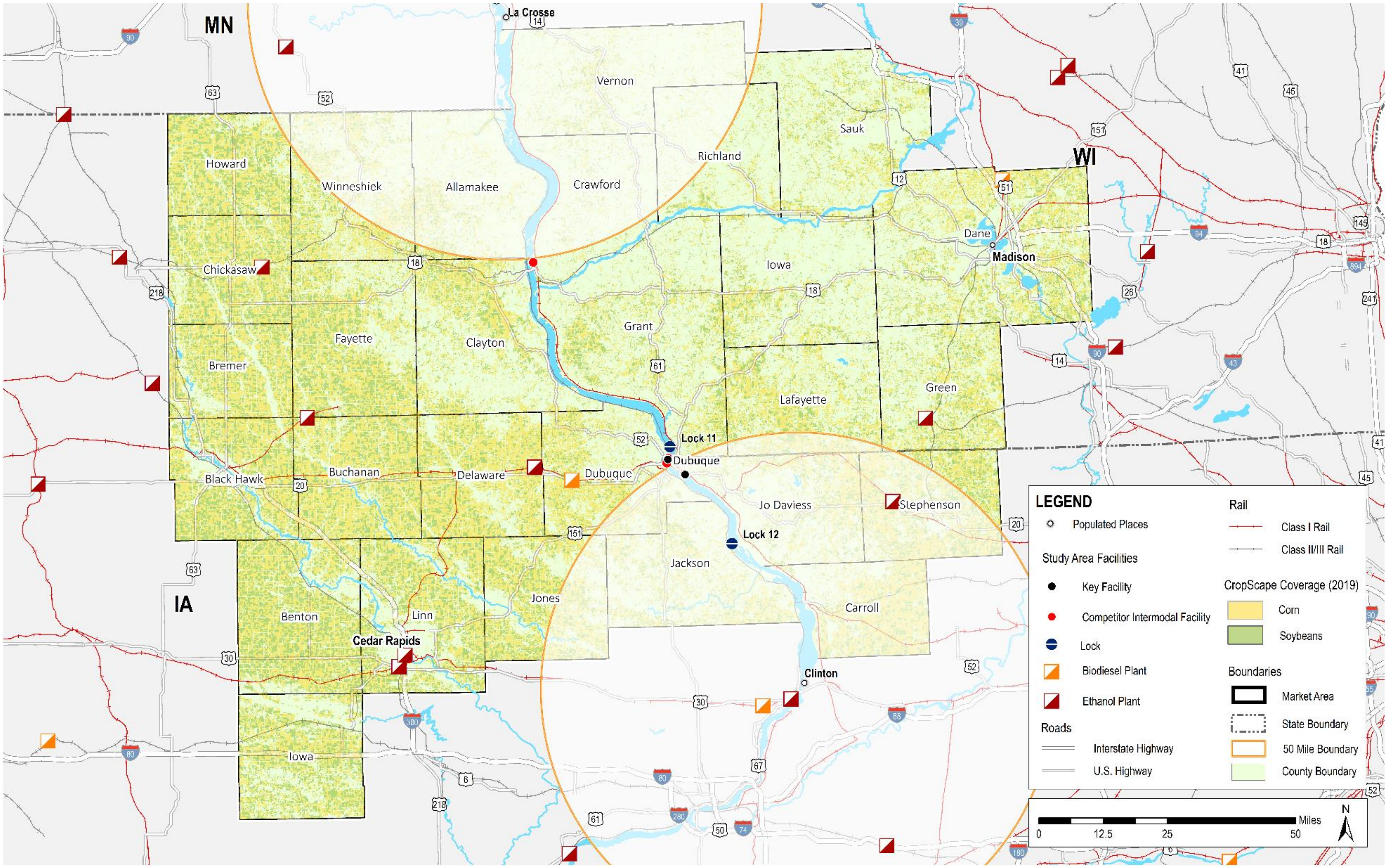
Source: National Renewable Energy Laboratory Biofuels Atlas.

Table 19: Ethanol and DDG Producers in Market Area

Facility Name	Location	Annual Ethanol Production (gallons)	Annual DDG Production (tons)	Rail Connections
Big River Resources	Dyersville, IA	110m	350,000	CP (DM&E)
Flint Hills Resources	Fairbank, IA	120m	350,000	DWRV, IANR
Homeland Energy	Lawler, IA	200m	315,000	CP (DM&E)
Ingredion	Cedar Rapids	45m	N/A	UP, CN
ADM	Cedar Rapids	275m	N/A	UP, CN
Adkins Energy	Lena, IL	60m	100,000	CN
Badger State Ethanol	Monroe, WI	85m	128,000	WSOR

Source: National Renewable Energy Laboratory Biofuels Atlas.

Figure 31: Biofuel and DDG Production Sites and Transload Terminals



Source: CPCS Transcom analysis of USACE Master Dock Plus, National Transportation Atlas Data, and Renewable Energy Atlas.

Production capacity can be difficult to visualize. Table 20 lists the equivalent weekly truckloads, railcar loads, and barge loads that each facility would produce if it operated at full capacity year-round. Most facilities produce enough DDG to fill a unit train each week, or the equivalent of 4-5 1,500 ton barges each week.

Table 20: DDG Production Capacity

Facility Name	DDG Capacity (tons)	Weekly Production (tons)	Truckloads	Oversize Truckloads	Railcar Hopper	Jumbo Hopper	1,500 Ton Barges
Big River Resources	350,000	6,730.8	169	113	94	68	4.5
Flint Hills Resources	350,000	6,730.8	169	113	94	68	4.5
Homeland Energy Solutions	315,000	6,057.7	182	101	85	61	4.0
Adkins Energy	100,000	1,923.1	49	33	27	20	1.3
Badger State Ethanol	300,000	5,769.2	145	97	81	58	3.8

Source: Source of vehicle capacities: Dooley, Frank and Bobby Martens. Using Distillers Grains in the International Livestock and Poultry Industries. Iowa State University. 2010.

5.3.5 Summary, Biofuels and DDG

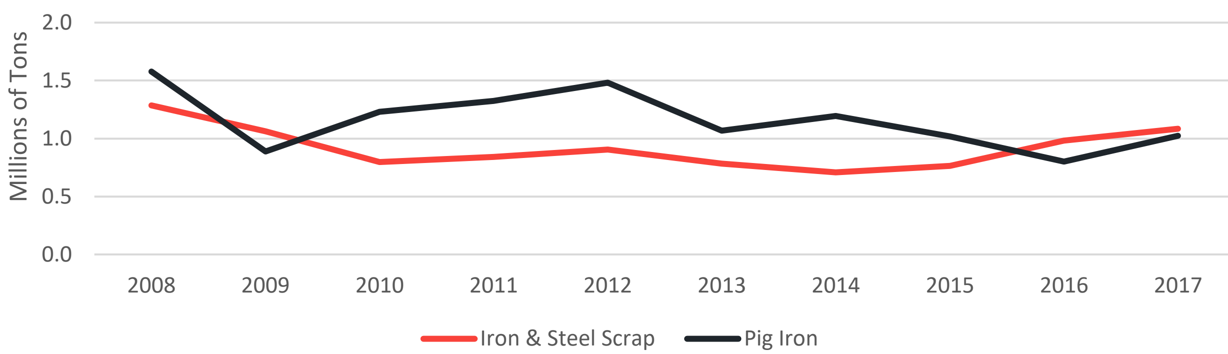
While large volumes of biofuels and DDG are produced in the market area, all of the production facilities have unit train rail access. Therefore, it may be difficult to attract traffic from these established rail connections. Based on their proximity to Dubuque, the Big River refinery in Dubuque, Flint Hills Resources, and Homeland Energy solutions refineries in Iowa may be the most likely facilities to consider utilizing barge service.

5.4 INBOUND METAL

5.4.1 Commodity Trends

Iron and steel are valuable inputs to many manufacturing industries, particularly those associated with vehicle manufacturing, appliance manufacturing, and construction. Given the heavy weight of metal products, and the placement of steel mills on portions of the Mississippi and Ohio Rivers, some steel is carried by barge throughout the inland river system. The majority of the metal moving on the Upper Mississippi River, north of St. Louis, is scrap and pig iron used as inputs into other metal production processes. Figure 32 shows how this metal tonnage has changed over time.

Figure 32: Scrap and Pig Iron Tonnages Moved on the Upper Mississippi River



Source: CPCS analysis of USACE Waterborne Commerce Statistics.

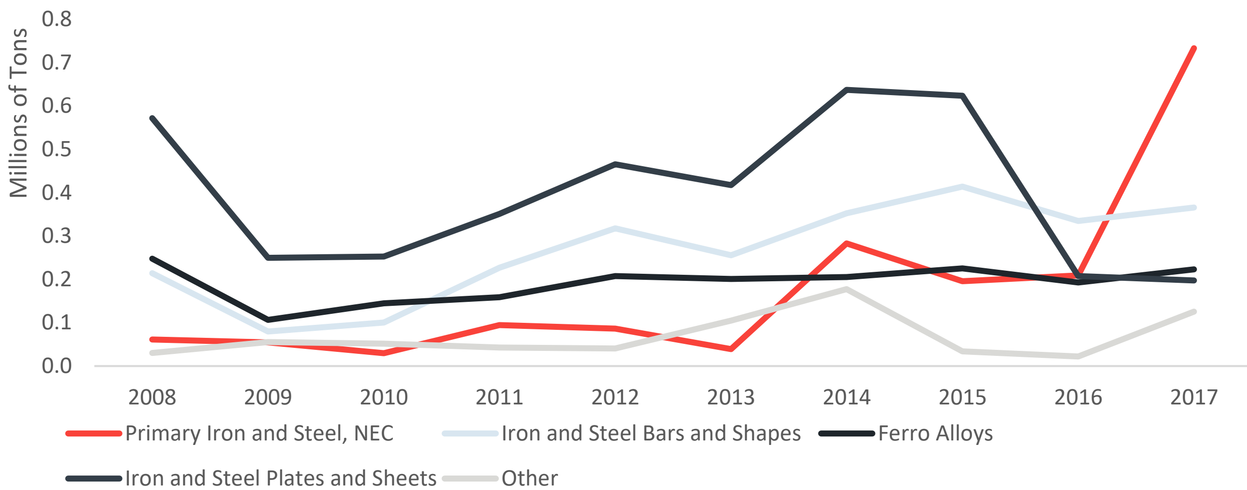
Over the past ten years, the volume of scrap and pig iron moving on the system has declined; about 15 percent less scrap, and 35 percent less pig iron was moved in 2017 relative to 2008. Potential reasons for this change could include the closure of existing mills or foundries on the Upper Mississippi River or reduced demand for these materials elsewhere in the United States. These changes in tonnage are less-relevant to the Dubuque area because the nearest steel production facility is located outside of the market area, in Muscatine.[14]

By comparison, much smaller volumes of primary metals intended for input into value-added manufacturing processes are moved on the system. These primary metals include bars, shapes, plates, and sheets of metal. This difference in tonnage from scrap and pig iron may be due to the relatively higher value of primary metals, which makes it more feasible to transport these goods by truck or rail. Additionally, unlike large steel mills located on the river, which can source scrap and pig iron directly by barge, manufacturers utilizing primary metals may be located further inland, where direct truck and rail transportation would make more sense, rather than transloading primary metal from barges. Figure 33 illustrates the tonnage of primary metals

[14] American Iron and Steel Institute. 2019.

moved on the Upper Mississippi River north of St. Louis. The "other" category includes aluminum, iron and steel pipe and tube, and iron and steel primary forms.

Figure 33: Primary Metal Tonnages Moved on the Upper Mississippi River



Source: CPCS analysis of USACE Waterborne Commerce Statistics.

Unlike raw metal manufacturing inputs, the tonnage of primary metal moving on the Upper Mississippi has generally increased since a low point in 2009. However, the volume of each of these primary metals is still much lower than scrap or pig iron. Relevant firms within a potential Dubuque facility's market area are discussed in a later section of this snapshot.

5.4.2 Transportation Profile

Scrap metal and pig iron are bulky, relatively low in value, and often consumed in large amounts, which means that transportation costs can affect the end-user price of these materials, and barge shipping may be preferred when river access is available. By comparison, primary metals have undergone value-added processing, and have a higher value per ton. As a result, these materials may be more likely to ship via truck or rail, particularly if their end-users do not have connections to inland waterways, or do not consume steel in volumes large enough to support barge-sized shipments.

5.4.3 Facilities Profile

Within the immediate study area, there are three barge terminals that indicate they handle metals, and these facilities are listed in Table 21. In addition to these particular sites, it is possible there may be other terminals with the capability of handling inbound metal, assuming adequate storage space and lifting equipment is available. Two of these three terminals are within the same river pool as Dubuque, which means that a new barge terminal with metal handling capacity could face significant competition from existing terminals. These terminals are mapped in Table 21.

Table 21: Terminals for Inbound Metals

Facility Name	Location	Connections
Prairie Sand and Gravel	Prairie Du Chien, WI	Barge
Dubuque River Terminal	Dubuque, IA	Barge, Rail
Logistics Park Dubuque	East Dubuque, IL	Barge, Rail

Source: CPCS Transcom analysis of National Transportation Atlas Data, US Army Corps of Engineers Master Dock Plus, and Google Earth.

5.4.4 Related Economic Activity

Within the 26-county market area, there are 130 firms that may utilize metals as part of their manufacturing processes, and the locations of these firms are shown in Figure 34. To be included in the map, these 130 firms must have had at least one of the classifications shown in Table 22 and Table 23 listed as their "primary" industry. For the purposes of this project, firms are broken into two categories: firms using "primary" metals to produce shapes or components used in other manufacturing processes, and firms using these "secondary" metal products to produce more-finished goods.

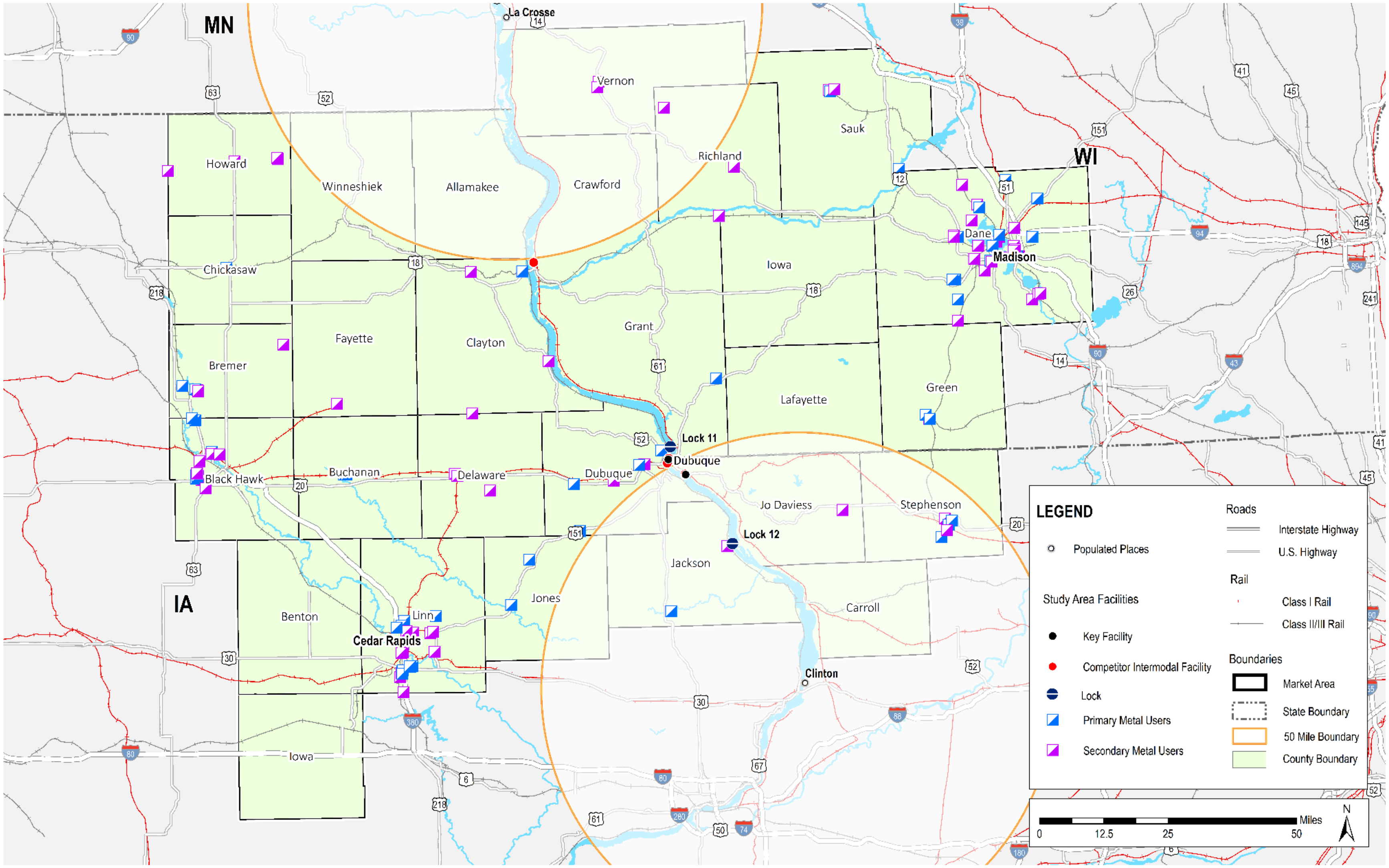
Table 22: Industries Using Primary Metals to Produce Secondary Metals or Products

NAICS Code	Industry Description
3321	Forging and Stamping
3322	Cutlery and Handtool Manufacturing
3323	Architectural and Structural Metals Manufacturing
3324	Boiler, Tank, and Shipping Container Manufacturing
3325	Hardware Manufacturing
3326	Spring and Wire Product Manufacturing
3327	Machine Shops
3328	Coating, Engraving, Heat Treating, and Allied Activities
3329	Other Fabricated Metal Product Manufacturing

Table 23: Industries Using Secondary Metals to Produce Finished Goods

NAICS Code	Industry Description
3331	Agriculture, Construction, and Mining Machinery Manufacturing
3332	Industrial Machinery Manufacturing
3333	Commercial and Service Industry Machinery Manufacturing
3334	Ventilation and HVAC Machinery Manufacturing
3335	Metalworking Machinery Manufacturing
3336	Engine, Turbine, and Power Transmission Equipment Manufacturing
3339	Other General Purpose Machinery Manufacturing
3361	Motor Vehicle Manufacturing
3362	Motor Vehicle Body and Trailer Manufacturing
3363	Motor Vehicle Parts Manufacturing
3364	Aerospace Product and Parts Manufacturing
3365	Railroad Rolling Stock Manufacturing
3366	Ship and Boat Building
3369	Other Transportation Equipment Manufacturing

Figure 34: Manufacturing Firms Utilizing Metals and Transloading Points



Source: CPCS Transcom analysis of USACE Master Dock Plus, National Transportation Atlas Data, and ReferenceUSA.

Very few of these firms are located in Dubuque or Jo Daviess County, but many are located in metropolitan areas with interstate connections, as well as rail connections. These firms may be unwilling to disrupt their supply chains or shipper relations to utilize a terminal in Dubuque unless the terminal can promise significant cost savings over their current operations. Notable potential users in the Dubuque area could include:

- AY McDonald Manufacturing in Dubuque, a producer of plumbing fixtures,
- Dubuque Screw Products, or
- Dubuque Stamping and Manufacturing.

5.4.5 Summary, Inbound Metal

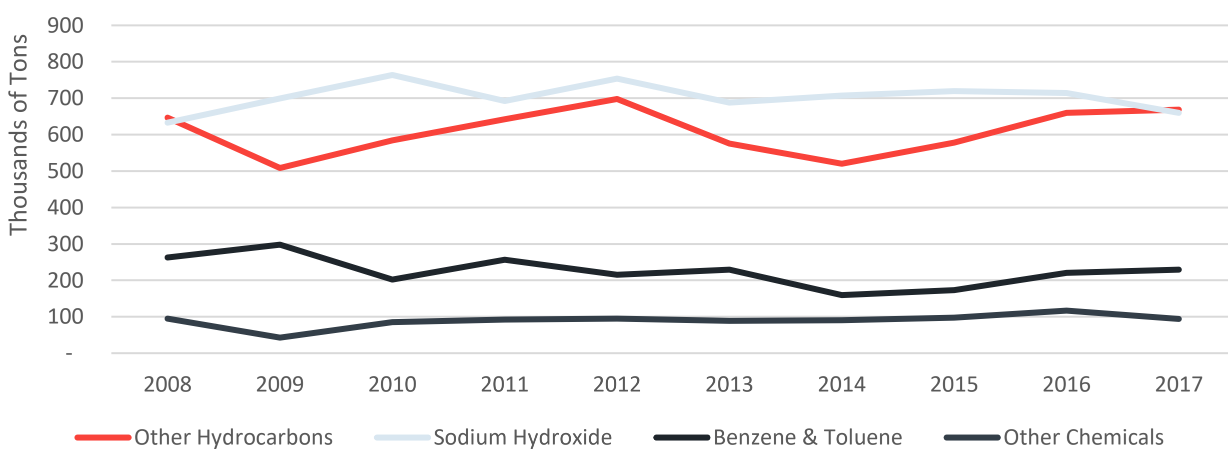
Given the dispersed geographic distribution of metal-using manufacturing firms away from Dubuque, and the presence of two terminals already handling inbound metals, there may be little demand for additional barge service of metal products in the market area. A potential strategy for the development of metal-related barge service could be the creation or attraction of a metal distribution capable of serving multiple businesses in the market area, as aggregate demand could make barge shipping more feasible or regular.

5.5 INBOUND CHEMICALS

5.5.1 Commodity Trends

Like iron and steel, chemical products can be an input to many manufacturing processes. In the case of chemical manufacturing, some "feedstock" chemicals used as primary ingredients in further manufacturing processes may move in volumes large enough to make barge transportation feasible. For example, on the Upper Mississippi River, sodium hydroxide, benzene, and toluene are some of the most commonly-moved chemicals, and these materials are used as feedstock for many other chemical manufacturing processes. Figure 35 illustrates the tonnages of common chemical feedstocks moving on the Upper Mississippi, upstream of St. Louis. The "other hydrocarbons" category excludes unrefined petroleum or distilled petroleum such as gasoline, diesel, natural gas, or kerosene, and refers to chemical feedstocks derived from hydrocarbons. The "other chemicals" category includes lesser-shipped chemicals such as carboxylic acid, chemical additives, and other chemicals not elsewhere classified in USACE data.

Figure 35: Common Chemicals Moving on the Upper Mississippi River

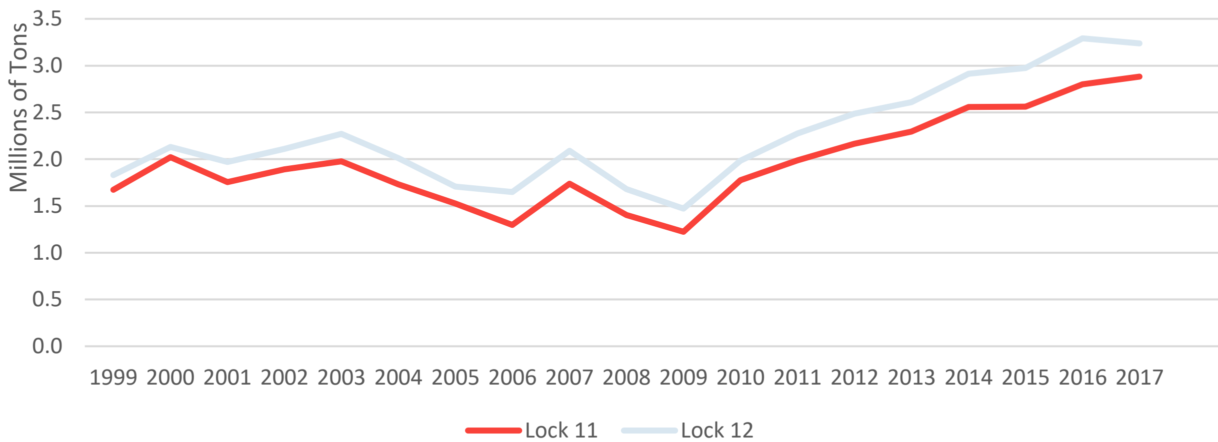


Source: US Army Corps of Engineers Waterborne Commerce Statistics. 2018.

Over the past ten years, the volume of these chemical products moving on the system has remained relatively steady, fluctuating between about 1.5 and 1.7 million tons per year. The majority of these overall chemical shipments (78 percent) are listed in USACE data as "through" shipments with no inbound or outbound information available. However, based on the characteristics of US chemical production, with major hydrocarbon (including benzene), sodium hydroxide production facilities located in Texas and Louisiana, it is likely that shipments flagged as "through" movements in the USACE data are likely traveling upstream and inbound to ports in the Upper Mississippi system.

In the Dubuque area specifically, the volume of chemicals moving through Lock 11 (immediately upstream of Dubuque), and Lock 12 (downstream of Dubuque) has been increasing since 2009. Figure 36 illustrates this trend over the past 20 years. It is important to note that this measure of chemical tonnage includes goods like fertilizers, which far surpass chemical feedstocks in terms of tonnage moved. Also, the Dubuque area is home to a fertilizer manufacturing facility operated by CVR Energy, which likely accounts for most of the tonnage change between Locks 11 and 12.

Figure 36: Chemicals Moving through Dubuque's Locks



Source: US Army Corps of Engineers Waterborne Commerce Statistics. 2018.

5.5.2 Transportation Profile

The transportation profile of chemicals can vary widely based on their value. Low-value bulk chemical feedstocks may travel by rail or barge, but high-value or highly-concentrated manufactured chemical products such as pesticides, soaps, or paints are valuable enough to travel relatively long distances by truck. Since this project is focused on chemicals that may be eligible for barge movement, it will focus on chemical products with lower value and larger volume. Feedstock chemicals may be shipped in either liquid bulk or dry bulk form, depending on their characteristics.

5.5.3 Facilities Profile

Within the immediate study area, there are at least 5 barge terminals that handle the transshipment of liquid or dry bulk materials to trucks or rail for further distribution in the region. Table 24 provides a list of these facilities, and Figure 37 illustrates their distribution in the region.

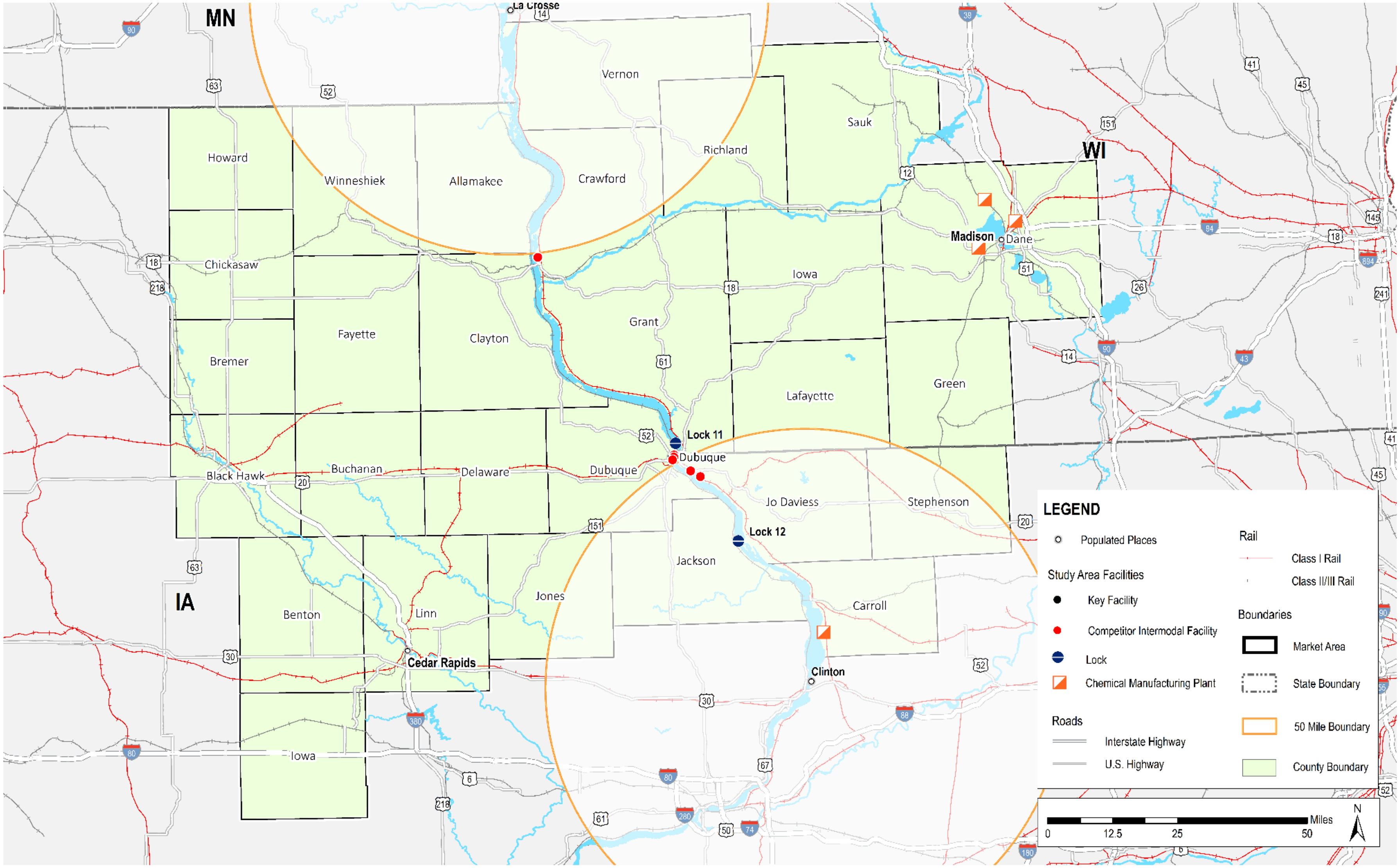
Table 24: Chemical Transload Facilities

Facility Name	Location	Connections	Relevant Commodities Handled
Flint Hills Resources	Dubuque, IA	Barge, Rail	Petroleum
Gavilon	Dubuque, IA	Barge, Rail	Fertilizer, Other Dry Bulk
Dubuque River Terminal	Dubuque, IA	Barge, Rail	Fertilizer, Metals, Other Liquid Bulk
Logistics Park Dubuque	East Dubuque, IL	Barge, Rail	Fertilizer, Metals, Other Dry Bulk
CVR Energy	East Dubuque, IL	Barge, Rail	Fertilizer, Chemicals, Natural Gas

Source: CPCS Transcom analysis of National Transportation Atlas Data, US Army Corps of Engineers Master Dock Plus, and Google Earth.

It is important to note that dry and liquid bulk capabilities do not mean that terminals will be able or willing to accept incoming chemical shipments, depending on the chemical’s stability and associated health and fire hazards.

Figure 37: Potential Chemical-Handling Transload Facilities, and Users in the Market Area



Source: CPCS Transcom analysis of USACE Master Dock Plus, National Transportation Atlas Data, and ReferenceUSA.

5.5.4 Related Economic Activity

Within the 26-county market area, there are at least 5 major firms (employment greater than 50 people) that may utilize chemical feedstocks that are eligible for barge transportation. The location of these firms is shown in Figure 37 above, and a list is provided in Table 25. In addition to the firms on this list, CVE Energy's fertilizer plant in West Dubuque already has its own barge terminal and rail access.

Table 25: Major Chemical Producers in the 26-County Market Area

Name	Location	Primary Industrial Classification
Du Pont Nutrition & Health	Thomson, IL	Chemical Manufacturing
Bell Laboratories Inc	Madison, WI	Adhesive Manufacturing
Millipore Sigma	Madison, WI	Chemical Manufacturing
Motomco Limited	Madison, WI	Pesticide and Agricultural Chemical Manufacturing
Scientific Protein Labs	Waunakee, WI	Pesticide and Agricultural Chemical Manufacturing

Source: ReferenceUSA. 2019.

5.5.5 Summary, Inbound Chemicals

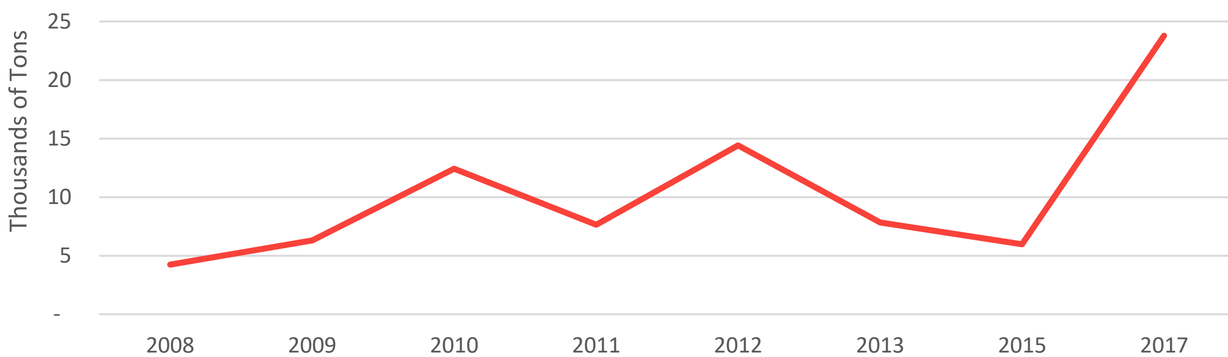
There are relatively few chemical manufacturing firms in the market area that would generate the demand sufficient to move chemicals by barge. Furthermore, most of these facilities are located far inland, adjacent to major rail and interstate corridors, making transloading chemicals from barge to truck less cost-effective. On the terminal side, the potential need for specialized handling equipment and protocols, as well as potential health and fire hazards associated with certain types of chemicals (such as corrosive properties associated with sodium hydroxide) may make barge terminals unwilling to handle chemicals in the first place. Given a relative lack of demand, and need for potentially-specialized handling equipment and practices, chemicals are a less-feasible option for a proposed barge facility.

5.6 INBOUND PLASTICS

5.6.1 Commodity Trends

Modern plastic products are molded from plastic resin (also referred to as plastic pellets), which can be handled as a dry bulk material, and which may be suitable for barge transportation. Over the last 10 years, the volume of plastic resin manufactured in the US increased about 15 percent, to nearly 120 billion pounds.[15] In 2017, Wisconsin accounted for about 2.6 percent of the United States' plastic production, Illinois produced about 4.4 percent, and Iowa accounted for less than 1 percent. In all three states, plastic-related business was focused on plastic production, the creation of usable plastic shapes from resin.[16] Despite this focus on plastic production, very little plastic or rubber moves on the Upper Mississippi River, with shipments failing to break 15,000 tons over the past 10 years, with the exception of 2017. For example, the 22-ton high point of shipment in 2017 would only fill 9-10 barges (by weight). Most of this plastic tonnage (2/3rds) was marked as "outbound" from the Upper Mississippi while the remainder was marked as movements "through" the river.

Figure 38: Tonnage of Plastic and Rubber Carried on the Upper Mississippi River



Source: CPCS analysis of USACE Waterborne Commerce Statistics.

5.6.2 Transportation Profile

While plastics manufacturing is a major industry in the United States, only about 10 percent of US plastic resin shipments are carried by water, with 53 percent of shipments traveling by truck, and 37 percent traveling by rail.[17] Reliance on trucking and rail reflects many plastic resins' relatively high value per ton. The price per pound of resin varies for "commodity" plastics widely based on the type of plastic, between 50 cents per pound and 150 cents per pound.[18] These

[15] American Chemistry Council. 2019.
[16] Plastics Industry Association. 2019.
[17] Plastic Resins in the United States. American Chemistry Council. 2013.
[18] Plastics News. 2019.

prices translate to roughly $1,000 to $3,000 per ton. Specialized plastics for higher-quality applications cost even more. At these price ranges, trucking is an affordable option for long-distance shipment, as is rail for large volumes. Additionally, the large volume of a barge would require that plastic producers using barge service either (1) stockpile large amounts of plastic when new barge loads arrive, or (2) consume very large volumes of plastic on a daily or weekly basis. In both cases, the cost savings of barge shipment would likely not be worth the hassle of stockpiling large volumes of pellets or waiting for longer shipping times relative to trucking or rail, which provide closer to just-in-time service.

5.6.3 Facilities Profile

Within the immediate study area, there are four barge terminals that indicate they handle dry bulk materials and these facilities are listed in Table 26 and mapped in Figure 39. Based on a web-based scan of promotional materials for these terminals, no terminal advertised that it currently handled plastic resins.

Table 26: Terminals for Inbound Plastic Pellets

Facility Name or Operator	Location	Transportation Connections	Relevant Commodities Handled
Prairie Sand and Gravel	Prairie du Chien, WI	Barge	Other Dry Bulk
Gavilon	Dubuque, IA	Barge, Rail	Fertilizer, Other Dry Bulk
Newt Marine Services Dubuque River Terminal	Dubuque, IA	Barge, Rail	Fertilizer, Metals, Other Liquid Bulk
Logistics Park Dubuque	East Dubuque, IL	Barge, Rail	Fertilizer, Metals, Other Dry Bulk

Source: CPCS Transcom analysis of National Transportation Atlas Data, US Army Corps of Engineers Master Dock Plus, and Google Earth.

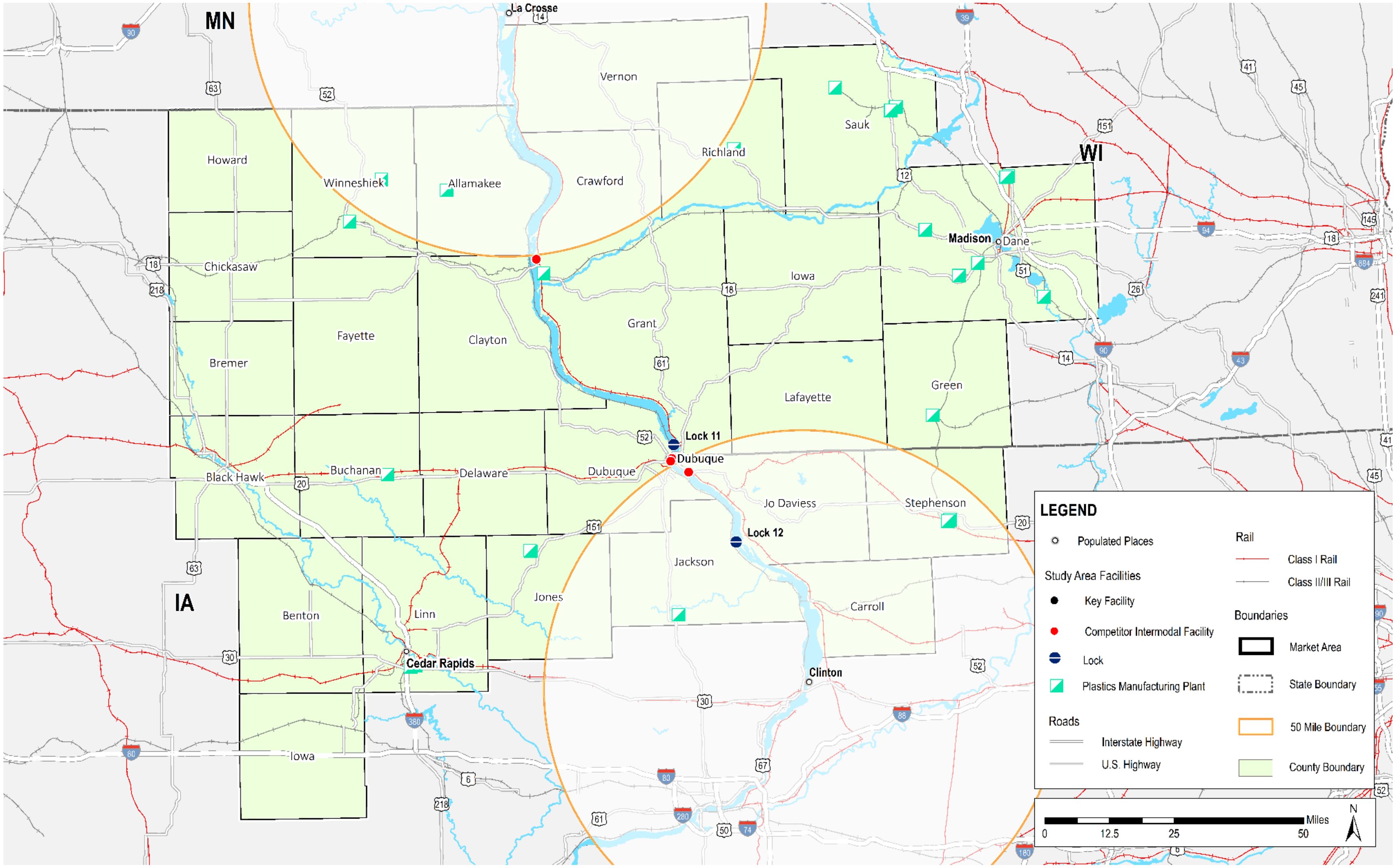
5.6.4 Related Economic Activity

Within the 26-county market area, there are at least 25 firms with more than 50 employees that are primarily engaged in plastics manufacturing. These firms are mapped in Figure 39. Very few of these firms are located in Dubuque or Jo Daviess County, but many are located in metropolitan areas with interstate connections, as well as rail connections, such as Cedar Rapids and Madison.

5.6.5 Summary, Inbound Plastics

Given that the immediate Dubuque area lacks major plastics manufacturers, the fact that plastic resins are a relatively higher-value material capable of cost-effectively being trucked longer distances, and the fact that barge-sized amounts of plastic may require long-term storage or stockpiling, it is likely that there is no immediate demand for plastic resin service at a barge terminal around Dubuque. A potential path for success could be establishing a plastic terminal that would serve multiple clients.

Figure 39: Plastics Manufacturing and Transloading Terminals



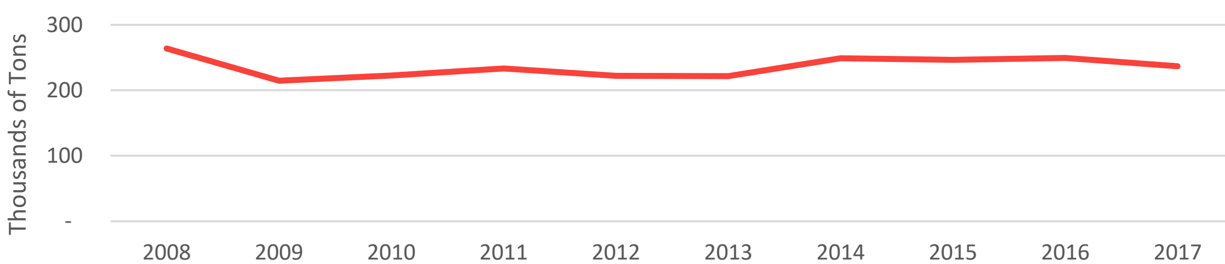
Source: ReferenceUSA, National Transportation Atlas Database.

5.7 INBOUND WOOD AND LUMBER

5.7.1 Commodity Trends

The Dubuque area was once known for its wood products manufacturing, including millwork, and the area is still home to some firms that receive wood as inputs to manufacturing processes. In theory, manufacturing firms utilizing large volumes of lumber or other semi-finished wood products could receive these goods via the river. In reality, the only major type of wood moving on the Upper Mississippi River above St. Louis is wood chips, which made up over 99 percent of wood shipments in 2017. Almost all (98 percent) of these movements were marked as "through" movements with no indication of outbound or inbound destination.

Figure 40: Wood Chip Tonnage Carried on the Upper Mississippi River



Source: US Army Corps of Engineers Waterborne Commerce Statistics. 2018.

The lack of other forms of wood shipped on the Upper Mississippi may be due to misalignment between wood production areas (such as northern Wisconsin, Michigan, and Minnesota, the Pacific Northwest, or foreign nations) and barge routes.

5.7.2 Transportation Profile

The value of wood products will vary in relation to their use and quality. For example, raw logs, low-quality pulpwood used in papermaking, or wood chips will have a relatively low value per ton. However, wood that is of high enough quality for milling and lumber production will have a much higher value once it goes intermediate value-added milling into lumber. As a result, these materials may be more likely to ship via truck or rail, particularly if both their producers and end-users do not have connections to inland waterways.

5.7.3 Facilities Profile

Within the immediate study area, there are four barge terminals that indicate they handle dry bulk materials and these terminals may have the space to accommodate loads of lumber as well. These facilities are listed in Table 27 and mapped in Figure 41. Based on a web-based scan of promotional materials for these terminals, no terminal advertised that it currently handles wood. A consideration for the handling of wood products may be a need for sheltered storage space at the dock.

Table 27: Terminals for Inbound Wood and Lumber

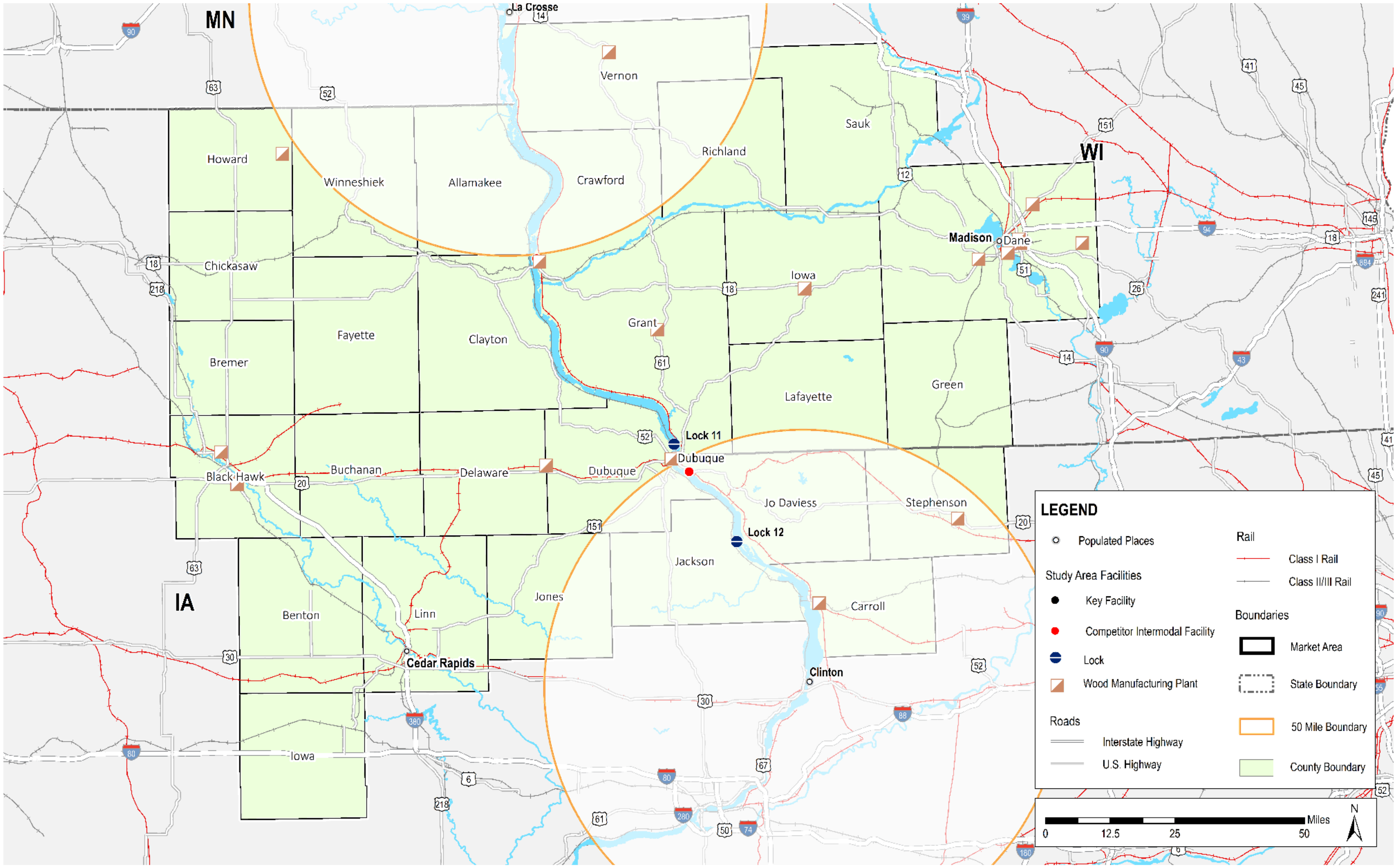
Facility Name or Operator	Location	Transportation Connections	Relevant Commodities Handled
Prairie Sand and Gravel	Prairie du Chien, WI	Barge	Other Dry Bulk
Gavilon	Dubuque, IA	Barge, Rail	Fertilizer, Other Dry Bulk
Newt Marine Services Dubuque River Terminal	Dubuque, IA	Barge, Rail	Fertilizer, Metals, Other Liquid Bulk
Logistics Park Dubuque	East Dubuque, IL	Barge, Rail	Fertilizer, Metals, Other Dry Bulk

Source: CPCS Transcom analysis of National Transportation Atlas Data, US Army Corps of Engineers Master Dock Plus, and Google Earth.

5.7.4 Related Economic Activity

Within the 26-county market area, there are at least 18 firms with more than 50 employees that are primarily engaged in manufacturing that utilizes wood. These firms are mapped in Figure 41. Only one of these firms is located in Dubuque or Jo Daviess County, but many others are located in metropolitan areas with interstate connections, as well as rail connections, such as Cedar Rapids and Madison. As with plastic and chemicals, the value proposition of routing wood shipments through a terminal in Dubuque is unclear, and firms may be unwilling to alter their supply chains to utilize a barge routing for their inbound manufacturing inputs.

Figure 41: Wood Manufacturing and Transloading Terminals



Source: ReferenceUSA, National Transportation Atlas Database.

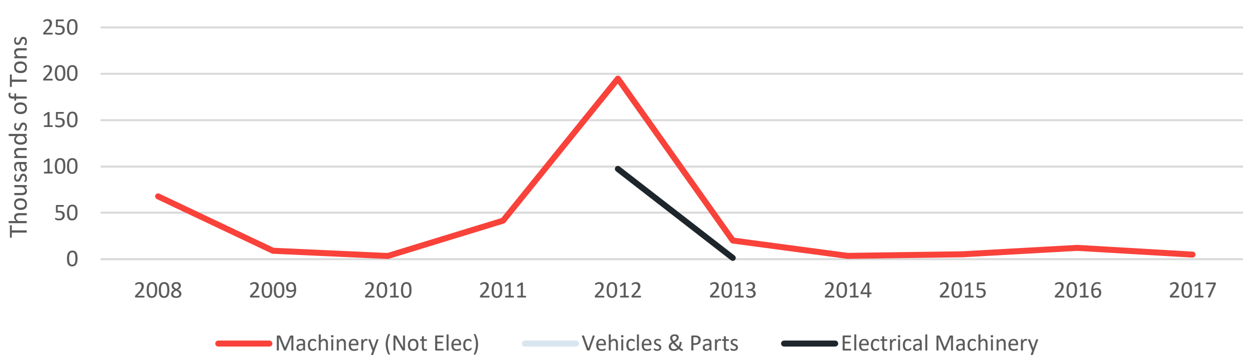
5.8 INBOUND PROJECT CARGO

5.8.1 Commodity Trends

For the purposes of this project, the term *project cargo* refers to heavy, oversized, or highly-valuable, discrete loads that are not bulk or break-bulk. Common examples of project cargo include wind turbine blades, refining equipment, oversized construction equipment, nuclear reactor components, or other large pieces of machinery. Transporting these loads by truck can be difficult, as their large size of heavy weight can require the loads to travel on circuitous road routes to avoid tight clearances or weight-restricted segments. Additionally, moving loads by truck can be expensive due to extensive permitting requirements that vary from state-to-state, as well as common requirements for exceptionally loads to be escorted by pilot or public safety vehicles. Moving oversized loads by barge can help minimize trucking distances, and thus reduce the administrative burden and cost of complex truck permitting.

Given the specialized nature of project cargo loads, and the fact that these loads are often associated with one-off projects (and thus not moved on a regular, annual basis), it is difficult to determine how much project cargo moved on the Upper Mississippi River. The USACE does not track project cargo in its own category, instead, the annual tonnage of major categories associated with project cargo is shown in Figure 42.

Figure 42: Potential Project Cargoes Moved on the Upper Mississippi River

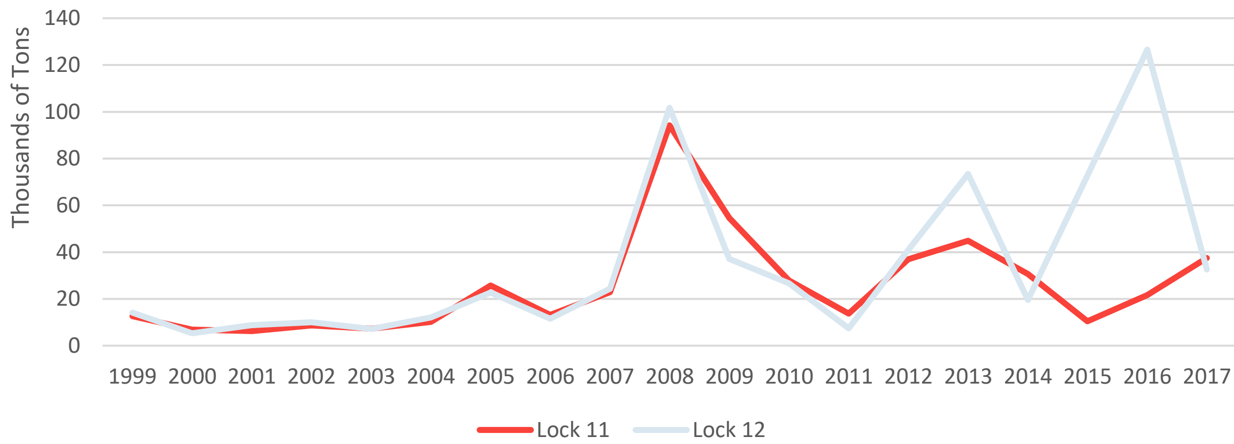


Source: CPCS Transcom analysis of National Transportation Atlas Data, US Army Corps of Engineers Master Dock Plus, and Google Earth.

Most of the potential project cargo tonnage moving on the Upper Mississippi River is associated with the “Machinery, Not Electric” category, which includes a wide range of heavy equipment such as boilers, turbines, engines, machine tools, generators, pumps, furnaces, compressors, transmissions, and material handling equipment. All of this tonnage was flagged as either “inbound” or “through” movements.

In addition to these specific categories, USACE Public Lock Commodity Reports track “manufactured goods and machinery” a category that includes project cargo. The tonnage of these materials traveling through the Dubuque area has varied significantly over the past 20 years.

Figure 43: Manufactured Goods and Machinery Transiting Through Locks 11 and 12



Source: CPCS Transcom of USACE Public Lock Commodity Data.

5.8.2 Transportation Profile

The key consideration for transportation of project cargo is the ability or ease of movement, with transportation cost as a secondary consideration. Therefore, barge shipment could be an attractive option for project cargoes that must travel large distances, particularly across multiple state lines, because it avoids potential clearance conflicts, and can reduce costs associated with long truck travel times and permitting fees. However, barge terminals receiving project cargo must have dock infrastructure of handling equipment capable of moving project cargo, as well as road networks capable of supporting the movement of project cargo out of the terminal. This dockside infrastructure could include roll-on roll-off ramps, or heavy lift cranes, while local road infrastructure must have sufficient bridge clearances and weight capacities to support project cargo loads.

5.8.3 Facilities Profile

In the immediate study area, there are two barge terminals that may have the space and equipment to handle oversized project cargo. Both Logistics Park Dubuque and New Marine's Dubuque River Terminal may have the lift capabilities to handle some project cargoes, and the space to store them. Outside of the market area, La Crosse, WI has a terminal with crane capacity to handle project cargo.

5.8.4 Related Economic Activity

Since project cargoes are usually not carried on a regular basis (like bulk grain or fertilizer cargoes) and are shipped in response to specific construction or manufacturing projects, identifying economic activity relevant to project cargo shipments can be more difficult.

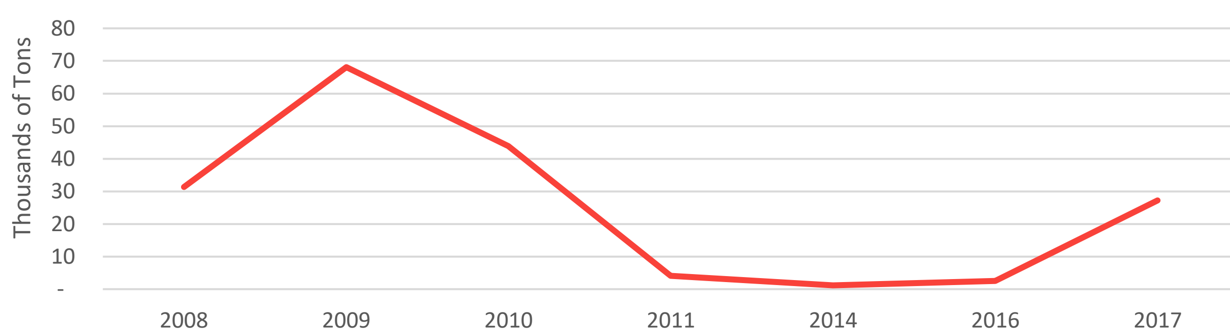
A potential future project cargo that would travel more-regularly on the system could be wind turbine components, which are growing in size. Increasing turbine size (particularly tower height and blade length) is also enabling gains in turbine efficiency, and opening large areas of the United States to cost-effective wind development.[19] These continued increases in size and corresponding efficiency gains could make wind development around the Dubuque area more feasible, and open up an opportunity for inbound wind component handling at barge terminals. Other future project cargo loads could relate to the creation of new manufacturing facilities, or the construction of new infrastructures such as bridges and pipelines.

5.9 OUTBOUND LIQUEFIED NATURAL GAS

5.9.1 Commodity Trends

Since the development and implementation of new oil and gas extraction techniques in the late 1990s and early 2000s opened up new regions of the United States to oil and natural gas production, the US has become a major producer and exporter of petroleum products. The US Army Corps of Engineers does not track movement of Liquefied Natural Gas (LNG) specifically, instead LNG is included as part of the "Hydrocarbon & Petrol Gases, Liquefied and Gaseous." Very few of these products moved on the Upper Mississippi River north of St. Louis, as shown in Figure 44.

Figure 44: Tonnage of Hydrocarbon & Petrol Gases, Liquefied and Gaseous

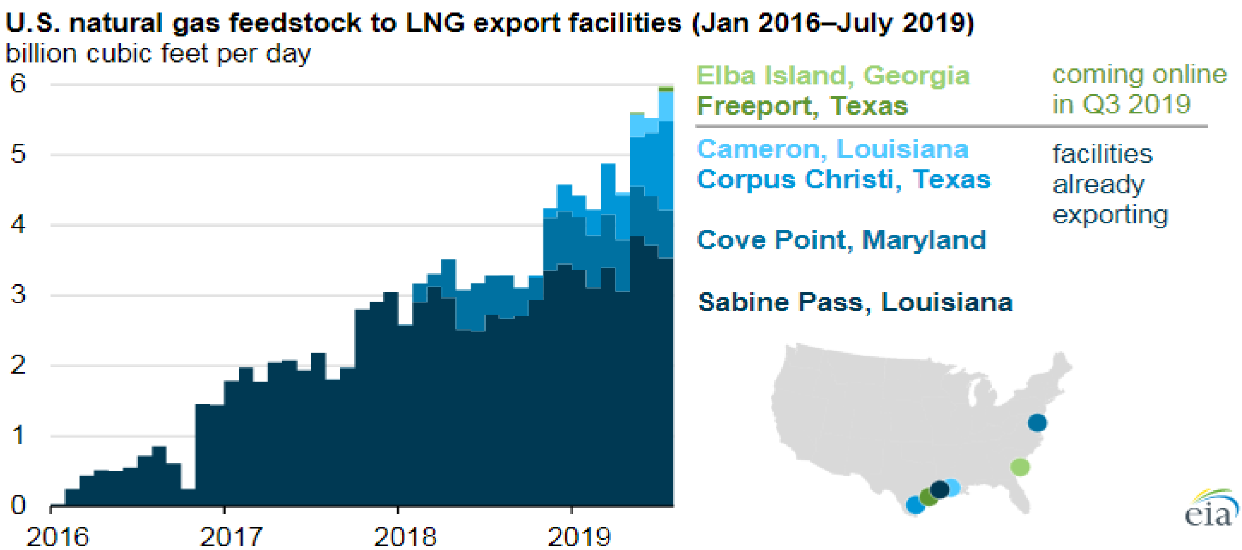


Source: US Army Corps of Engineers Waterborne Commerce Statistics. 2018.

[19] US Energy Information Administration. 2019.

Most of the United States' LNG production is exported to other regions, while small amounts are imported to New England, where there are pipeline constraints limiting the volume of natural gas transmission. As a result, the US' natural gas liquefaction infrastructure is clustered at petroleum export terminals on the Gulf Coast and the Atlantic Ocean. Figure 45 shows the volume of LNG exports and the locations of these export terminals.

Figure 45: LNG Export Volumes and Export Points



Source: US Energy Information Administration. 2019.

5.9.2 Transportation Profile

Natural gas is moved primarily via pipeline to end-users throughout the United States, as well as liquefaction plants at export ports. The Dubuque area is served by one interstate pipeline and two intra-state pipelines.[20] Liquefaction of natural gas is performed when pipeline service is not available, particularly for overseas transportation. Once LNG reaches its destination, it is re-gasified.[21] Since Dubuque already has dedicated natural gas pipelines, and it is far from export ports, there is no reason for major liquefaction plants to be established in the area.

[20] Energy Information Administration. US Energy Mapping System. 2019.
[21] Shell Oil Company. 2018.

5.9.3 Related Economic Activity

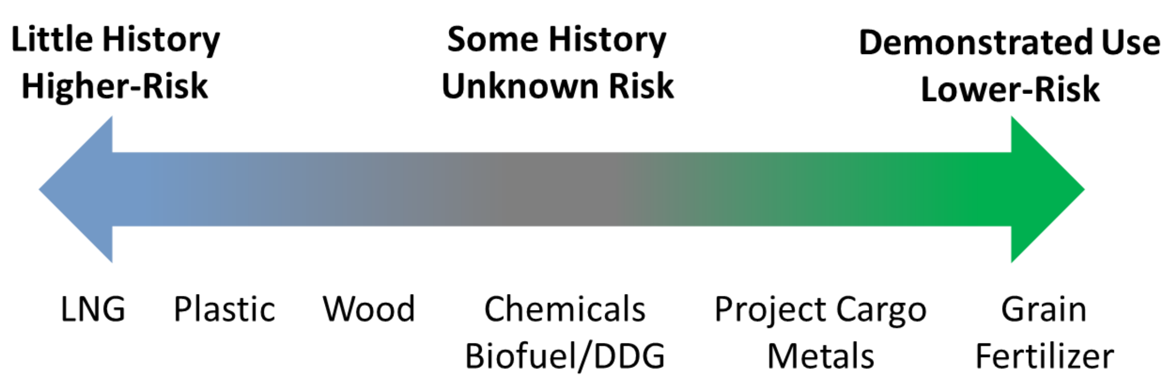
Since the US has a robust natural gas pipeline network, domestic LNG use is limited to select transportation applications, and most liquefaction of LNG is performed at ocean export terminals. Since gas can be shipped by pipeline directly to these ocean terminals, there is currently no economic reason to liquefy gas inland in a location like Dubuque and ship it to domestic users or export markets via the inland waterway system.

5.10 MARKET IMPLICATIONS

Based on the analysis presented here, the competitive opportunities for each commodity are varied based on the number and location of competitor terminals, the consumption or demand for materials in the market area, and the previous history of materials' movement on the Mississippi River. Based on these factors, the commodities studied can be arranged on a spectrum of likely competitiveness, shown in Figure 46. Commodities with little to no history of movement on the Mississippi River are shown on the left, and are considered more speculative or "higher risk" for potential barge service. In comparison, commodities regularly moved on the Mississippi River are shown on the right, and are considered "lower risk" due to their demonstrated history of shipment on the River.

In general, bulk materials related to agriculture and heavy manufacturing (such as grain, fertilizer, and metals) already move on the river, and therefore are considered low-risk commodities to attract to a terminal. However, lighter, higher-value manufacturing inputs such as wood and plastic do not move on the river right now, and demand may be too small to support barge-sized shipments of these commodities. In the absence of current shipments and potential demand, trying to attract these commodities is considered a "higher-risk" strategy.

Figure 46: Spectrum of Commodity Competitiveness



This commodity assessment is intended as a starting point for the market analysis, showing where publicly-available information obtained through Task 2 data collection efforts tend to point. Further detailed research will be performed in the Task 3 Market Analysis to validate, modify, and refine these initial findings, and to address other issues such as containerization that are not treated in the analysis above.

6 Next Steps

The data collection work in Task 2 serves as a platform and framework for the remaining tasks in the ECIA Port Expansion Study, providing a baseline understanding of:

- Study area port facilities and competing facilities;
- Waterway, highway, and rail access conditions;
- Land use and industry factors; and
- Preliminary market implications drawn from available data.

The next steps in the Study will:

- Build on the material in this Technical Memo – particularly Section 5 – to develop a full Market Assessment (Task 3);
- Develop terminal capacity analyses for Gavilon and LPD (Task 4); and
- Compare market demand and available capacity to identify shortfalls, needs, and opportunities (Task 5), which then form the basis for improvement plans and recommendations to be offered by the study.