Port of Muscatine Planning and Feasibility Study

City of Muscatine, Iowa

May, 2017

Contents

Executive Summary

The Port of Muscatine is envisioned to be a multi-modal transportation interchange serving regional shippers and connecting them into the international and domestic transportation system and associated markets worldwide as well as serving as a catalyst of economic development for the State of Iowa and local region.

In October 2015, The City of Muscatine, Iowa, (the City) and Kent Corporation (Kent) applied to the Iowa Department of Transportation (IADOT) for a Linking Iowa's Freight Transportation System (LIFTS) grant for the Port of Muscatine Planning and Feasibility Study to initiate the recognition of this vision. The application requested for $80,000 in LIFTS funds, matched by $20,000 from Kent for conducting a planning and feasibility study for establishing a multi-modal container terminal port facility on the Mississippi River in Muscatine, Iowa, that will allow for the sending, receiving, and trans-loading of intermodal container freight and smaller bulk items utilizing the river, highway, warehousing or rail. The LIFTS grant was awarded to the City of Muscatine in early 2016.

HDR was asked to undertake an assessment of the proposed Port of Muscatine site, located on the Mississippi River just south of the Muscatine municipal boundary. The property is fully owned by the Kent Corporation who intends to operate it as a common user terminal. It is anticipated that the location will be annexed by the City from the County in the near future. In general, the site is approximately 100 acres and is located on a bend of the river. It is comprised of a large flat area separated from the river by a levee. The HDR Team worked with the City through this study process to:

- Assess the region's current and future business operations and opportunities;
- Examine the competitive Port landscape in the region;
- Identify and evaluate business opportunities using qualitative and quantitative criterion;
- Assess the business case for investment results in the region;
- Assess the new infrastructure required to secure the new revenue streams and the cost and conceptual design of that infrastructure;
- Assess governance models for ownership and operation of the port; and,
- Provide recommendations based on the results of the study for future steps in advancing the port project

The site is adjacent to several key roadways; has good highway access; is adjacent to an active rail line that serves other industrial users. It has adjacent properties which can be incorporated with the willingness of the owners for expansion and is near several other industrial sites as well as a nearby industrial park. According to the City, the site has utility access and is comprised of mostly packed clean river sand. In general, the site and the waterfront, as well as adjacent activities, have the right attributes for the development of a river terminal and port district.

Overall the site lends itself to the handling of various types of cargoes including container on barge, liquid bulk and dry bulk commodities. Successful terminal models incorporate a range of handling capabilities in such a manner as to be flexible and adaptable to different cargoes and changing market demands. There is sufficient room on site for the addition of dry bulk and liquid bulk storage tanks as well as appropriate road and rail rack loading/unloading equipment. In addition, there is sufficient room for sheds to accommodate various commodities including interior bulk storage capacity. These facilities can be built similar to the ones operated by Kent Corporation in their nearby industrial yard.

Inland river ports and terminals must have key characteristics to be functional. These include, access for the intended vessels, unencumbered road access (not near residential communities) that connect to main thoroughfares such as large collector roads or highways, rail access and sufficient land for expansion. In addition, river ports must be able to adapt its operations to various periods of time when river heights vary based on seasons. River ports in the northern part of the mid-west must also account for a nine month operational season based on ice buildup and lock closures by the US Army Corps of Engineers for annual maintenance. There are three river locks below Muscatine between the City and St. Louis where the river

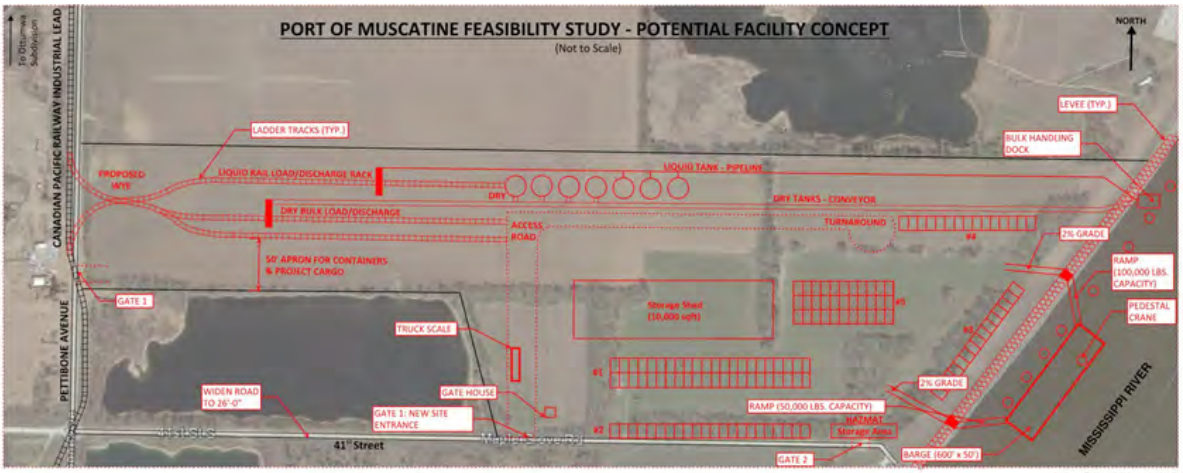
opens up for non-lock constrained traffic. River ports that are lock dependent also have to contend with tow delays at locks due to traffic volume, silting, operational interruptions and unscheduled maintenance.

All cargo will generally require additional services on site. All of these services generate revenue for the terminal operator and are a convenience for the shipper as well as the transportation services that call on the facility. These include but are not limited to value added services, processing, blending and mixing, mandated cargo inspection, equipment supply and chassis pools, warehousing, consolidation, distribution, cargo protection, hazmat, freezing and temperature control, monitoring, humidity control and moisture protection, trucking and rail support services. The methods for handling cargo may vary depending on the commodities handled but as mentioned the processes are essentially the same. The most involved process includes the handling of containers which have a wide range of requirements in regard to handling.

The management focus for a port facility includes administration and planning, access to and from the terminal, gate inbound and outbound processing, storage and dwell times related to cargo, safety and security regulatory compliance, on-site efficiency and flow and management of vessel operations. On a daily basis, staff focus on fast and efficient gate processing, accurate and secure storage, proper staging and marshalling of transport equipment as well as the maintenance of ground equipment. Marine terminals, including river facilities, generally use the same equipment as found in most other multi- modal facilities. The handling of containers has become standardized and similar equipment is used across every mode of transportation. River ports are unique in that they do not normally handle large volumes of containers per vessel move. A standard hopper barge can handle as many as forty-eight, forty foot containers or ninety-six, twenty foot containers. There is a wide range of equipment required to handle containers at terminals. This equipment is highlighted in the main report.

Fees are collected from shippers and vessel operators for terminal use and cargo handling. The fees, services offered and terms and conditions for use of the terminal are contained in the port or terminal tariff or a similar document such as a services and pricing schedule. The name tariff is the common industry term. A port or terminal tariff is a policy document approved by the governing authority of a port or corporation. Rate structures are developed by the terminal or port operator and cover costs plus provide profit margins for the operator. Most marine terminals categorize rate structures into dockage, wharfage, demurrage, terminal handling, leaseholds, security, miscellaneous fees such as equipment and stevedoring services.

A potential facility concept for Muscatine, an opinion of probable conceptual capital cost to construct the facility, and a potential phased approach for implementation that matches the long-term vision for the facility has been developed in this Study. The potential facility concept is based upon data provided by the City of Muscatine, an initial site visit undertaken by the City of Muscatine and HDR, preliminary coordination with potential project stakeholders, and industry best practices and related cost experience for the development of multimodal ports. No engineering design or environmental analysis was undertaken for this phase of study. A concept design and approximate cost estimate ranges follows.



NEW INVESTMENT	LOW RANGE	HIGH RANGE	PHASE
Master Planning/Permitting	$100,000	$200,000	Pre-construction
Land Improvement/Pavement	$4,000,000	$9,500,000	Initial
Utilities	$200,000	$500,000	Initial
Roadway Expansion	$1,200,000	$1,800,000	Initial
Floating Barge Wharf	$3,100,000	$3,800,000	Initial
Fixed Barge Wharf	$4,500,000	$5,000,000	Initial
Mooring Caissons (4)	$400,000	$750,000	Initial
Liquid Bulk Tanks (4)	$4,000,000	$7,000,000	Phase 2
Dry Bulk Silos	$1,000,000	$1,500,000	Phase 2
Conveyor System	$2,500,000	$4,500,000	Phase 2
Piping	$250,000	$1,000,000	Phase 2
Railroad Infrastructure	$1,650,000	$1,800,000	Phase 1
Crane	$1,500,000	$4,500,000	Initial
Reach Stackers	$500,000	$600,000	Initial
Hostlers (4)	$200,000	$300,000	Initial
Spreaders (2)	$40,000	$60,000	Initial
Chassis (25)	$250,000	$300,000	Initial
Yard Gantry Crane	$750,000	$1,000,000	Phase 3
Trackmobile	$50,000	$60,000	Phase 1
Gatehouse	$10,000	$15,000	Initial
Scale (Truck)	$100,000	$150,000	Initial
Fencing	$500,000	$550,000	Initial
Miscellaneous*	$100,000	$150,000	Initial

*Miscellaneous includes signage, communications equipment, security equipment, computers, etc.

Implementing a port and terminal development plan is based on a methodical process that takes into account the current situation in Muscatine. The facility is on private property and can be fully developed privately.

However, a public agency partnership is to the advantage of the City as well as the private property owner because it opens the door to areas of public support of infrastructure as well as a partnership in promoting the port, its capabilities and insuring that port development is consistent with the comprehensive plans of the City. The following is a series of methodical steps needed to implement the desired port and terminal development. From start to finish the anticipated timeline to complete these steps should be between 12 and 16 months. It should be noted that several of these steps can and should take place simultaneously.

Step 1: Designate a Port Zone
Step 2: Create an Oversight Structure
Step 3: Strategic Planning
Step 4: Proposed Site
Step 5: Site Development
Step 6: Business Development Plan
Step 7: Construction Planning
Step 8: Build It
Step 9: Staffing and Tariff

Successful ports are planned properly, managed professionally, are financially responsible, develop innovative investment resources, are reliable in their service offerings and claims, are partners in a region's economic

development and support private terminal business development. Most port governance is focused on development, regulatory requirements, job creation and economic development and are not always limited to just marine activities. The most common public port entities consist of public port authorities, public port commissions, state or municipal port agencies, publically owned-commercially leased facilities, privately owned facilities, and associated port entities.

Based on the findings presented in this study, the development of a multimodal container terminal port facility at the proposed Muscatine site is feasible. Obviously a phased approach to the site development would be recommended, based on the volume of cargo to be handled. Overall, the greatest opportunity for marine terminal activity lies with a diversified cargo base which is handled both in bulk and containerized movements. The changing cycle of shipments warrants a broader mix that uses all of the key transportation systems available, as well as terminal capabilities. The use of containers is fundamentally for international import and export of commodities. Containers are occasionally used for domestic shipments if the revenue generated from using an international container offsets the domestic repositioning cost of that container. In analyzing the data retrieved from various public sources and speaking with a sampling of local shippers, potential commodities that may provide for trans-load opportunities include:

- Agricultural products
- Perishable products in refrigerated or "reefer" containers.
- Petroleum based and packaged products such as chemicals and certain fuels
- PET resins. These refer to *Polyethylene terephthalate*, a common thermoplastic polymer, commonly in the polyester family.
- Grain alcohols
- Compressed gases shipped in ISO containers both domestically and internationally
- Scrap metal destined for local processing into refabricated products
- Consumer products such as manufactured goods
- Project cargo such as fabricated components for larger assembled products
- Organic and manufactured fertilizers
- Reprocessed food stuffs

While the volume of commodities transported along the Mississippi river systems has remained relatively constant over the past decade, the mix of commodities has changed. The vast majority of river volumes are dry or liquid bulk. These commodities are most cost effectively shipped by water due to their lower value per ton, are not time sensitive and can be handled with lower labor requirements and cost. Commodities moving north and south along the system are either destined for domestic use near river ports or for international ship movements where these cargoes are transloaded to ocean going ships or coastal barges.

Most bulk commodities have remained steady over the last several decades with strongest bulk commodities being agricultural products, liquid bulk petroleum products and chemicals, and minerals. Growth in these commodities has been offset by weakening coal demand. The biggest increase has been in consumer commodities, such as manufactured household goods, which have increase since the 2008 economic downturn ended.

COMMODITY	DOWN BOUND	% OF TOTAL, DOWN BOUND	UP BOUND	% OF TOTAL, UP BOUND	BI-DIRECTIONAL TOTAL	% OF TOTAL
Food & Farm	80.8	39.8%	0.0	0.0%	80.8	25.6%
Petro & Petro Products	64.0	31.5%	39.7	35.2%	103.7	32.8%
Crude Materials	20.5	10.1%	22.6	20.0%	43.1	13.6%
Coal	19.6	9.6%	5.3	4.7%	24.9	7.9%
Chemicals	12.0	5.9%	29.3	26.0%	41.2	13.1%
Other	6.2	3.1%	2.4	2.1%	8.6	2.7%
Manufactured Goods	-	0.0%	13.5	12.0%	13.5	4.3%
Grand Total	**203**	**100.0%**	**113**	**100.0%**	**316**	**100.0%**

A key driver for the proposed facility is potential commodities, and respective volumes, that may be diverted from both truck and rail onto barge. Various commodities require specialized infrastructure and equipment necessary for mixed-use facilities, and thus must be taken into account when planning potential port services. HDR conducted interviews with numerous shippers within the Muscatine area to not only identify potential intent to ship from the proposed facility, but also to understand current and potential future commodity movements. From these interviews, it was determined that container-on-barge (COB) and dry bulk shipments would play a large role. Additionally, many dry bulk commodities identified including: scrap steel, grain, and non-metallic minerals may be shipped by container.

The following table provides Iowa originated and terminated volume of commodities utilizing land based transportation modes (truck, rail and multiple modes) for select commodities deemed to be "divertible" to the Mississippi inland water system. Overall, for the year 2015, FHWA's Freight Analysis Framework data suggests some 10.4 million tons of freight originates or terminates in Iowa along the Mississippi corridor.

Table ES-1: Land-Based Divertible Volumes, 2015. Mississippi River Corridor, Millions of Short Tons*

TYPE OF FLOWS	NORTH		SOUTH		TOTAL	
	TONS	%	TONS	%	TONS	%
DOMESTIC	**1.96**	**98.6%**	**5.56**	**66.4%**	**7.52**	**72.6%**
Multiple Modes	0.06	2.97%	3.57	42.6%	3.63	35.0%
Rail	1.52	76.3%	1.69	20.1%	3.20	30.9%
Truck	0.39	19.4%	0.31	3.65%	0.69	6.67%
INTERNATIONAL	**0.03**	**1.35%**	**2.81**	**33.6%**	**2.84**	**27.4%**
Multiple Modes	0.012	0.61%	1.38	16.4%	1.39	13.4%
Rail	0.015	0.73%	1.35	16.1%	1.36	13.2%
Truck	0.0001	0.01%	0.09	1.04%	0.09	0.84%
Total	**1.99**	**100%**	**8.37**	**100%**	**10.4**	**100%**

* Note: multiple modes may include waterborne volumes

Northbound flows include tonnage terminating in Iowa from the selected origin states, while southbound flows capture commodity flows originating in Iowa. Of total volumes, rail and multiple modes are the most common mode of shipment. Domestic flows account for 73% of total movements.

Table ES-2: Inland Waterborne Tonnage Movements, 2015. Mississippi River Corridor, Millions of Short Tons**

TYPE OF FLOWS	NORTH	%	SOUTH	%	TOTAL	%
DOMESTIC	0.11	5.35%	1.98	94.6%	2.09	72.6%

Type of Flows North % South % Total

**No international-based tonnage originated or terminated in Iowa in 2015

Table 2 summarizes current southbound and northbound tonnage originating and terminating in Iowa, respectively. Complementary to Table 1, the majority of directional flows are southbound. Southbound flows encompass 95% of total flows, with nearly 2 million tons shipped.

Depending on volume and destination, each of the products may be moved by a single mode such as truck or rail, or more commonly by a multi-modal move consisting of truck to rail or barge (including container on barge). Commodities then commonly move by truck to a final destination. Key factors determining how the cargo will move depends foremost on total price for the entire origin and destination move, time sensitivity related to the time required to move the product, and if that is convenient for the shipper and consignee. In addition, perishable characteristics, final destination and original point of shipment, convenience of each mode, and the intermodal handling capabilities of each transfer point (in this case the river terminal) play a key role.

The Western River system has been an effective transport mode for commodities that can be moved in larger quantities at the lowest possible costs. Bulk liquid cargoes, such as crude oil and refined products, as well as dry bulk cargoes, such as coal, grains and minerals, are transported regularly and handled at most river terminals. Some of these commodities are shifting to container due to the large number of empty containers available domestically, low international container rates, and high available container slot capacity. Loading of grain into containers is increasing in frequency because origin load costs are lower than moving the cargo in bulk and then transloading it at the distribution point. In addition, the containers are serving as intermediate storage units in many locations where high volume storage is not available.

Business development based on cargo handling begins with flexible infrastructure. If a terminal facility has rail, truck, and riverside handling, the options for cargo moving in numerous modes are diversified and adaptable to changing market conditions. The first step in the development of this new facility is planning that reflects on site access for all transportation modes, coupled with warehousing and storage capacity and including the ability to handle cargo in units or in bulk. Site planning should indicate all of these elements with build-out occurring as opportunities present themselves, including the activities below:

- Overall site improvements with improved road access
- New central gate and secondary access points including security fencing
- Utilities
- Storage capacity in the forms of dry silos, liquid bulk tanks and warehousing, including cold storage capacity
- Related load/unload racks, container tilters and loaders
- Truck and rail scales
- Conveyors and pipelines
- Appropriate ground handling equipment
- Over levee infrastructure
- Two separate berths with associated mooring infrastructure and handling capability for Dry/liquid bulk, Neo-bulk, Container and Project cargoes.

After initial road access, site, mooring, and security infrastructure is put in place, other infrastructure can be developed as business opportunities present themselves. The initial should include a full build out plan, with

a twenty year window, and an associated investment plan with a projected timeline estimating future costs. Infrastructure development should be tied to realistic cargo opportunities. The initial development should be designed to handle multi-modal and intermodal transfer of containers and general cargo. The floating wharf and associated ramps should be constructed in such a manner as to accommodate all types of crane handled cargo. It should be noted where a federally constructed levee and federal waterway are impacted, the US Army Corp of Engineers should be consulted and engaged early once general site concepts are accepted. The USACE will be responsible for formal permitting related to all of the waterside considerations including impacts on the waterway and river navigation.

Based on the analysis of the proposed site, shipper interviews and commodity analysis the following activities are recommended for consideration:

- Develop a structure for a public association that incorporates public-private partnerships;
- Develop strategic goals and master planning objectives for the proposed port development;
- Quantify potential funding opportunities;
- Adjust municipal zoning to create a specific and inclusive “port zone”;
- Agree on an acceptable site plan for the proposed Muscatine port site;
- Develop site engineering with phased timeline and specified costing;
- Undertake the required federal and state permitting processes including USACE processes;
- Develop a business development process including shipper, consignee, broker, and carrier database;
- Develop an initial construction plan to meet basic requirements of a new marine facility, taking into account plausible short term opportunities;
- Once permits are approved, initiate construction; and
- Develop a terminal tariff, regulations, and pricing schedule for terminal users.

1. Introduction and Approach

In October 2015, The City of Muscatine, Iowa, (the City) and Kent Corporation (Kent) applied to the Iowa Department of Transportation (IADOT) for a Linking Iowa's Freight Transportation System (LIFTS) grant for the Port of Muscatine Planning and Feasibility Study. The application requested for $80,000 in LIFTS funds, matched by $20,000 from Kent for conducting a planning and feasibility study for establishing a multi-modal container terminal port facility on the Mississippi River in Muscatine, Iowa, that will allow for the sending, receiving, and trans-loading of intermodal container freight and smaller bulk items utilizing the river, highway, warehousing or rail. The LIFTS grant was awarded to the City of Muscatine in early 2016. The City subsequently developed and published a Request for Proposals for the project and through a competitive process awarded a contract to HDR Engineering, Inc. (HDR) for the completion of the study.

HDR was asked to undertake an assessment of the proposed Port of Muscatine site, located on the Mississippi River just south of the Muscatine municipal boundary. The property is fully owned by the Kent Corporation who intends to operate it as a common user terminal. It is anticipated that the location will be annexed by the City from the County in the near future. In general, the site is approximately 100 acres and is located on a bend of the river. It is comprised of a large flat area separated from the river by a levee.

The HDR Team comprised of port planners, port engineers and economic and financial analysts undertook this project to guide the City based on a logical and rational approach that assesses *what is realistically feasible for a proposed terminal port facility based on an assessment of site and regional data.* The HDR Team worked with the City through this study process to:

- Assess the region's current and future business operations and opportunities;
- Examine the competitive Port landscape in the region;
- Identify and evaluate business opportunities using qualitative and quantitative criterion;
- Assess the business case for investment results in the region;
- Assess the new infrastructure required to secure the new revenue streams and the cost and conceptual design of that infrastructure;
- Assess governance models for ownership and operation of the port; and,
- Provide recommendations based on the results of the study for future steps in advancing the port project.

The overall project approach revolved around 6 distinct phases illustrated below.

Figure 1. Phased Project Approach

The following sections of this report describe the current site conditions, characteristics of successful port terminal facilities, market conditions of the region that could support such a facility, governance models, a proposed facility layout and associated cost estimates, and possible funding alternatives. The report concludes with recommendations for development of the facility.

2. Site Conditions

The site is adjacent to several key roadways; has good highway access; is adjacent to an active rail line that serves other industrial users. It has adjacent properties which can be incorporated with the willingness of the owners for expansion and is near several other industrial sites as well as a nearby industrial park. According to the City, the site has utility access and is comprised of mostly packed clean river sand. In general, the site and the waterfront, as well as adjacent activities, have the right attributes for the development of a river terminal and port district.

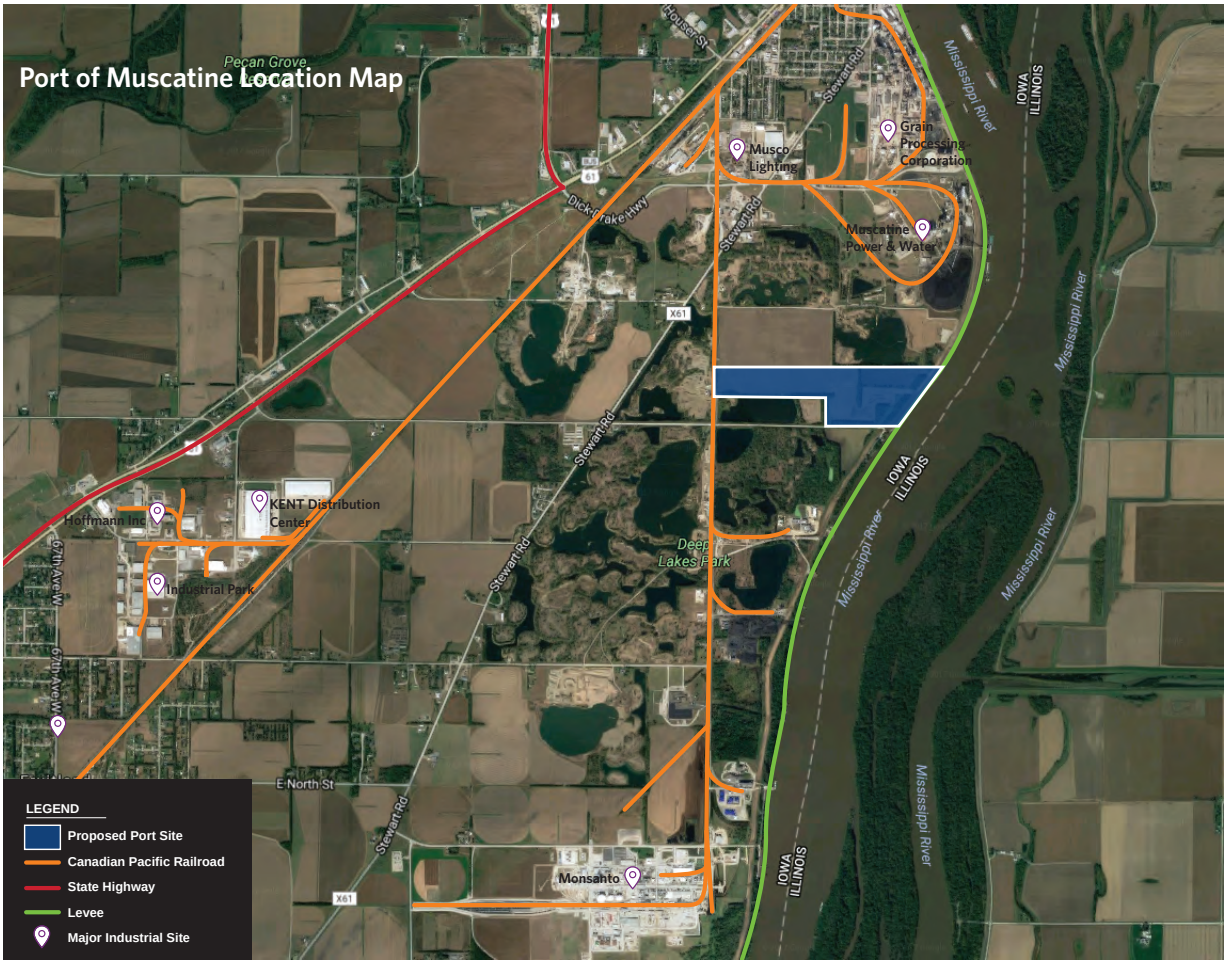


Figure 2. Site Location

The proposed facility site is an irregular rectangle with the largest acreage on the eastern side toward the river front. The river access is approximately 2,500 linear feet with sufficient depth for barge and towboat handling. There is some reported silting near the shoreline which has to be quantified. The property is mostly flat with some tree growth and low growth bush areas which can be removed. There is an elevation of approximate 10-12 feet from the shore-side property to the top of the levee and then a rapid drop-off to the river's edge consistent with most types of levee construction.

Figure 3. Levee and Drop-Off to River

The property behind the levee has a low slope to the main portion of the site which is flat and consists of mostly fine sand. The City indicated there was no known contamination on site. The property lends itself to use as a marine terminal with proper improvements which would include surface improvements, drainage, landing weight improvements, access over the levee to waterfront infrastructure and circulation and storage planning.

Figure 4. Property behind the Levee

There are approximately 35 or more acres adjacent to the levee which is adequate for the development of an upland terminal facility. Access to the levee would have to be developed which would most likely include paved road ramps with an approximate 2%-3% grade. An adequate over levee system, approved by the US Army Corps of Engineers, would have to be developed and then at least two ramps to the mooring and waterside cargo handling area.

Figure 5. Shore-side Slope to Levee

The site can be accessed by two key roadways, one being the north/south Pettibone Avenue and the second being the 41st Street extension. The 41st Street extension is a narrow unpaved road which would afford the best overall mid-site access. The road would have to be widened and paved to accommodate 100,000 lb. loads. The road has a corridor on the south side with electrical utility poles.

Figure 6. 41St Street Extension Ending at Levee

Adjacent to Pettibone Avenue is a Canadian Pacific (CP) rail spur which services an industrial user south of the site. The development site lends itself well to the installation of "ladder tracks" system that could be connected to this spur. Ladder tracks would work effectively for the west end of the site which is narrower than the east end of the site. A second alternative would be the extension of the "balloon track" to the north of the site. The approach to the rail line on site would be dependent upon two things; the amount of capacity desired on site and the issues associated with grade crossings on Pettibone Avenue. This would also allow for the installation of both dry and liquid bulk handling equipment, as well as an apron for handling containers.

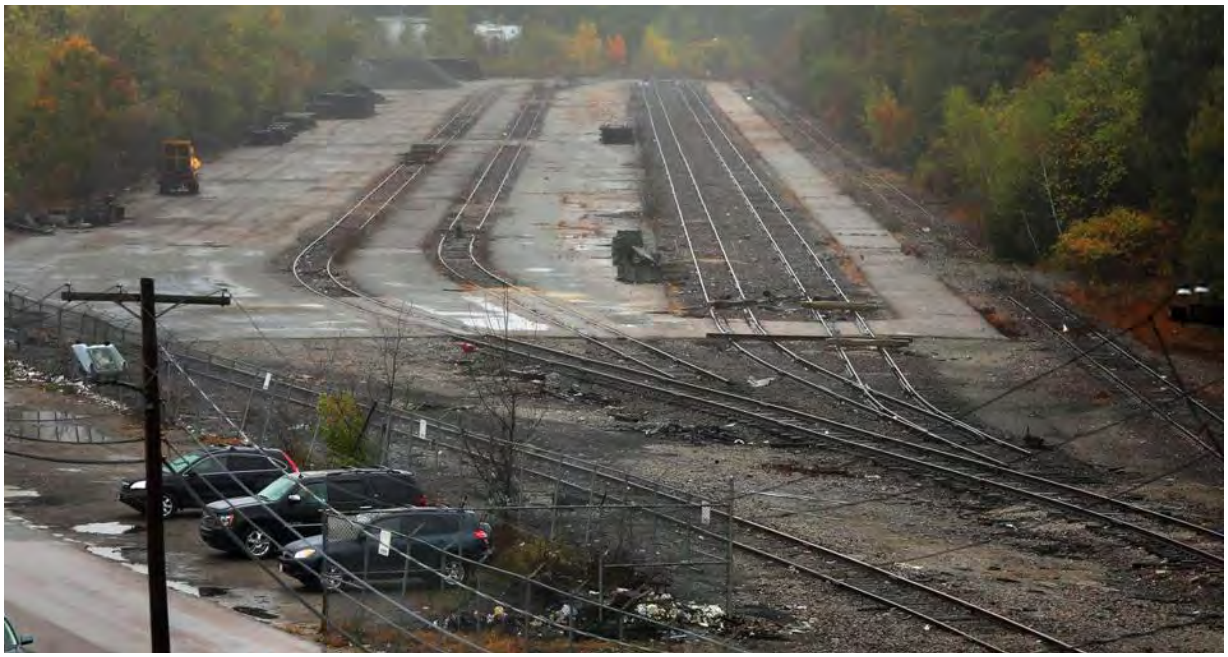


Figure 7. Typical Ladder Track Installation (IAMPE Photo)

Overall the site lends itself to the handling of various types of cargoes including container on barge, liquid bulk and dry bulk commodities. Successful terminal models incorporate a range of handling capabilities in such a manner as to be flexible and adaptable to different cargoes and changing market demands. There is sufficient room on site for the addition of dry bulk and liquid bulk storage tanks as well as appropriate road and rail rack loading/unloading equipment.

Figure 8. Dry Bulk Storage (Agricultural) and Truck Loading/Unloading Bays (IAMPE Photos)

Figure 9. Cement Silo with Truck Bay, Liquid Bulk Storage Tanks, Rail Loading Bay (HDR Photos)

Figure 10. Rail and Truck Loading Racks (IAMPE Photos)

In addition, there is sufficient room for sheds to accommodate various commodities including interior bulk storage capacity. These facilities can be built similar to the ones operated by Kent Corporation in their nearby industrial yard.

Figure 11. Typical Storage Shed, Canvas on Steel on Concrete Foundation (HDR Photos)

3. Characteristics of Successful Terminal Port Facilities

Inland river ports and terminals must have key characteristics to be functional. These include:

- Access for the intended vessels
- Unencumbered road access (not near residential communities) that connect to main thoroughfares such as large collector roads or highways
- Rail access
- Sufficient land for expansion

In addition, river ports must be able to adapt its operations to various periods of time when river heights vary based on seasons. River ports in the northern part of the mid-west must also account for a nine month operational season based on ice buildup and lock closures by the US Army Corps of Engineers for annual maintenance. There are three river locks below Muscatine between the City and St. Louis where the river opens up for non-lock constrained traffic. River ports that are lock dependent also have to contend with tow delays at locks due to traffic volume, silting, operational interruptions and unscheduled maintenance.

3.1 Operations

All port facilities, large or small, operate in the same manner. Only methodology may vary depending on the type of commodities handled. Their functions are fundamentally the same. All marine facilities are basically transportation facilities and act as intermodal exchange locations, which is the transfer of cargo from one of transportation to another. Functions include vessel management, operations and scheduling, cargo processing and clearance, terminal equipment operation and maintenance, pier and terminal flow and traffic control, safety and security, administration, environmental protection and ancillary and cargo support services.

The management focus includes administration and planning, access to and from the terminal, gate inbound and outbound processing, storage and dwell times related to cargo, safety and security regulatory compliance, on-site efficiency and flow and management of vessel operations. On a daily basis, staff focus on fast and efficient gate processing, accurate and secure storage, proper staging and marshalling of transport equipment as well as the maintenance of ground equipment. Operationally, personnel tries to achieve efficient pick rates or crane moves, per ton or per barrel fast load/discharge rates, conformance with federal regulations, safety of personnel, efficient billing and collections and from the customers standpoint, predictability.

Planning of sites, particularly one being developed from undeveloped land, must be able to take into account the wide range of functions that must eventually be built into a master plan. In the case of the Muscatine site, a main gate and secondary access points would have to be determined. The main access point would involve inbound and outbound processing which includes inspections, acceptance or release of cargo, government clearance if required and volume measurement for bulk cargoes and weight of export containers. All sites require a level of security and a safety plan that applies to terminal and visiting personnel. On site flow must be planned along with proper and secure storage for various commodities planned to be handled. In properly planned terminals, vessel, truck and rail handling with associated equipment needs to be specified as well as the procedures for cargo handling, tracking and billing. All cargo generally requires some form of additional services on site. All of these services generate revenue for the terminal operator and are a convenience for the shipper as well as the transportation services that call on the facility. These include but are not limited to:

- Value added services
- Processing
- Blending and mixing
- Mandated cargo inspection
- Equipment supply and chassis pools

- Warehousing, consolidation, distribution
- Cargo protection
- Hazmat
- Freezing & temperature control
- Monitoring
- Humidity control and moisture protection
- Trucking and rail support services

The methods for handling cargo may vary depending on the commodities handled but as mentioned the processes are essentially the same. Cargo inbound arrives at the receiving point, generally the main terminal gate or rail gate, or for barges at the dock, where it is logged and inspected. Bulk cargoes are weighed and some sampled both inbound (and outbound). After inspections and processing are done, the cargo is moved to storage areas where it is then made ready for loading aboard vessels. The most involved process includes the handling of containers which have a wide range of requirements in regard to handling.

Figure 12. Container Handling on Rivers and Barge Fleeting (IAMPE Photo)

Most containers are for handling imports or exports which involve proper manifest filing, inspections, weighing and government clearance. Container barge loading must be properly planned and stows arranged to optimize the number of containers carried in a safe manner.

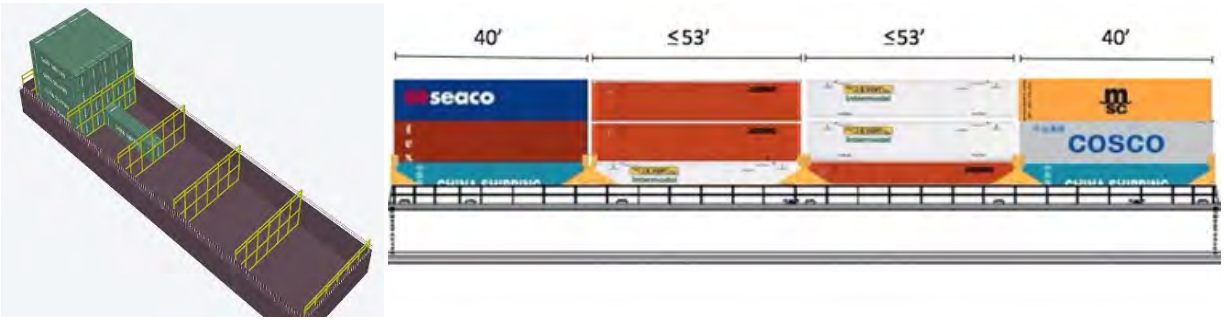


Figure 13. Barge Stowage Planning (IAMPE Photo)

Bulk cargo stowage including loading and discharging is also unique. Some commodities must be protected and in many cases unloading will take a longer period, particularly for dry bulk cargoes, which will take up valuable dock space. Dry bulk cargoes include aggregate, fertilizer, scrap steel, agricultural cargoes such as corn, legumes, distilled grains, wheat and minerals.

Liquid bulk cargoes are handled by pipeline systems which are connected to and from the shoreline with fixed pipeline systems. Depending on the commodity and if it is refined or not, separate pipelines are normally utilized to prevent contamination. Liquid bulk cargoes include crude oil, refined products such as

gasoline or kerosene, chemicals, liquid fertilizer, kaolin, liquefied gases such as propane or natural gas. Liquid bulk piers are generally similar to dry bulk piers and often share cargo handling structures with dry bulk cargo equipment.

Figure 14. Dry Bulk Unloading/Loading with Ground Equipment and Fixed Equipment (IRPT Photos)

Another type of cargo commonly handled on the river are project cargoes. These generally involve large component pieces such as machinery, power systems and manufactured components of larger units. Handling of these cargoes require docks with heavy weight capacity and cranes with higher than average working loads.

Figure 15. Project Cargo Handling (IAMPE Photo)

Project cargoes are often few and far between except if there are fabrication facilities located near the terminal. Muscatine has several steel fabricators in the immediate vicinity which could potentially use the terminal once developed. The infrastructure should be planned to accommodate heavy loads and specialized equipment.

Containers, project cargoes, neo-bulk cargo and break bulk cargoes can be handled over fixed piers or barge wharfs. Fixed piers on the river system tend to be built over sheet pile structures with backfill to provide the necessary landing weights. A variation of the fixed wharf is the caisson mooring system which allows barges to be moored along fixed structures that are generally spanned by walkways to access mooring points and handling equipment. The last type is the barge wharf system which is based on a floating dock comprised of a barge alongside a fixed mooring system that is accessed by ramps from the shoreline. The most flexible types are the fixed and floating docks.

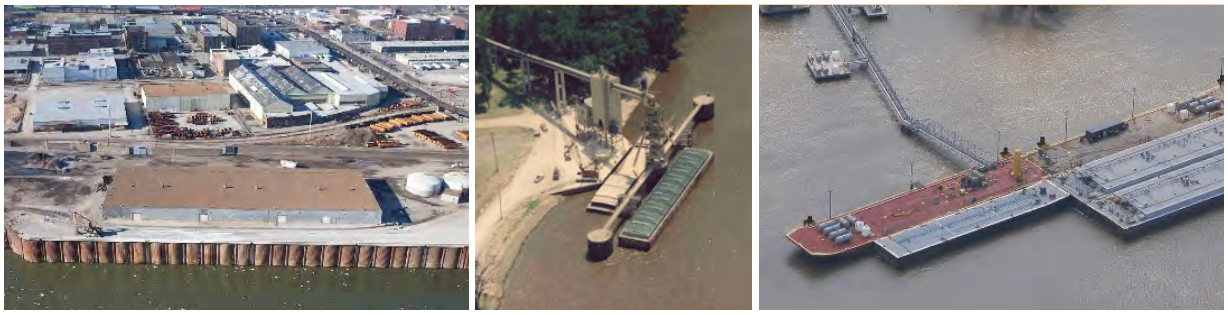


Figure 16. Dock Types: (Left to right) Sheet pile-fixed, caisson type, floating dock with shore ramp. (IAMPE Photos)

Outbound processing is similar to inbound processing. This involves physical inspection, weighing, volume admeasurement, sampling, lab confirmation release, release associated with billing, fees or duties and in some cases government release. Gate processing involves check in and check out at a gatehouse which also manages the truck scales.

Figure 17. Gatehouse and Truck Scales (HDR Photos)

The gatehouse is located at the main entrance and is the security checkpoint for the terminal. Secondary gates for rail access and hazmat yards are monitored and controlled at the main gate.

3.2 Equipment

Marine terminals, including river facilities, generally use the same equipment as found in most other multi-modal facilities. The handling of containers has become standardized and similar equipment is used across every mode of transportation. River ports are unique in that they do not normally handle large volumes of containers per vessel move. Fleeting practices using drop and pick methodology are generally more dependent on pick up and drop off schedules set up by the towboat companies as opposed to the tight schedules for single vessel handling in large seaports. A standard hopper barge set up for container handling can carry three forty foot containers (FEU-40 ft long x 8 ft wide x 8 ft high) across and four rows lengthwise in a single stack. Depending on the amount of loaded and empty containers handled, barges can handle stacked containers three or four levels high. Where barges are draft dependent which impacts capacity and loaded weight, a barge full of empty containers can handle as many as forty-eight, forty foot containers or ninety-six, twenty foot containers (TEU-20 ft long x 8 ft wide x 8 ft high). As loaded container amounts per vessel increase, the number of total units handled per barge will decrease. Amounts also depend on container

sizes. Some containers may be longer, up to fifty-three feet, and up to six inches wider. High cube containers range from six to eighteen inches higher than standard eight foot high containers.

The most efficient method of handling containers is by a shore based gantry crane. Their design can be configured to span wide areas including rows of containers on a barge or from the shore-side to the vessel over wide areas. A gantry crane can be designed to span a levee connecting the shore loading area to the barge without needing an intermediate wharf. The primary advantage of a gantry crane is that it has the same lifting capacity along its entire span. It is also faster for handling larger volumes of containers that need to be moved to and from a vessel operating on a tight schedule. Gantry cranes can be used for all types of cargoes, not just containers, but they are generally limited in their capacity which in most cases is under 40 metric tons unless a higher capacity crane is specified.

Figure 18. Shore Based Gantry Crane (IAMPE Photo)

Smaller facilities often use boom cranes for handling of cargo and containers because loading times are not as critical as they are at larger port facilities. Many facilities use mobile harbor cranes which were designed for smaller terminals and can be utilized for a wide range of cargoes including containers. Mobile harbor cranes differ from standard construction crawler cranes in that they have different head and heal block configurations and can lift higher loads at wider angles on inclination. Another advantage of mobile harbor cranes is that they can be repositioned on any portion of a terminal for use with other transportation modes. The crane base is situated on numerous wheel sets which distributes the weight of the crane as well as the counterbalance weights. They can be operated on terminal sites, on wharves and on barges.

Mobile harbor cranes have a wide range of uses. They can be set up for containers, project, neo-bulk, break bulk and dry bulk cargoes. The units are considerably less expensive than gantry cranes and have higher lifting capacities.

Figure 19. (Left to right) Mobile Harbor Crane on pier and barges, pedestal crane (Libeherr Photos-HDR Photo)

A variation of the mobile harbor crane is the pedestal crane which is operated off a fixed base and can be placed on piers or barges. While a pedestal crane has less lifting capacity than a mobile harbor crane and lacks the ability to be repositioned, it is frequently used for container handling for lower volume facilities.

Figure 20. Crawler type standard construction crane (HDR Photo)

Many startup terminals use standard construction cranes that can handle a 30 ton loaded container and various other types of cargoes. These can be leased as part of the initial startup. While loading rates are much slower than other types of cranes, they are ideal for lower volume terminals. These cranes have limited reach but are suitable for loading and unloading of barges where reach is not as critical of a factor.

Figure 21. Rubber tired gantry crane and reach stacker. (IAMPE Photos)

Site capacity can be increased by the stacking of containers. Generally, two or three high stacked units can be made up by use of a reach stacker or yard gantry crane. There are two types of yard gantry cranes, rail (RMG) and tire mounted (RTG). Tire mounted are most flexible and can stack containers two to three times higher than reach stackers.

Figure 22. Container Spreader (HDR Photo)

All containers are hoisted on and off transport equipment and ground equipment with the use of spreaders. They are interchangeable between cranes and reach stackers and are used in rail yards, tack facilities and marine terminals. Spreaders are also used for handing other cargoes and they are designed to protect the cargo from damage by lifting equipment and to lift material with equalized stress. They are semi-automatic and self-adjusting in some cases or can be manually adjusted for lifting. For low volume facilities, manual units are adequate.

Figure 23. Yard Hostler and Container Flex-chassis. (IAMPE Photo)

Container handling also involves additional ground equipment. Yard hostlers are used to move containers on chassis or in bomb carts around yards or to reposition chassis for use with containers for storage. Hostlers have a short turning radius and less space is needed for travel lanes between storage areas.

Most chassis are adjustable for different size containers (flex-chassis). Containers are placed or removed directly onto the chassis for truck handling or movement to and from barges. Bomb carts, or container transporters, are used to transport containers from vessels to and from stacking areas. When containers are stacked, they are handled a second time with a reach stacker or yard gantry for placement on top of each other. Mafi trailers are also used on terminals for handling of project cargoes or neo-bulk cargoes. They are low profile and have a higher carriage capacity than a chassis.

Figure 24. Container Transporter (Bomb Cart) and Mafi Trailer (IAMPE Photo)

Containers are designed to be handled by the same type of equipment and all types meet standard dimensions. There are five common types of containers. Each are used for different types of cargo. These include the dry cargo container, reefer (refrigerator) or temperature controlled container, half high container, tank container and flat rack container which can be collapsible, bin (removable sides) or platform type.

		20'CONTAINER		40' CONTAINER		40' HIGH-CUBE CONTAINER		45' HIGH-CUBE CONTAINER	
		imperial	metric	imperial	metric	imperial	metric	imperial	metric
EXTERNAL DIMENSIONS	length	19' 10.5"	6.058 m	40' 0"	12.192 m	40' 0"	12.192 m	45" 0"	13.716 m
	width	8' 0"	2.438 m	8' 0"	2.438 m	8' 0"	2.438 m	8' 0"	2.438 m
	height	8' 6"	2.591 m	8' 6"	2.591 m	9' 6"	2.896 m	9' 6"	2.896 m
INTERIOR DIMENSIONS	length	19' 3"	5.867 m	39' 5 45/64"	12.032 m	39' 4"	12.000 m	44' 4"	13.556 m
	width	7' 8 19/32"	2.352 m	7' 8 19/32"	2.352 m	7' 7"	2.311 m	7' 8 19/32"	2.352 m
	height	7' 9 57/64"	2.385 m	7' 9 57/64"	2.385 m	8' 9"	2.650 m	8' 9 15/16"	2.698 m
DOOR APERTURE	width	7' 8 1/8'	2.343 m	7' 8 1/8'	2.343 m	7' 6"	2.280 m	7' 8 1/8'	2.343 m
	height	7' 5 ¾"	2.280 m	7' 5 ¾"	2.280 m	8' 5"	2.560 m	8' 5 49/64"	2.585 m
INTERNAL VOLUME		1,169 ft³	33.1 m³	2,385 ft³	67.5 m³	2,660 ft³	75.3 m³	3,040 ft³	86.1 m³
MAXIMUM GROSS WEIGHT		66,139 lb	30,400 kg	66,139 lb	30,400 kg	68,008 lb	30,848 kg	66,139 lb	30,400 kg
EMPTY WEIGHT		4,850 lb	2,200 kg	8,380 lb	3,800 kg	8,598 lb	3,900 kg	10,580 lb	4,800 kg
NET LOAD		61,289 lb	28,200 kg	57,759 lb	26,200 kg	58,598 lb	26,580 kg	55,559 lb	25,600 kg

Figure 25. Standard Container Sizes (Source-IAMPE)

Most standard dry cargo containers can be used to handle a wide variety of cargoes including general merchandise, agricultural products, dry bulk commodities, liquid cargo in container bladders and heavy weight cargoes. Agricultural cargoes are commonly moved in dry cargo containers. Low container rates in the market are favorable for these shipments. The containers, many destined for third world nations, serve as the storage areas at the point of delivery. To maximize the use of container capacity, container tilters are used in many locations to turn the unit on end where it can be loaded more fully.

Figure 26. Container Loaded with Agricultural Commodities and Container Tilter (IAMPE Photos)

Perishable cargoes, requiring temperature controlled containers, are also extensively used in the industry. Fruit and fish are often moved in chilled containers which can also be used for frozen product. Bottled spirits, wine and beer are also moved in temperature controlled containers to keep the liquid from freezing. Reefer units are equipped with generator packs to power the temperature control units and are plugged in at the terminal with temperatures monitored by terminal staff on a regular basis.

Figure 27. Reefer Container, Portable Power Distribution Unit and Tank Container (IAMPE Photos)

Half high units are half the height of a standard container. They are used for dense and heavy weight commodities such as pig iron or steel plates. Tank containers have an enclosed steel tank within a rectangular container frame. Flat rack containers are platforms with or without sides on each end. These containers are often designed with removable ends.

Figure 28. Trackmobile (IAMPE Photo)

For small terminals with track capacity, terminal operators often have their own equipment on site for positioning of rail cars and setting up equipment on loading/discharge racks. Trackmobile units are generally operated by terminal staff and connect to individual rail cars to put them into proper position within the rail yard area.

3.3 Fee Structures

Fees are collected from shippers and vessel operators for terminal use and cargo handling. The fees, services offered and terms and conditions for use of the terminal are contained in the port or terminal tariff or a similar document such as a services and pricing schedule. The name tariff is the common industry term. A port or terminal tariff is a policy document approved by the governing authority of a port or corporation. It is an implied contract established for marine terminals which is designed to include all terms, conditions and rates for using a specific facility or various facilities under control of a single port management authority. They are generally applied to carriers and shippers who use marine facilities. Tariffs are established to allow for rapid conclusions of agreement between the port/terminal operator and a vessel operator or shipper.

The tariff is established under the authority of the port or terminal operator and in essence dictates all of the terms and conditions a vessel, shippers and other users of the port or terminal are to comply with when using port facilities. The tariff system was designed to eliminate complex and diversified contracts. Tariffs have a long history of being upheld in international admiralty and U.S. courts. When a tariff is published, the vessel operator agrees to all of the terms and conditions when the vessel ties up at, or when personnel enter the facility. Tariffs contain a great deal of specific information including:

- Scope and applicability
- Facility owner's rights
- Insurance requirements
- Control of the facility, vessels and cargo
- Prohibited cargos
- Protection for the terminal operator including inspections
- Payment of charges
- Loss or damage of the facility
- Complaint processes
- Additional provisions as the terminal operator may determine appropriate
- Rates and charges

Tariffs apply equally to all vessels and cargo handled at the terminal and do not allow for preferential treatment. They can include incentive rates and provisions for agreements outside of the tariff. Under U.S. Federal Maritime Commission rulings, such agreements must be available to all parties using the port or terminal if the facility manager is qualified and certified as a Marine Terminal Operator (MTO) which is required when handling international cargo. Even if only domestic cargo is handled, a tariff is critical for the terminal operator.

The tariff is designed to provide an optimal amount of protection for the port/terminal operator as recognized by U.S. and international law. A key advantage is that the tariff may be updated easily without having to reopen individual contracts. It can also be designed for shorter terms and can be modified regularly as conditions or circumstances dictate. Tariffs also allow for the adjustment of rates charged for terminal services as the market or revenue requirements of the terminal operator change. In addition to terms and conditions, the tariff contains all of the rate structures that apply to the vessel and cargo.

Many facilities also have separate terminal rules and regulations which address specific operational, safety and security issues on site which are applicable to staff, vessel crews and other persons using the terminal. These are established under the authority of the tariff and provisions and changes are managed by port

or terminal management staff. Tariffs also provide for the establishment of special agreements such as incentives, and leaseholds outside of the tariff under the authority of the port or terminal management. The community also benefits from economic development opportunities such as these by gaining job opportunities and ancillary businesses that will grow with the establishment of the port, while the developer/ investor benefits from these revenue sources to help in the continued development and maintenance of the necessary and costly infrastructure.

Rate structures are developed by the private entity that is making the investment and operating the facility. Most marine terminals categorize rate structures into each of the following key areas:

- Dockage
- Wharfage
- Demurrage
- Terminal handling
- Leaseholds
- Security
- Miscellaneous fees such as equipment
- Stevedoring services

Not all port terminals base their rate structures on the same methodology. The development of rates is, in most cases, a two-step process. First it involves the determination of actual operating cost vs. potential revenue and a second step which adjusts the rates based on market comparisons. The primary component is determined by the terminals actual operating and capital cost applied to the potential revenue for an average year and then projected forward. While components vary for each terminal, the basic framework is as follows:

a. **DOCKAGE** - A fee which is applied to the vessel for use of a pier, wharf or berth at a facility. The fee is intended to cover the cost of maintenance and capital improvements to the portion of the terminal where the ship is moored. It is determined by the annual maintenance and operating costs and amortized cost of past, current or future capital improvements applied to potential revenue. The capital improvements include the cost of piers, aprons, support and pier structures, fendering systems and berth dredging. Marine terminals use a length overall (LOA) measurement, gross (GT) or net tonnage (NT), or per standard unit method to determine the total cost which is applied on a 24 hour basis or portion of that period. Per standard unit applies to a common size or type of barge or towboat used on inland rivers. The LOA standard and per unit standard is easiest to calculate. Dockage is paid by the operator of the vessel. Rates are applied as follows:

   - Overall length (LOA) of a vessel - based on length overall (LOA) measured in feet or meters applied to the longest continuous point from the bow of the ship to the stern of the ship.
   - Gross tonnage (GT) - based on the cubic capacity of a vessel including all internal spaces. The cubic capacity is converted to metric tons and varies, depending on the construction of the vessel as well as the classification society used for tonnage certification.
   - Net tonnage (NT) - based on the cubic carrying capacity of a vessel with certain spaces removed from the calculation such as engine rooms or living spaces which are normally included in the gross tonnage (GT). The net tonnage is provided on a vessel's survey certificate as determined by a classification society. NT can vary dramatically between 50% and 80% of the GRT, depending upon the type of vessel and how it was certified.
   - Per Standard Unit-Commonly known as a barge fee or towboat for docking, it is based on a standard size or type (hopper, oil, gas) barge or towboat that ties up for the purpose of loading or discharging cargo.

b. **WHARFAGE** - Wharfage is a fee that is applied to the cargo and is paid by the cargo owner or shipper. It is determined by the annual cost of terminal facilities including operating costs, utilities, insurance,

personnel, equipment, administration, security and other costs associated with the operation of the terminal applied to potential cargo volume. The rate also includes an operational contingency percentage and profit margin. Fees are applied to units, barrels, or weight generally in tons handled to and from a vessel. Unit fees are generally applied to cargo contained in intermodal containers, for equipment or automobiles. Tonnage rates are applied to dry bulk cargoes such as coal, aggregate, salt or agricultural products. Per barrel rates are generally applied to liquid bulk cargoes. Rates are commonly broken down by commodity based on the type of cargo a port or terminal handles. Rates are applied as follows:

- Per unit - cost per unit based on loaded, empty or on a value per unit basis. Generally applied to containers.
- Per ton - based on short tons equal to 2000 pounds per ton, long tons which is equal to 2240 pounds or the metric ton which is the most common international standard equal to 2204 pounds or 1000 kilograms per ton.
- Per barrel rate - based upon the specific gravity of the liquid measured at 60 degrees Fahrenheit.

c. **TERMINAL HANDLING** - Terminal handling is a fee charged to the cargo on per unit, per ton or per barrel basis used by terminal operators to cover the cost of their terminal operations specifically related to handling of the cargo. It is separate from the stevedoring charge and may be applied separately or built into wharfage rates for a facility. The fees are generally based on a cost of personnel, plus benefits including health, longshoreman and workman's compensation insurance, contribution to pension funds and any employee payroll taxes on a straight time or overtime basis with a management margin added.

   Terminal handling is generally set at a cost plus basis and charged at specific rates for straight time which occurs during normal operating hours or for overtime outside of that period. The cost is calculated per man-hour times the number of employed personnel. A management margin averaging between 10-15% is added by the management entity.

d. **DEMURRAGE** – Demurrage is a fee based on per units or per ton that is applied to cargo that exceeds a specific number of allotted free days for storage at the terminal. Demurrage fees are utilized by terminal operators to reduce terminal congestion and prevent a customer from "warehousing" at the terminal. Rates are based on a per unit or weight of measure basis exceeding a specific number of days retained or stored on site.

e. **LEASEHOLDS** – A Leasehold is when a terminal operator provides a portion of its facility to a shipper or other customer for their convenience in stock piling and distributing cargo that comes through the terminal. Leasehold arrangements can be based on a specific piece of property with no additional services provided or may incorporate a wider range of fees. Rates are based on per square meter, per square foot or per acre rate structures applied per week, month(s) or year(s) timeframe.

f. **SECURITY** - Security fees are an assessment being applied by terminals to cover the cost of requirements as set forth under the Marine Transportation Security Regulations (MTSR) in Canada or the Marine Transportation Security Act of 2002 (MTSA 02) in the United States. It is a universal charge that applies to all vessels and terminal users designed to cover the cost of terminal security including personnel, surveillance equipment and access controls. Supplemental security fees are applied when escorts for vessel crews are provided by the terminal or if a particular cargo has a hazardous nature. These fees are based on a per unit or per ton rate structures, may be a flat fee per vessel call or for specialized operations, may be contractor cost plus port/terminal administrative margin.

g. **MISCELLANEOUS FEES** - Miscellaneous fees are developed by terminal operators to cover any unique terminal requirements or services that may be required for vessels or cargo handling. These can include use of over the road trucking fees (also called gate fees), fees for cargo handling equipment,

fenders, gangways, ground vehicles, vendor services, utilities, water, sewage or any other service that is provided. Some ports include pilot fees and harbor fees in their tariffs or in similar separate documents depending on the level of control the port has over these charges. Not all terminals offer the same services and include them in the tariff. Some examples of miscellaneous rate structures include:

- Fleeting fees
- Over the road fees for cargo entering the terminal not conveyed over wharves
- Crane hire-per hour
- Conveyor system-per hour
- Hose or arm-per hour
- Anti-pollution boom-per foot per day
- Fenders-per unit per day
- Gangways-per day
- Ground vehicles-per unit per hour by type
- Vendor services-annual or temporary licenses
- Utilities-electrical per kilowatt hour plus administrative fee
- Water-per ton or gallon
- Sewage-per ton or gallon
- Hookup fees-per man hour, straight or overtime, plus benefits and management

h. **STEVEDORING**- Stevedoring is the management of labor (long-shoring) that handles cargo to and from vessels. It may be provided by the terminal operator or a third party contractor. These charges include the cost of long-shore gangs, management fees and additional costs such as contributions to benefit plans. Stevedoring fees are generally charged to the vessel operator or the shipper depending on cargo types.

An additional set of terms and conditions that apply to facilities are Port and Terminal Rules and Regulations. Port and terminal rules and regulations are developed by a port or terminal's port manager and generally apply to persons or firms using port facilities. The rules and regulations are established to promote safety, enhance security and address various operational needs of facilities. Authority to establish, change, add or delete provisions is in most cases granted to the port or terminal's management staff by the governing body of the port or terminal through the approved tariff. This allows management to address immediate issues without complicated approval processes. Separate rules and regulations also allow the port or terminal to simplify tariff documents by shifting a wide range of tariff provisions to a Rules and Regulation document.

This makes tariff documents easier to use. Since these documents are established under the authority of the tariff, they are also posted and provided to port users in the same manner. Unlike the tariff, they generally do not contain fees. These are referenced back to the tariff and the tariff contains a provision authorizing the "establishment of separate rules and regulations" for facility users.

Terminal Rules and Regulations generally contain the following, as well as any additional provisions as the terminal operator may determine appropriate:

- Scope and Applicability
- Definitions
- Operational Requirements
- Communications
- Mooring at Berths
- Security Rules
- Bunkering, Fueling and Transfer Requirements
- Hazmat Requirements
- Safety Rules

- Loss or Damage to the Facility
- Vehicle Rules
- Miscellaneous Rules and Regulations

In the case of public agencies that do own or manage port facilities that are in a state of municipal jurisdiction, the public agency will often assess a fee to cover the cost of providing infrastructure improvements or services. Generally in excess of property taxes, or in the form of Payments in Lieu of Taxes (PILOT), these fees cover the cost of administration, promotion, infrastructure planning and development and other services that benefit the terminals within a port district. The fees are generally placed into a designated fund for port district improvements and may be assessed in any of the following manner:

- Port District or Zone including Property and Equipment Taxes;
- Dockage and wharfage in addition to terminal rates, or shared portion charged by the terminal;
- Port user fee;
- Public infrastructure repayment fee;
- Gate assessments;
- Tonnage fees (minimum guarantees); and
- Specialty rates.

Whenever public assets and funds are involved in port development, even if terminals are privately owned and operated, the public entity serves as an advocate for the port and its related district. Public entities often apply for and receive grants on behalf of private entities for the purpose of infrastructure improvements. Once those assets are handed over to the private sector for their use, a repayment plan back to the advocating public agency is put into place. Eventually, the private sector takes ownership of the public sector financed infrastructure or equipment and the grant is repaid for future benefit of the facilities. Private terminals may also provide services to the public sector at a discount for public benefit. For example the handling and storage of road salt for a city at discounted rates to that city. The public sector may also retain ownership of public infrastructure such as piers and wharves and lease them back to the private sector. All of these options allow the public sector to advocate for port development, retain a financial benefit and allow for shared public/private sector development to the benefit of the community and the terminal operator. Job creation in the community as well as the benefit to local industries are also critical indirect benefits but not to the exclusion of direct revenue to the public sector for future investment.

Additional public services, grant funds, infrastructure development and advocacy for the port are generally within the area managed by the public sector. Revenue that support those functions are generated from port activity and should be applied equally among all port users. The funds should always be maintained separate from general funds and reinvested in the port district. Rates should be set keeping market forces and competition in mind. They should take into account the cost to shippers over the entire origin and destination pathway.

4. Commodity Analysis

This section provides an overview of the type and potential volumes of commodities that may utilize the proposed facility. For the purposes of this analysis, no restrictions on the type of services offered at the facility (dry and liquid bulk, containers, etc) are assumed. A brief overview on the type and volume of existing inland waterway shipment is provided in Section 4.1.

In order to assess potential volumes within the facilities' catchment area, an examination of the current waterway traffic flows originating and terminating in the State of Iowa is provided in Section 4.2. Next, Section provides data pertaining to current landside movements from select origins and destinations within both the assumed truck and rail catchment areas. Finally, Section 4.4 discusses locally sourced commodities and volumes through data gathered during stakeholder interviews conducted by HDR.

For much of this analysis, two data sources are predominately used:

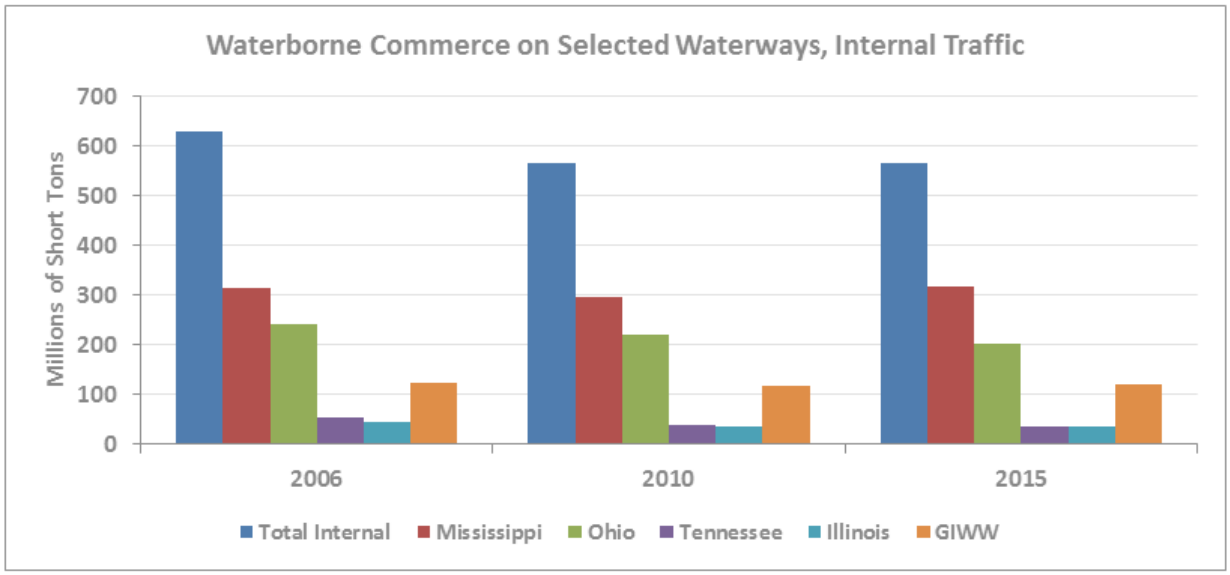
US Army Corp of Engineers, Navigation Data Center. The primary function of the Waterborne Commerce Statistics Center is to collect, process, distribute, and archive vessel trip and cargo data. These statistics are often used to analyze the feasibility of new projects and to set priorities for new investment, and for the operation, rehabilitation and maintenance of existing projects.

US Department of Transportation, Freight Analysis Framework, Version 4. The Freight Analysis Framework (FAF), produced through a partnership between Bureau of Transportation Statistics and Federal Highway Administration, integrates data from a variety of sources to create a comprehensive picture of freight movement among states and major metropolitan areas by all modes of transportation. FAF provides estimates for tonnage and value by regions of origin and destination, commodity type, and mode.

4.1 Mississippi River Waterborne Shipments

This section provides a brief overview of the volume and nature of inland waterborne shipments within the US over the past decade. Chart 1 shows the total volume of commodities transported on selected waterways within the US.

Chart 1. Waterborne Commerce on Selected Waterways, Internal Traffic. Millions of Short Tons



Source: Final Waterborne Commerce Statistics 2015. U.S. Army Corps of Engineers Internal tonnage, as defined by the USACE, includes all tonnage moved exclusively on waterways within US boundaries. GIWW is defined as the Gulf Intercoastal Waterway; the portion of the intercoastal waterway located along the US Gulf Cost

While the Mississippi waterway system has historically captured over 50% of traffic volume among major waterways within the U.S., these volumes have not grown. Over the 2006 to 2015 timeframe, total tonnage transported on the inland waterway system has declined by slightly over 1% per annum. Along the Mississippi River, volumes have remained relatively constant throughout the past 10 years.

Mississippi River traffic predominately travels in the southbound direction (approximately 65%) as depicted in Table 1. In 2015, the USACE categories[1] of Food & Farm products coupled with Petroleum and Petroleum products accounted for over 70% of southbound cargo. All Food & Farm products flow in the southbound direction.

Upbound cargo flows are dominated by Petroleum Products, Chemicals and Crude Materials (sand, gravel, stone and other inedible bulk products).

It should be noted that while volumes of containerized commodities are included within each of these commodity groups, data with respect to the number of tons transported via containers is lacking.

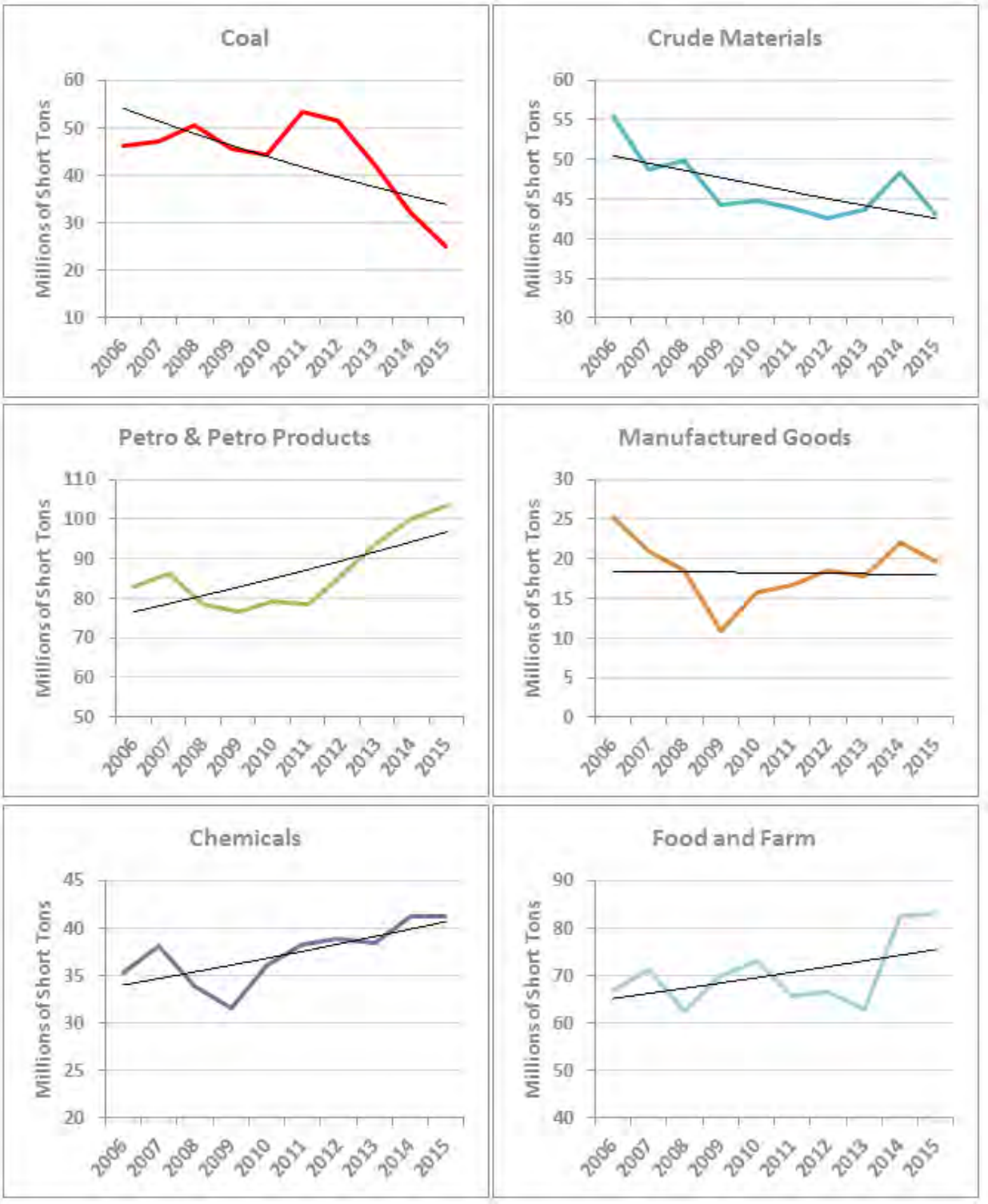
Table 1: Direction of Commodity Flows Comparison, 2015. Mississippi River System, Millions of Short Tons

COMMODITY	DOWN BOUND	% OF TOTAL, DOWN BOUND	UP BOUND	% OF TOTAL, UP BOUND	BI-DIRECTIONAL TOTAL	% OF TOTAL
Food & Farm	80.8	39.8%	0.0	0.0%	80.8	25.6%
Petro & Petro Products	64.0	31.5%	39.7	35.2%	103.7	32.8%
Crude Materials	20.5	10.1%	22.6	20.0%	43.1	13.6%
Coal	19.6	9.6%	5.3	4.7%	24.9	7.9%
Chemicals	12.0	5.9%	29.3	26.0%	41.2	13.1%
Other	6.2	3.1%	2.4	2.1%	8.6	2.7%
Manufactured Goods	-	0.0%	13.5	12.0%	13.5	4.3%
Grand Total	**203**	**100.0%**	**113**	**100.0%**	**316**	**100.0%**

While the volume of commodities transported along the Mississippi river systems has remained relatively constant over the past decade, the mix of commodities has changed. The vast majority of river volumes are dry or liquid bulk. These commodities are most cost effectively shipped by water due to their lower value per ton, are not time sensitive and can be handled with lower labor requirements and cost. Commodities moving north and south along the system are either destined for domestic use near river ports or for international ship movements where these cargoes are transloaded to ocean going ships or coastal barges. Most bulk commodities have remained steady over the last several decades with strongest bulk commodities being agricultural products, liquid bulk petroleum products and chemicals, and minerals. Growth in these commodities has been offset by weakening coal demand. The biggest increase has been in consumer commodities, such as manufactured household goods, which have increase since the 2008 economic downturn ended. Chart 2 provides historical shipments of select commodities along the Mississippi river system.

1 *USACE Commodity group classification includes the following commodities:*
Coal: Coal, lignite, and coke
Petro & Petro Products: Petroleum and Petroleum Products
Chemicals: Chemicals and fertilizers
Crude Materials: Crude materials, inedible, such as: forest products, pulp, sand, gravel, stone, iron ore, marine shells, non-ferrous metallic ores, and sulphur
Manufactured Goods: Primary manufactured goods, such as: paper and allied products, concrete, iron, steel, non-ferrous metals, and wood products
Food and Farm: Food, grain, and farm products
Manufactured Equipment: All manufactured equipment
Waste material: Waste material, such as: garbage, landfill, sewage sludge, and waste water
Other: Commodity group not specifically listed in a table

Chart 2: Historical Waterborne Volumes of Select Commodities, Mississippi River



Source: Final Waterborne Commerce Statistics 2015. U.S. Army Corps of Engineers

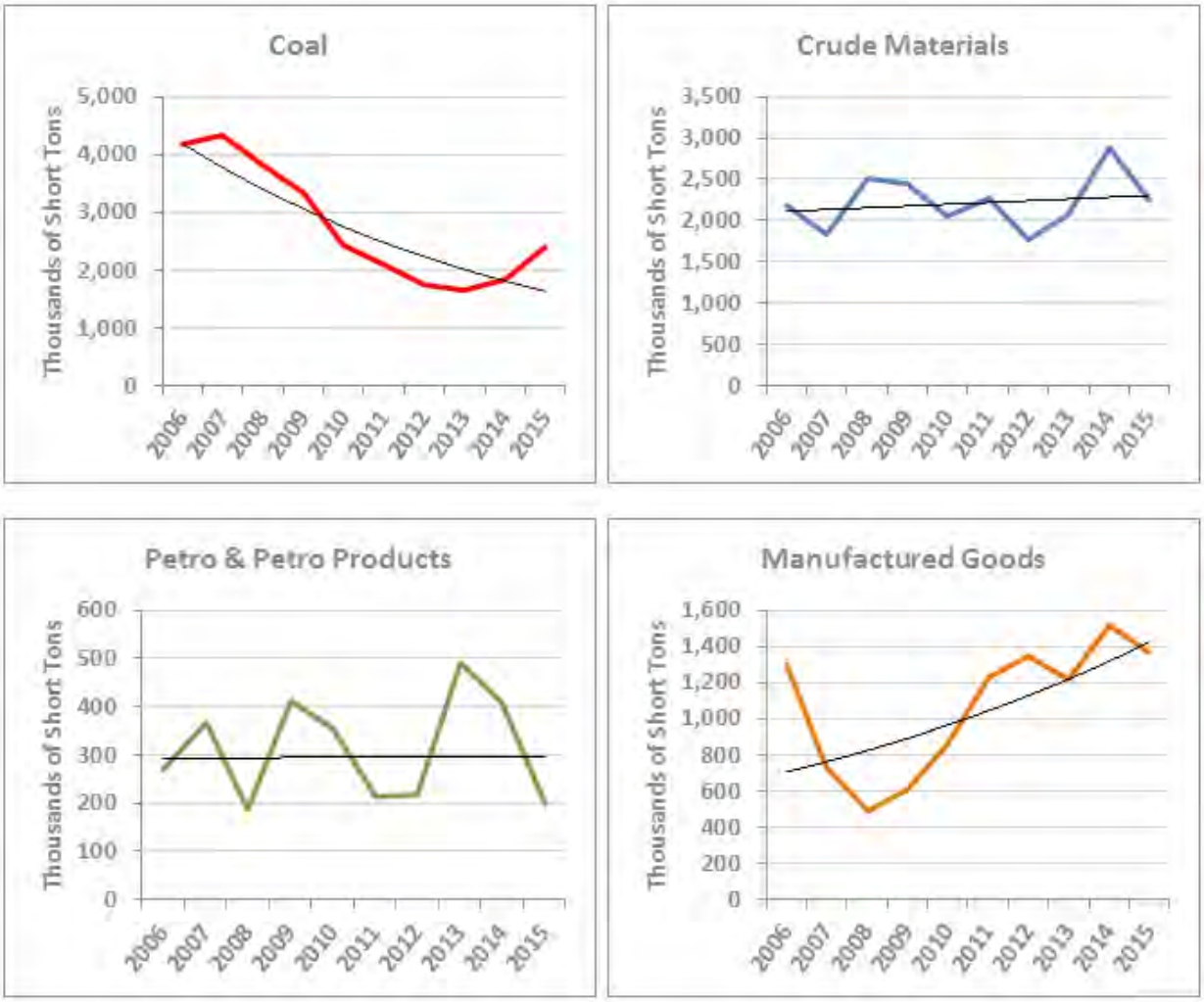
- ***Coal's*** volumes reached a minimum in 2015, reflecting an overall decrease of 46% since 2006. No significant changes in volumes are expected
- Despite a slight growth from 2013-2014 of 10%, ***crude materials*** have been a following a generally decreasing trend. Since 2014, volumes have decreased by 11%

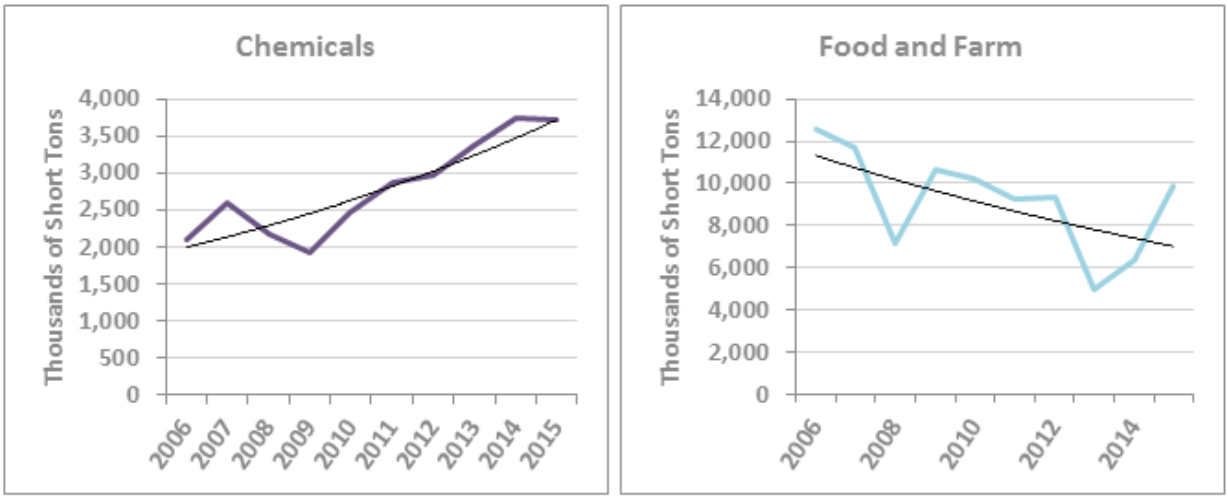
- ***Petroleum and related products*** have been following an increasing trend since 2011. Volumes since then have grown by 32%
- Following the minimum reached in 2009, ***manufactured goods'*** volumes have generally increased despite some variation. Since, 2009, volumes have grown by 79%. Following a spike from 2013-2014, volumes decreased by 11% (2014-2015)
- Since 2009, ***chemicals*** have increased in volumes by 31%, thus reflecting a strong upwards trend
- Despite relatively stagnant growth since 2014, ***food and farm product*** volumes have increased 32% since 2013

4.2 Mississippi River Waterborne Shipments Originating and Terminating in Iowa

In order to inform the type and size of the proposed facility, it is useful to examine the type and volume of Mississippi River waterborne shipments currently originating and terminating in the State of Iowa. Utilizing the US Army Corp of Engineers, Public Lock Commodity Database, Chart 3 provides historical commodity flows through select Lock and Dam 16 approximately 1 mile upstream of Muscatine, Iowa.

Chart 3: Historical Waterborne Volumes of Select Commodities, Lock and Dam 16





Source: Lock and Dam Statistic, U.S. Army Corps of Engineers

- ***Coal's*** volumes reached a minimum in 2013, reflecting an overall decrease of 62% since 2006. Despite volumes rebounding by 45%, no significant changes in volumes are expected
- ***Crude materials*** have been following a marginally increasing trend, largely driven by a 63% increase from 2012-2014. Since 2014, however, volumes have decreased by 22%
- ***Petroleum and related products*** exhibit substantial year-by-year variation, however the overall trend is flat. Volumes since 2013, however, have decreased by 60%
- Following the 2009 recession, ***manufactured goods'*** volumes have nearly tripled, although a slight 10% decrease since 2013 is observed
- Since 2009, ***chemicals*** have increased in volumes by 94%, thus reflecting a strong upwards trend
- Despite declining generally since 2006, ***food and farm product*** volumes have increased 97% since 2013. This upwards trend reflects similar behavior across the Mississippi River corridor during the period. Overall, there exists an inverse relationship to total Mississippi River corridor volumes which may be a result of numerous competing facilities and a relative underutilization of the Upper Mississippi Corridor

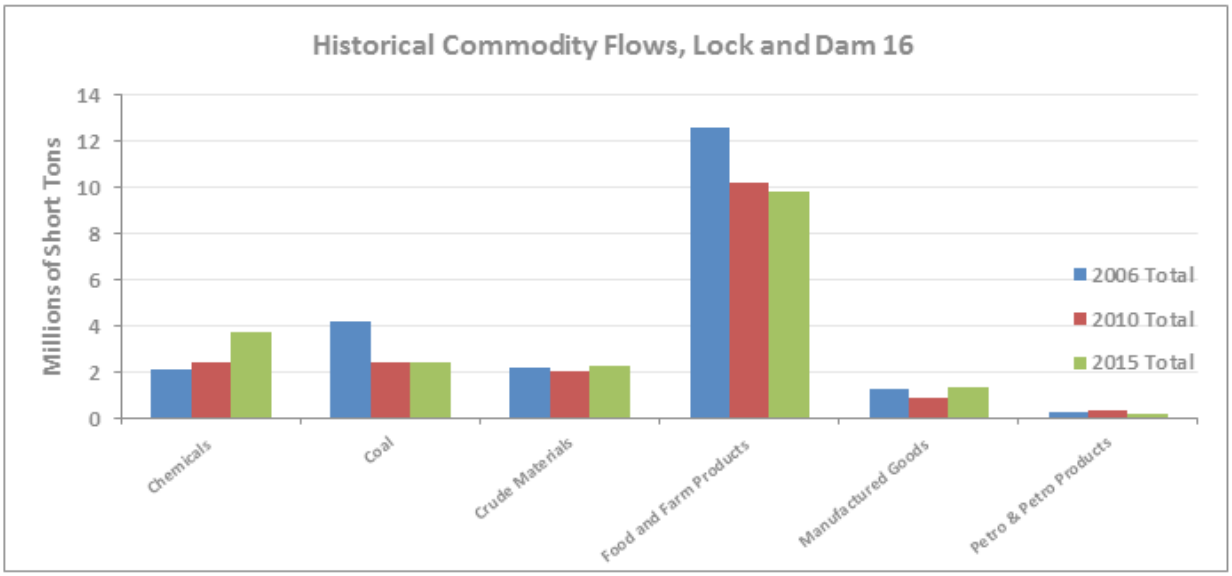
Table 2 and Chart 4 below summarize and visualize the above analysis.

Table 2. Historical Waterborne Volumes of Select Commodities, Lock and Dam 16. Millions of Short Tons

COMMODITIES	2006	2010	2015
Coal	4.19	2.44	2.39
% of Total Mississippi River Volumes	*9.04%*	*5.50%*	*9.60%*
Petro & Petro Products	0.27	0.36	0.20
% of Total Mississippi River Volumes	*0.32%*	*0.45%*	*0.19%*
Chemicals	2.09	2.46	3.71
% of Total Mississippi River Volumes	*5.94%*	*6.81%*	*9.00%*
Crude Materials	2.17	2.05	2.25
% of Total Mississippi River Volumes	*3.92%*	*4.58%*	*5.23%*
Manufactured Goods	1.30	0.86	1.36
% of Total Mississippi River Volumes	*5.15%*	*5.48%*	*6.94%*
Food and Farm	12.6	10.2	9.82
% of Total Mississippi River Volumes	*18.8%*	*13.9%*	*11.8%*

Sources: Lock and Dam Statistic, U.S. Army Corps of Engineers
Final Waterborne Commerce Statistics 2015. U.S. Army Corps of Engineers

Chart 4. Historical Waterborne Commodity Flows, Lock and Dam 16. Millions of Short Tons



Sources: Lock and Dam Statistic, U.S. Army Corps of Engineers

Following, this analysis seeks to understand commodity flow volumes originating from Iowa terminating at select destinations south of each origin state.

Table 3 below summarizes Iowa waterborne tonnage to select destinations and vise versa.

Table 3. Iowa Origin Waterborne Tonnage to Louisiana. All Commodities, Thousands of Short Tons

DESTINATION/COMMODITY	2015
LOUISIANA TOTAL	**1,977**
Cereal grains	963
% of Total Modal Tonnage	*48.7%*
Other agricultural products	1,014
% of Total Modal Tonnage	*51.3%*

Source: Freight Analysis Framework (FAF) Database

- Other agricultural products encompass the majority (51%) of Iowa waterborne tonnage to Louisiana
- Cereal grains account for the remaining volumes (49%)
- There are no Iowa origin waterborne volumes to Mississippi
- The tonnage identified (1.98M) corresponds to approximately 1,130 barges per year, or 3 per day

Lastly, the inverse direction is considered to help understand general waterborne intra-state movements.

Table 4. Louisiana Origin Waterborne Tonnage to Iowa. All Commodities, Thousands of Short Tons

COMMODITY	2015 TONNAGE
Nonmetallic minerals	112

Source: Freight Analysis Framework (FAF) Database

- As compared to the inverse direction, i.e. Iowa waterborne tonnage to Louisiana, volumes are substantially smaller
- Key waterborne freight being shipped from Louisiana to Iowa is nonmetallic minerals
- There are no Mississippi origin waterborne volumes to Iowa
- The tonnage identified (112k) corresponds to approximately 64 barges per year, or 0.2 per day

4.3 Landside Movements from Select Origins and Destinations

The following sections describe commodity landside movements from Iowa to Louisiana, and Mississippi, in addition to the inverse direction. Firstly, necessary assumptions are outlined. Following, the Study undertakes an analysis of domestic, import, and export flows.

4.3.1 Analysis Assumptions

A key driver for the proposed facility is potential commodities, and respective volumes, that may be diverted from both truck and rail onto barge. Various commodities require specialized infrastructure and equipment necessary for mixed-use facilities, and thus must be taken into account when planning potential port services. HDR conducted interviews with numerous shippers within the Muscatine area to not only identify potential intent to ship from the proposed facility, but also to understand current and potential future commodity movements. From these interviews, it was determined that container-on-barge (COB) and dry bulk shipments would play a large role. Additionally, many dry bulk commodities identified including: scrap steel, grain, and non-metallic minerals may be shipped by container. Commodity tables are sorted to display the top 3 commodities (if applicable, certain modes ship less than 3 commodities) by tonnage, and by mode.

Iowa was selected as the primary origin and forms the base for both truck and waterborne shipment analysis. It's further assumed that goods being shipped within a 2 hour catchment area, or 100 mile radius, of the proposed facility would benefit from barge shipments. Rail, however, is treated differently. Since rail, through comparison, is commonly used for intermediate and long-distance shipments, the catchment area was expanded to include states north of Iowa. Thus, the rail catchment area includes Iowa, North Dakota, Minnesota, and Wisconsin.

Destinations identified reflect tonnage analysis and supporting assumptions while being tangent to the Mississippi River. These destinations are:

- Louisiana
- Mississippi

These assumptions form the base for subsequent analysis of commodity flows, by both mode and destination. Section 4.3.1.1, following, examines domestic flows of commodities from identified origins to destinations. These volumes aid in painting a general picture of total tonnage that may reasonably be diverted to the proposed facility. Section 4.3.1.2 and Section 4.3.1.3 analyze import and export flows, respectively.

4.3.1.1 DOMESTIC COMMODITY FLOWS

Domestic flows, as discussed, help form the overall flows of commodities through identified origins to selected destinations. The analysis begins with a discussion of overall commodity tonnage shipped via multiple modes, rail, and truck.

Table 5. Iowa Origin Landside Tonnage to Louisiana, by Mode. Top 3 Commodities by Tonnage, Thousands of Short Tons

MODES/COMMODITIES	2015 TONNAGE
LOUISIANA TOTAL	**8,340**
Multiple Modes Total	3,563
Cereal grains	1,020
% of Total Modal Tonnage	*28.6%*
Machinery	3.08
% of Total Modal Tonnage	*0.09%*
Other agricultural products	2,540
% of Total Modal Tonnage	*71.3%*

Rail Total	4,659
Cereal grains	693
% of Total Modal Tonnage	*14.9%*
Crude petroleum	3,765
% of Total Modal Tonnage	*80.8%*
Natural sands	200
% of Total Modal Tonnage	*4.30%*
Truck Total	118
Chemical products	27.0
% of Total Modal Tonnage	*22.9%*
Motorized vehicles	48.1
% of Total Modal Tonnage	*40.8%*
Other foodstuffs	42.7
% of Total Modal Tonnage	*36.2%*

Source: Freight Analysis Framework (FAF) Database

- ***Multiple Modes*** account for approximately 43% of the total identified tonnage. Other agricultural products encompass the bulk of these flows, with 71% of total multiple mode volumes
- Tonnage to Louisiana is predominately shipped by ***rail*** (56%), with crude petroleum being the key commodity. As noticed with multiple modes, cereal grains are a common commodity shipped from Iowa to Louisiana
- ***Truck*** tonnage is relatively negligible, encompassing only 1.4% of total identified tonnage. Motorized vehicles are commonly shipped by truck (41%) as are other foodstuffs (36%) and chemical products (23%)
- In total, the 8.34M tons shipped corresponds to approximately 4,765 barges per year, or 13 per day

Table 6. Iowa Origin Landside Tonnage to Mississippi, by Mode. Top 3 Commodities by Tonnage, Thousands of Short Tons

MODES/COMMODITIES	2015 TONNAGE
MISSISSIPPI TOTAL	**739**
Multiple Modes Total	0.59
Motorized vehicles	0.25
% of Total Modal Tonnage	*41.6%*
Precision instruments	0.17
% of Total Modal Tonnage	*29.2%*
Textiles/leather	0.17
% of Total Modal Tonnage	*29.2%*
Rail Total	699
Cereal grains	605
% of Total Modal Tonnage	*86.5%*
Other foodstuffs	23.1
% of Total Modal Tonnage	*3.30%*
Waste/scrap	71.3
% of Total Modal Tonnage	*10.2%*

Truck Total	39.0
Base metals	13.0
% of Total Modal Tonnage	*33.4%*
Machinery	15.3
% of Total Modal Tonnage	*39.3%*
Mixed freight	10.6
% of Total Modal Tonnage	*27.2%*

Source: Freight Analysis Framework (FAF) Database

- As compared to Iowa to Louisiana volumes, ***multiple modes*** make up only 0.1 % of the total identified tonnage to Mississippi. Motorized vehicles encompass the bulk of these flows, with 42% of total multiple mode volumes. The remaining volumes are similar, with precision instruments and textiles/leather shares being 29%
- Tonnage to Mississippi is predominately shipped by ***rail*** (95%). Cereal grains are the key commodity shipped, with 87% of total modal volumes
- Lastly, tonnage shipped by truck account for the remaining 5.3% of volumes. The commodities identified have similar shares to total ***truck*** volumes; base metals (33%), machinery (39%), and mixed freight (27%)
- The 739k tons shipped corresponds to approximately 422 barges per year, or 1 barge per day

To understand inverse movements, Table 7 below summarize tonnage from Louisiana and Mississippi to Iowa.

Table 7. Louisiana Origin Landside Tonnage to Iowa, by Mode. Top Commodities by Tonnage, Thousands of Short Tons

MODES/COMMODITIES	2015 TONNAGE
MISSISSIPPI TOTAL	**124**
Multiple Modes Total	15.2
Misc. manufactured products	0.89
% of Total Modal Tonnage	*5.84%*
Nonmetallic minerals	10.2
% of Total Modal Tonnage	*66.9%*
Wood products	4.14
% of Total Modal Tonnage	*27.2%*
Rail Total	37.9
Chemical products	1.84
% of Total Modal Tonnage	*4.87%*
Newsprint/paper	19.6
% of Total Modal Tonnage	*51.7%*
Wood products	16.5
% of Total Modal Tonnage	*43.5%*
Truck Total	70.8
Articles-base metal	18.2
% of Total Modal Tonnage	*25.7%*
Machinery	23.9
% of Total Modal Tonnage	*33.8%*
Wood products	28.7
% of Total Modal Tonnage	*40.5%*

Source: Freight Analysis Framework (FAF) Database

- ***Multiple modes*** make up only 3.1 % of the total identified tonnage to Iowa. Plastics and rubber make up the bulk of these flows, with 58% of total multiple mode volumes. The remaining volumes are similar, with fertilizers and wood product shares being 19% and 23% respectively
- Tonnage to Iowa is predominately shipped by ***rail*** (84%). Chemical products are the key commodity shipped, with 50% of total modal volumes
- Lastly, tonnage shipped by ***truck*** makes up the remaining 13% of volumes. Base chemicals account for 64% of total truck volumes, while chemical products and coal make up 24% and 12% respectively
- The 1.30M tons shipped corresponds to approximately 742 barges per year, or 2 barges per day

Table 8. Mississippi Origin Landside Tonnage to Iowa, by Mode. Top 3 Commodities by Tonnage, Thousands of Short Tons

MODES/COMMODITIES	2015 TONNAGE
MISSISSIPPI TOTAL	**739**
Multiple Modes Total	0.59
Motorized vehicles	0.25
% of Total Modal Tonnage	*41.6%*
Precision instruments	0.17
% of Total Modal Tonnage	*29.2%*
Textiles/leather	0.17
% of Total Modal Tonnage	*29.2%*
Rail Total	699
Cereal grains	605
% of Total Modal Tonnage	*86.5%*
Other foodstuffs	23.1
% of Total Modal Tonnage	*3.30%*
Waste/scrap	71.3
% of Total Modal Tonnage	*10.2%*
Truck Total	39.0
Base metals	13.0
% of Total Modal Tonnage	*33.4%*
Machinery	15.3
% of Total Modal Tonnage	*39.3%*
Mixed freight	10.6
% of Total Modal Tonnage	*27.2%*

Source: Freight Analysis Framework (FAF) Database

- ***Multiple modes*** account for 12% of the total identified tonnage to Iowa. Nonmetallic minerals up the bulk of these flows, with 58% of total multiple mode volumes
- Tonnage shipped by ***rail*** makes up 31% volumes to Iowa. As compared to the inverse direction, rail is used relatively less. Newsprint/paper is the key commodity shipped, with 52% of total modal volumes. Wood products account for 43%, while chemical products encompass the remaining 5%
- Lastly, tonnage shipped by ***truck*** makes up the remaining 13% of volumes. Base chemicals account for 64% of total truck volumes, while chemical products and coal make up 24% and 12% respectively
- The 124k tons shipped corresponds to approximately 71 barges per year, or 0.2 per day

4.3.1.2 IMPORT COMMODITY FLOWS

This section aims to analyze import commodity flows imported into Louisiana and shipped directly to the Study's identified destinations. Table 9 below summarizes import tonnage from Louisiana to Iowa. The Port of New Orleans is a key port for containerized cargo, and thus Louisiana is the origin state considered.

Table 9 Louisiana Import Tonnage to Iowa, Top 3 Commodities. Thousands of Short Tons

MODES/COMMODITIES	2015 TONNAGE
LOUISIANA TOTAL	**25.9**
Multiple Modes Total	11.3
Plastics/rubber	2.16
% of Total Modal Tonnage	*19.2%*
Textiles/leather	9.11
% of Total Modal Tonnage	*80.8%*
Rail Total	14.5
Alcoholic beverages	0.26
% of Total Modal Tonnage	*1.76%*
Machinery	0.34
% of Total Modal Tonnage	*2.35%*
Metallic ores	13.8
% of Total Modal Tonnage	*94.8%*
Truck Total	0.11
Plastics/rubber	0.11
% of Total Modal Tonnage	*100%*

Source: Freight Analysis Framework (FAF) Database

- ***Multiple modes*** account for 43% of import tonnage to Iowa. Textiles/leather make up the bulk of these flows, with 81% of total multiple mode volumes
- Tonnage shipped by ***rail*** encompasses the bulk (56%) of tonnage shipped to Iowa. Metallic ores account for 95% of the rail volumes identified. Remaining alcoholic beverages and machinery volumes are relatively negligible, with shares of 1.8% and 2.3% respectively
- Lastly, tonnages shipped by ***truck*** account for the remaining 0.4% of volumes and are fairly negligible. Plastics/rubber account for all import truck volumes to Iowa
- The 26k tons shipped corresponds to approximately 15 barges per year, or 0.04 barges per day

4.3.1.3 EXPORT COMMODITY FLOWS

The last aspect of inland tonnage movements related to export flows. That is, Iowa volumes that are shipped to Louisiana for subsequent export. The Port of New Orleans is a key port for containerized cargo, and thus Louisiana is the destination state considered.

Table 9 below summarizes tonnage shipped from Iowa to Louisiana for export.

Table 9. Iowa Export Tonnage to Louisiana. Top 3 Commodities, Thousands of Short Tons

MODES/COMMODITIES	2015 TONNAGE
LOUISIANA TOTAL	**3,347**
Multiple Modes Total	1,376
Basic chemicals	5.39
% of Total Modal Tonnage	*0.39%*
Cereal grains	790
% of Total Modal Tonnage	*57.4%*

Other agricultural products	580
% of Total Modal Tonnage	*42.2%*
Rail Total	1,800
Animal feed	100
% of Total Modal Tonnage	*5.58%*
Cereal grains	1,463
% of Total Modal Tonnage	*81.3%*
Other agricultural products	237
% of Total Modal Tonnage	*13.1%*
Truck Total	86.8
Animal feed	83.7
% of Total Modal Tonnage	*96.4%*
Milled grain prods.	2.39
% of Total Modal Tonnage	*2.76%*
Plastics/rubber	0.74
% of Total Modal Tonnage	*0.85%*

Source: Freight Analysis Framework (FAF) Database

- Tonnage shipped by ***multiple modes*** is commonly cereal grains (57%) and other agricultural products (42%)
- The majority of export tonnage is shipped by ***rail*** (54%), with cereal grains accounting for the majority of rail volumes (81%)
- Export tonnage shipped by ***truck*** is fairly negligible, making up 2.6% of total identified volumes. Animal feed accounts for the bulk (96%) of truck shipments
- The 3.35M tons shipped corresponds to approximately 1,913 barges per year, or 5 per day

The Port of South Louisiana is a key destination port for bulk commodities, while the Port of New Orleans is significant for containerized shipments.

Table 10 below summarizes, by the top 5 commodities exported, commodity export flows from the Port of South Louisiana in 2015. This port is vital for bulk commodity exports.

Table 10 Port of South Louisiana, 2015 Export Tonnage. Top 5 Commodities by Tonnage, Millions of Short Tons

DESTINATION/COMMODITY	2015
Animal Feed	3.87
Coal	6.38
Maize	17.6
Petrochemicals	10.5
Soybean	22.7
Total Tonnage	**61.1**

Source: Port of South Louisiana, Cargo Tonnage Statistics

- Soybean accounts for the bulk of volumes examined, with 22.7M tons (or 37% of total identified tonnage)
- Maize exports encompass a bulk of total Port export flows. From the tonnage identified, 29% of volumes consist of maize tonnage
- Overall, agricultural products are a key bulk commodity group being exported through the Port

Following, the analysis seeks to understand volumes departing the Port of New Orleans which is a significant Port for containerized exports. Tables 11 and 12 below summarize, by commodity, tonnage top the top 5 trading partners for the Port.

Table 11. Port of New Orleans. Total Containerized Tonnage by Top 5 Trading Partners and Commodities. 2015, Millions of Short Tons

CONTAINERIZED COMMODITIES	BELGIUM	BRAZIL	CHINA	GUATEMALA	JAPAN
Cereals	0.000	0.000	0.000	0.000	0.351
Inorg Chem; Prec & Rare-earth Met & Radioact Compd	0.024	0.214	0.067	0.001	0.001
Organic Chemicals	0.086	0.080	0.020	0.001	0.001
Plastics And Articles Thereof	0.070	0.108	0.058	0.030	0.000
Rubber And Articles Thereof	0.091	0.021	0.019	0.000	0.002
Total	**0.272**	**0.424**	**0.164**	**0.033**	**0.355**

Source: US Census Bureau, Trade Database

Table 12. Port of New Orleans. Total Non-Containerized Tonnage by Top 5 Trading Partners and Commodities. 2015, Millions of Short Tons

NON-CONTAINERIZED COMMODITIES	CHINA	COLOMBIA	JAPAN	MEXICO	NETHERLANDS
Cereals	1.755	3.595	3.678	4.494	0.000
Oil Seeds Etc.; Misc Grain, Seed, Fruit, Plant Etc	6.071	0.428	0.513	0.819	0.445
Food Industry Residues & Waste; Prep Animal Feed	1.827	0.761	0.114	0.202	0.011
Mineral Fuel, Oil Etc.; Bitumin Subst; Mineral Wax	0.400	0.278	0.241	1.018	3.242
Organic Chemicals	0.085	0.009	0.017	0.000	0.026
Total	**10.1**	**5.07**	**4.56**	**6.53**	**3.72**

Source: US Census Bureau, Trade Database

From the above tables, it's noticed that cereals and organic chemicals are shipped both by container and non-containerized methods. From the top 5 commodities identified, Brazil received 34% of containerized tonnage in 2015, followed by Japan (28%), Belgium (22%), China (13%), and Guatemala (3%). The commodities most shipped, by tonnage, are cereals, plastics, and inorganic chemicals.

Non-containerized tonnage, however, slightly differs. The majority of tonnage was shipped to China (34%), while Mexico received 22% followed by Colombia (17%), Japan (15%), and the Netherlands (12%). Cereals were mostly shipped, whole oil seeds, food industry residues, and mineral fuels exhibit relatively significant volumes.

4.4 Area Shippers

This section aims to identify potential shippers within the vicinity of the proposed facility, and offer additional insights into potential commodities and respective volumes.

The Study team conducted interviews with 4 potential shippers to understand the potential need for barge services and current commodity flows. Their desirability to ship from the proposed facility, as well as a brief summary of commodity movements, is discussed below.

Company A ships approximately 4,000 containers per year of which ~60% are domestic volumes. Much of this product is shipped over 100 miles via rail to a transload facility where product is transferred into containers. Company A would rather perform this transfer in Muscatine.

Company B currently receives approximately 7 hopper rail cars per day of an ingredient. The majority of outbound shipments are domestic, generally in the Midwest, while some inbound volumes are imported. They support the proposed facility as it would allow them greater modal diversity, and help keep rail rates down.

Similarly to Company B, **Company C** would support the proposed facility due to greater modal diversity. Shipping via barge is expected to cost less and provides a physical movement option not currently available. Currently, Company C brings in product from Chicago mostly via truck. It's expected that these volumes may move alternatively via barge. Additionally, Company C has a need to move oversized items by barge, although the need is inconsistent. Future exports may include shipping product via container, in order to protect product from salt water.

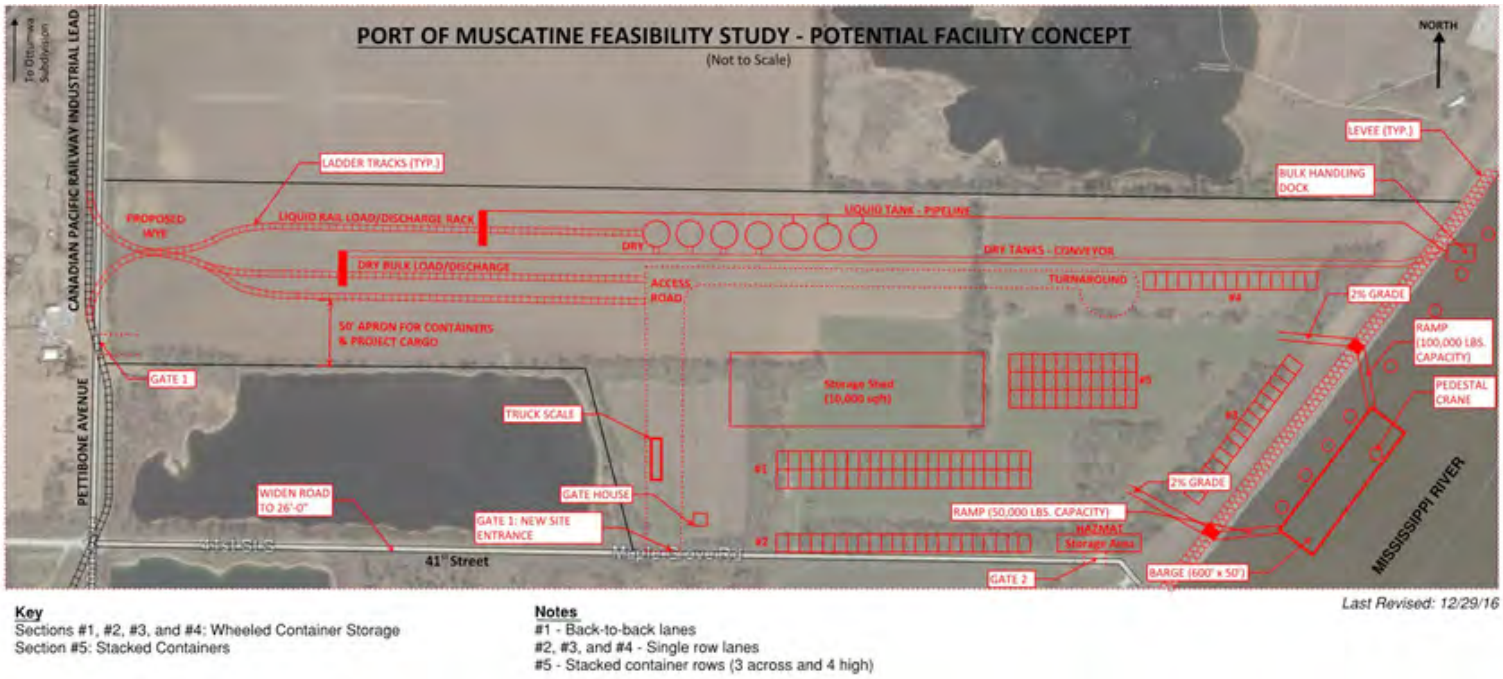
Lastly, **Company D** receives and ships approximately 900-1,000 rail cars per month. Additionally, they received 70+ barge loads and shipped 2 barge loads. Company D currently has a strong reliance on truck. They're interested in the proposed facility, it must have easy truck access. Company D has used barge facilities previously; in 2015, they used the Pettibone Avenue dock to ship 15 barges outbound.

These interviews and the information obtained are invaluable to understand potential shipper commitments and usage of the facility. It's clear that the facility must have easy truck and rail access for it to be appealing to potential shippers. There are some concerns regarding lock age and size, thus putting restrictions on barge numbers per move.

5. Conceptual Facility Layout and Cost Estimate

A potential facility concept for Muscatine, an opinion of probable conceptual capital cost to construct the facility, and a potential phased approach for implementation that matches the long-term vision for the facility has been developed for the Study. The potential facility concept is based upon data provided by the City of Muscatine, an initial site visit undertaken by the City of Muscatine and HDR, preliminary coordination with potential project stakeholders, and industry best practices and related cost experience for the development of multimodal ports. No engineering design or environmental analysis was undertaken for this phase of study. Figure 28 below shows a conceptual layout of the potential facility, including likely infrastructure, equipment, and support facilities necessary to operate the port, and connectivity of the port to the adjacent waterway, roadway, and railroad networks. Actual facility configuration, facility needs, and requirements for establishing connections with the existing waterway, roadway, and railroad networks would be identified through additional future coordination with project stakeholders.

Figure 29. Concept Layout



An opinion of probable conceptual cost to construct the potential port facility at Muscatine is presented as a range of costs by category (in 2017 dollars) and assigned to a likely phase of port implementation in Table 13 below.

Table 13. Opinion of Probable Development Costs

NEW INVESTMENT	LOW RANGE	HIGH RANGE	PHASE
Master Planning/Permitting	$100,000	$200,000	Pre-construction
Land Improvement/Pavement	$4,000,000	$9,500,000	Initial
Utilities	$200,000	$500,000	Initial
Roadway Expansion	$1,200,000	$1,800,000	Initial
Floating Barge Wharf	$3,100,000	$3,800,000	Initial
Fixed Barge Wharf	$4,500,000	$5,000,000	Initial
Mooring Caissons (4)	$400,000	$750,000	Initial
Liquid Bulk Tanks (4)	$4,000,000	$7,000,000	Phase 2
Dry Bulk Silos	$1,000,000	$1,500,000	Phase 2
Conveyor System	$2,500,000	$4,500,000	Phase 2
Piping	$250,000	$1,000,000	Phase 2
Railroad Infrastructure	$1,650,000	$1,800,000	Phase 1
Crane	$1,500,000	$4,500,000	Initial
Reach Stackers	$500,000	$600,000	Initial
Hostlers (4)	$200,000	$300,000	Initial
Spreaders (2)	$40,000	$60,000	Initial
Chassis (25)	$250,000	$300,000	Initial
Yard Gantry Crane	$750,000	$1,000,000	Phase 3
Trackmobile	$50,000	$60,000	Phase 1
Gatehouse	$10,000	$15,000	Initial
Scale (Truck)	$100,000	$150,000	Initial

Fencing	$500,000	$550,000	Initial
Miscellaneous*	$100,000	$150,000	Initial

*Miscellaneous includes signage, communications equipment, security equipment, computers, etc.

An estimate of an initial investment for the proposed facility is shown in the following table.

Table 14. Initial Investment Estimate

NEW INVESTMENT	RANGE
Master Planning/Permitting	$ 100,000 to $200,000
Land Improvement/Pavement	$4,000,000 to $9,500,000
Utilities	$200,000 to $400,000
Roadway Expansion	$1,200,000 to 1,800,000
Floating Barge Wharf	$3,100,000 to $3,800,000
Mooring Caissons (4)	$400,000 to $750,000
Equipment and Access Control	$3,200,000 to $6,625,000
TOTAL INITIAL INVESTMENT	**$12,200,000 to $23,075,000**

5.1 Implementation Plan Steps

Implementing a port and terminal development plan is based on a methodical process that takes into account the current situation in Muscatine. The facility is on private property and can be fully developed privately. However, a public agency partnership is to the advantage of the City as well as the private property owner because it opens the door to areas of public support of infrastructure as well as a partnership in promoting the port, its capabilities and insuring that port development is consistent with the comprehensive plans of the City. The following is a series of methodical steps needed to implement the desired port and terminal development. From start to finish the anticipated timeline to complete these steps should be between 12 and 16 months. It should be noted that several of these steps can and should take place simultaneously.

Step 1: Designate a Port District

The City is responsible for short and long term comprehensive planning. The initial step is for the City to create and designate a "Port Zone" that would include all of the existing industrial activities within current City boundaries through it normal comprehensive zoning process. Since the proposed facility is just beyond that boundary, working with the State and County, the new Municipal Port Zone should be expanded to include the new site and those industrial activities just south of the proposed location. This would incorporate all of the public infrastructure that is necessary for support of port activities.

The City and State can also create heavy weight roadway corridors that connect the port district to local industrial sites. This would allow for the transport of cargo that exceeds normal roadway standard weights appropriate for waterborne commerce.

Step 2: Create an Oversight Structure

The next step is to develop a structure for a public governance model that incorporates appropriate public-private partnerships. The City as a public entity has the broadest view of economic activity in the area. Through promotional efforts and planning it can stimulate growth in the surrounding industrial and commercial sectors through promotional activities, tax incentives and the development of efficient connecting infrastructure. Since the City does not own any of the proposed terminal property, it is not in a position to exercise direct control over the operations there. However, it has a direct impact on road, rail and utility corridors, all of which are essential to the success of any private or public facility.

While there are numerous different models for this, having a City entity that focuses on port activities is essential. A Port Commission is the most common method for municipalities similar to Muscatine. It would

be enabled by the City of Muscatine as a City corporation with the City Council appointing a Port Commission Committee that would be providing advocacy, grant facilitation, and support for maintaining the integrity of the district. A Port Commission is a slightly different organization than a Port Authority which normally owns its own staff, assets and has separate bonding authority. A Port Commission can use existing staff when and if required.

At a minimum, the City Council should appoint a small commission board of three to five members apointed/ submitted by the owner of the facility, with a chair, reporting to the City Council. Port tenants or those whose facilities existing within the port district should not be represented on the Board. The Board would have responsibilities and do general update reports to the Council, as well as Strategic and Master Plans to the Council of the Port District.

The ideal Board would have persons whose ability can benefit the organization. They should be generally business professionals whose careers are defined by professionalism, character & integrity. They must not have personal or professional conflicts with the port's interests and not be politically motivated. Board members should be good communicators and willing to consider all sides and must be fully supportive of management team to run the port and be willing to provide sound advice to the Director without micro-managing him/her or staff.

The Board would supervise an appointed Port Director who could be a City employee or an independent contractor depending upon the individual's background and experience. Independent contractors can be put on contract which is reviewed periodically and may be set up to reflect compensation packages that are more consistent with the industry than with municipal government. Reporting to the Director would be a Business Development Manager and Executive support. Budgets would be established either within or separate from the municipal budget and include compensation, benefits, office space and other appropriate expenses.

The Port Director's should have Senior Executive experience, be a good communicator, operationally oriented with a good background in terminal and marine operations, be knowledgeable regarding government processes and have industry experience. The Port Director would serve as the liaison to federal and state agencies for development grants, public infrastructure improvements, waterway issues, regulatory compliance and other executive management responsibilities associated with port management.

The Business Development Manager should have the supportive skills necessary to support the interest of those industries within the port district and work with community economic development personnel to enhance industry growth. Specific duties would include the development of customer databases, maintaining customer contact, work with port operators to promote port services, review of business proposals, identify business targets, market and promote the image and services of the port, handles customer relationships and coordinates public relations.

Step 3: Strategic Planning

Once the staff is in place, the Commission should develop strategic goals and master planning objectives for the port district as well as work with the private partner for the planning of the proposed Muscatine port facility. This would include advocacy before the Planning Board for the proposed site, road/rail/utility corridor improvements and support of plans before federal and state agencies.

Step 4: Proposed Site

The City of Muscatine and the developer should agree on and approve an acceptable site plan for the proposed Muscatine port site, as well as the connecting public infrastructure.

Step 5: Site Development

Site development has several steps. It begins with site engineering with phased timeline and specified costing for each phase of the development. Once the designs have reached at least a 20% completion, required

federal and state permitting processes including USACE processes can begin. This will also allow for any modifications that will have to be made as a result of the permitting process. Once completed, construction firms and final cost estimates can be completed. The site should be planned for full build out.

Step 6: Business Development Plan

New Commission staff would work with private entities in the Port District as well as those in the regional area to develop necessary databases to undertake a business development effort for all of the port entities. The database would include facility owners and manufacturers, shippers, consignees, brokers and carriers. This general information would provide an understanding of the business climate and allow local business interests to utilize this foundational data for the development of business targets. It should be noted that information gather by public entities remains public and that in most cases, private data is maintained confidentially. The gathering of public data forms the basis of private efforts with protected bridge between both entities.

Step 7: Construction Planning

As the permitting and business development plan is being undertaken, an initial construction plan tied to meeting the basic requirements of readily available and potential customers for the new marine facility can be developed. This ties infrastructure development to plausible short term opportunities and with long term plans in place, insures that infrastructure is not developed that inhibits future growth.

Step 8: Build It

Once permits are approved, initiate initial construction on site, for roadways, rail and utility corridors.

Step 9: Staffing and Tariff

During the construction planning, the operator should develop terminal staffing, operations, safety and environmental protection plans which would be ready for implementation on day 1. It should be noted that if the operator is planning on handling international cargo, the submission of a facility security plan may be required. That is a 60-90 day process. The operator may also wish to become CT-PAT Certified under US Customs regulations and apply for Foreign Trade Zone recognition if appropriate.

As part of this process, the development of a terminal tariff, regulations and pricing schedule for terminal users is necessary. This lays out all of the services offered and terms, conditions and cost of use. Including the provision of stevedoring and longshoring services. These can either be provided by the operator or under contract. Lastly, the ability to provide ancillary cargo support services is essential. This would include warehousing, tank and silo storage, container parking and cargo storage, container transloading including vanning and devanning, scales, testing and sampling, chassis repair, fumigation or any other service necessary for the handling and processing of cargo that would be appropriate on site and able to generate revenue.

5.2 Governance Models

Ports are a public asset and a public trust and must be managed for success. Successful ports are planned properly, managed professionally, are financially responsible, develop innovative investment resources, are reliable in their service offerings and claims, are partners in a region's economic development and support private terminal business development.

In the United States, there are multiple models for public port and terminal management. These models can include single or multiple terminal facilities which generally involves combined or collective property ownership and can encompass multiple facilities & waterfront areas. Port oversight is a collection of both overall port administration and specific terminal Management. Public entities have little jurisdiction over private entities but they influence or control road, rail and waterways as well as industrial zoning and tax incentives. Most port governance is focused on development, regulatory requirements, job creation and economic development and are not always limited to just marine activities. The most common public port entities consist of:

- Public Port Authorities;
- Public Port Commissions;
- State or Municipal Port Agencies;
- Publically Owned-Commercially Leased Facilities;
- Privately Owned Facilities; and
- Associated Port Entities.

Port and terminal governance revolves around essential needs and factors which include the ownership or right/title/interest related to the control of property, which in most cases is retained for some public benefit.

Governance may also include multi-jurisdictional locations such as different cities, counties or states and for the most part, vary under different government jurisdictions. The public port serves as the steward and promoter of port activities because port areas are economic engines, public assets & utilities as well as an integral part of the transportation system. Responsibilities of public ports are outlined in their enabling legislation which can be enacted by state, county or municipal governments. Public agencies are tasked to coordinate and connect together land and marine transportation infrastructure into a system and act as economic engines for their communities. In many cases, public port agencies can be landlord ports, allowing the private sector to manage marine operations, or they can be operational ports handling all terminal activities under their control. There are a number of ports that have port districts but own no property within that district except for roadways or other public utilities, similar to Muscatine. Their role involves insuring that those entities within the port district are able to utilize public assets to the benefit of both the public and private sector.

As mentioned previously, port responsibilities are based on ownership of public property and/or jurisdictional locations and control. Each has its distinct advantages and disadvantages and must be tailored and adjusted to the needs of the individual community. These include:

- Municipal ports
- State, Provincial or County ports
- Quasi-governmental ports or commissions
- Public port authorities
- Federal ports
- State or Regional Port Councils

5.2.1 Municipal Ports

Municipal ports are more common in small port areas. The local municipal entity, town or city, provides management of public port facilities or leases public property to private operators. The port's managers are within a department of the local government and are funded as part of the municipal budget. The key advantage is cost effective management because of shared municipal assets and human resources. The disadvantage is the port competes for funding with schools and community services as part of the annual municipal budget process.

5.2.2 State Ports

State ports are operated under the Transportation Department of a State and are managed or staffed with state employees. Many communities have state owned facilities which are either promoted by the state or leased to a public or private entity. State port management is often limited to port promotion or infrastructure investment. In most cases states have greater financial resources than municipalities. In some cases, municipal assets are leased to state agencies for their control and promotion. The advantage is the coordination of all transportation programs under a single state entity and larger financial resources. The disadvantage is political funding competition at the state level as well as the potential loss of local control.

5.2.3 Quasi-Governmental Port Commissions

Quasi-governmental port commissions are port models created by state legislatures, counties or municipal councils and generally have a separate form of governance. They are dependent on the state or local government for funding, asset valuation and project approvals. Port commissions are intended to allow the government entities to develop and promote marine industrial activities while still exerting a level of control over waterfront property in a community, even if they do not own any of the terminal property in that area. They exert influence because they control roadways, rail and utility access as well as zoning. Public port commissions may be part of municipal or state government, and are generally managed by government staff. They are incorporated by the state legislature or the municipal council. In the case of the state, they are generally assigned to a state department for oversight. In the case of a municipality, the council is the incorporators of the commission and budgets are maintained under a separate enterprise fund.

The primary advantage of the involvement of government in the form of a port commission in oversight includes advocating for public funding and investment in public infrastructure while having no involvement in facility management or operations. Financial resources are developed from taxes, fees, leases and other waterfront revenues which are then reinvested in public infrastructure. Their disadvantage is that the waterfront issues can be so diverse that progress may be slower than normal for industrial or commercial development. In addition, commissions often have responsibility over non-industrial or commercial activity which may divert attention from their primary mission. Development of parks, trails, marinas and other waterfront activities may be under their control. This only works effectively if the hosting authority provides sufficient budget and personnel to manage all of these activities.

5.2.4 Public Port Authorities

Public port authorities are autonomous entities that are created or enabled by a government's legislative action, in most cases, the state. They have independent management and separate bonding authority and generally own property that is dedicated to transportation uses. These include marine terminals, airports, bridges, bus systems, multi-modal transportation facilities, real estate, marinas, road and rail infrastructure and other appropriate activities. In marine ports, their focus on commercial marine terminal activities either as a terminal operator or as a landlord. Their advantage is that they have the ability to promote their business activities with limited involvement from local government processes. Their disadvantage is that they can have diverse policy from their host communities.

5.2.5 Port Councils

Port councils include independent port agencies and public officials that work together to achieve common state-wide or regional goals. Each port is represented along with key public officials who have regulatory or development responsibilities for port areas. They act as a Metropolitan Planning Office (MPO) where they review projects, coordinate State's transportation activities and allocate funding. The port council is tasked with providing a policy development forum that is coordinated with other State transportation objectives. Key is that every participating entity has its own management model appropriate to its community.

5.2.6 Additional Port Models

Aside from governance, there are also operational control models that must be considered in regard to providing services at marine facilities. Public agencies can manage both the administration and operations of a facility. It can also lease or contract the facility out to a commercial entity. Each model is designed to achieve the same goals, 24/7 operations to meet the needs of the marine and transportation system providers. These models fall into each of the following categories:

- Publically Owned-Managed and Operated
- Publically Owned-second Party Managed/Operated
- Publically Owned-Agent Managed/Third party Operated
- Privately Owned and Operated

Publically owned-managed and operated facilities are those owned by a public entity, such as a city or port authority, and are also operated by the same entity. This requires professional staff who understand how to manage and control transportation operations including the handling of barges and towboats at piers. The public entity serves as the terminal operator, stevedore (labor manager) and provides for the hiring of longshore labor. The public entity provides for benefits and pensions.

Publically owned-second party managed/operated are facilities that are owned by a public entity where the public entity serves as a landlord. It then leases the facility out to a private terminal operator and stevedore.

The private entity is responsible for all operations and administrative management of the facility. In the case of union facilities, they also contribute to benefit and pension plans.

Publically owned-agent managed/third party operated facilities are new in the industry. This model is used for publically owned facilities and provides for professional management under private contract. The contracted agent reports to the public entity but arranges for separate terminal operations and management, which are also under contract. The agent works directly for the public entity but is not an employee. The individual or firm has a fiduciary responsibility to that entity but as an industry professional(s), is able to manage the unique requirements of public facilities on behalf of the public entity.

Privately owned and operated facilities are those that are fully held privately and operated by the owner or a contract firm reporting to that owner. Unlike government entities that operate on a revenue/expense annual budget, they operate on a profit/loss model. The property is subject to taxes and other assessments from the community in which they reside. Aside from zoning or corridor access, the state, county or municipality in which they reside has little control over the private entity. Private entities may elect to continue in the business as long as it is to their benefit and may close down operations if they become unprofitable. State or local governments often arrange for a right of first refusal on the property to protect it from other than industrial use.

5.3 Recommendations

- The City should also take advantage of its public responsibilities to foster growth at local industrial parks, connect business activities along the river into a designated port district that can be supported by public efforts and promoted by the City and undertake short and long term comprehensive planning that supports commercial and industrial activities within the port district. The comprehensive planning should take into account road and rail access and improvements as well as utility corridors and access.
- A Port Commission enabled by the City of Muscatine as a City corporation should be created with an appointed Board to provide advocacy, grant facilitation and those other efforts consistent with the public sector. The Port Commission Board may hire key staff to enact the goals of the Commission. A Port Commission would provide information to the City Council, seek approvals as required and in general have the independent capability to meet the administrative, advocacy and promotional needs of the Commission.

6. Funding Alternatives

There are several possible federal and state funding programs that could support project tasks as outlined in this report. This section highlights a few of these funding alternatives.

Nationally Significant Freight and Highway Projects (FASTLANE)

DESCRIPTION

This federal grant is meant to provide financial assistance to nationally and regionally significant freight and highway projects that align with the program goals to improve safety, efficiency, and the reliability of the movement of freight and people. This grant offers $4.5 billion in assistance from 2016-2020 including $800 million for 2016 from the FAST Act.

ELIGIBILITY REQUIREMENTS

Eligible projects include the following:

- Highway freight projects on the national highway freight network;
- Highway or bridge projects on the national highway system including in the national scenic area or meant to add capacity to improve mobility;
- Highway grade crossing or grade separation project; and,
- Freight project that is intermodal or freight rail project within boundaries of public or private rail, water or intermodal facility and is necessary to facilitate direct intermodal interchange, transfer or access into or out of the facility or will make significant improvement on the national highway freight network.

And demonstrate the following characteristics:

- Improve the highway network to combat the effects of population growth, to compete in a global economy, and to meet the needs of consumers and industry;
- Address freight bottlenecks that severely constrain system performance and capacity;
- Improve the safety, efficiency, and reliability of the movement of freight and people ;
- Enable more efficiency intermodal transportation;
- Minimize delays at international borders;
- Improve inadequate first and last mile segments;
- Modernize port facilities to meet the demands of the 21st century including connections between ports and their surface transportation systems;
- Improving roadways vital to energy security;
- Enhance the resiliency of critical intermodal infrastructure and helping protect the environment; and,
- Projects that will be prioritized are those that help connect people with vital services such as employment centers, hospitals, schools, and strengthen communities through neighborhood redevelopment.

ELIGIBLE APPLICANTS

Eligible applicants must meet one or more of the following objectives:

- Generate national or regional economic benefits and an increase in global competitiveness of the United States market;
- Reduce highway congestion and bottlenecks;
- Improve connectivity between modes of freight transportation;
- Enhance the resiliency of critical highway infrastructure and help protect the environment;
- Improve roadways vital to the national energy security;
- Address the impact of population growth in the movement of people and freight; and,
- Mitigate the impacts of freight movements on communities.

Projects are separated into three categories:

1. **Large Projects**
   The minimum project size for qualifying to be considered a large project is the lesser of $100 million or 30% of the State's Federal Aid apportionment (or 50% of the larger State's apportionment if located in two states). The grants must be at least $25 million.

2. **Small Projects**
   A project is considered small if it does not meet size requirements of a large project. These projects are eligible for a minimum award of $5 million and must not exceed 60% of the future eligible project costs. 10% of funding is set aside for small projects.

3. **Rural Projects**
   Rural projects are defined as those in an area outside an urbanized area with a population of over

200,000. The cost share and minimum grant awards criteria are the same for projects located in rural and urban areas. 25% of funding is set aside for these rural projects.

PROJECT ELIGIBILITY REQUIREMENTS

- Should be reasonably expected to begin construction within 18 months;
- The project should serve needs not already met under existing Federal funding and should facilitate coordination with and leverage funds from States, local governments, metropolitan planning organizations, and representatives of public and private multimodal transportation; and,
- Federal funding from this grant can't exceed 60% of the total eligible project costs and only an additional 20% can come from other sources of Federal funding.

ELIGIBLE PROJECT COSTS

The grant money allocated to these projects can only be used for the following costs:

- Development phase activities, including planning, feasibility analysis, revenue forecasting, environmental review, preliminary engineering and design work, and other preconstruction activities; and,
- Construction, reconstruction, rehabilitation, acquisition of real property (including land related to the project and improvements to the land), environmental mitigation, construction contingencies, acquisition of equipment, and operational improvements directly related to improving the system performance.

APPLICATION PROCESS

- Applications must be submitted through Grants.gov.
- https://www.transportation.gov/sites/dot.gov/files/docs/2016%20FASTLANE%20Grants%20NOFO%20FR.pdf

Transportation Investment Generating Economic Recovery Grants

DESCRIPTION

The Transportation Investment Generating Economic Recovery (TIGER) grant is to be used to fund capital investments in surface transportation infrastructure that will have a significant impact on the nation, a region, or a metropolitan area. This grant will recognize projects that advance key transportation goals such as safety, innovation, and opportunity. The funding is allocated to transit (28.5%), Planning (1.3%), Rail (21.4%), Road (32.7%), Bicycle and Pedestrian (4.6%) and Port (11.4%).

The Tiger grant has been through seven rounds since 2009, providing funding to a total of 381 applications requesting $4.6billion. The minimum amount awarded is $5 million (or $1million for rural projects) and the maximum grant awarded is $100 million. Rural areas are defined by the US Census Bureau.

PROJECT ELIGIBLITY REQUIREMENTS

- Successful projects will leverage resources, encourage partnership, catalyze investment and growth, fill a critical void in the transportation network, or provide a substantial benefit to the nation, region, or metropolitan area in which the project is located.
- TIGER will allocate awards that ensure equitable geographic distribution of funds and an appropriate balance in addressing the needs of both rural and urban areas.
- Matching Requirement: This grant can only cover up to 80% of the project cost (100% for rural projects).
- No more than 20% of funding will be allocated to one State.

ELIGIBLE APPLICANTS

The eligible applicant requirements of TIGER allow project sponsors at the State and local level to obtain funding that is more difficult to support through traditional DOT programs. These applicants can include municipalities, counties, port authorities, tribal governments, MPOs, or others in contrast to traditional Federal programs which provide funding to very specific groups of applicants.

ELIGIBILE PROJECTS

- Highway or bridge projects eligible under title 23;
- Public transportation projects eligible under chapter 53 of title 49, US code;
- Port infrastructure investments (including inland port infrastructure and land ports of entry);
- Intermodal projects;
- Passenger and freight rail transportation projects; and,
- Project component if this component independently meets minimum award amounts, independently aligns with well with the selection criteria, and meets National Environment Policy Act requirements with respect to independently utility.

EVALUATION CRITERA

The applicants are evaluated based on the following criteria:

Primary Selection Criteria

- Improved safety;
- Economic competitiveness;
- State of good repair;
- Quality of life; and,
- Environmental Sustainability

Secondary Selection Criteria

- Innovation;
- Partnerships;
- Applicants must demonstrate the responsiveness of a project to pertinent selection criteria with the most relevant information that they can provide, regardless of whether that information has been specifically requested or identified in the notice; and,
- Applicants must provide evidence of the feasibility of reaching project milestones, financial capacity and commitment in order to support project readiness.

SUCCESS RATE

Over the course of the Tiger Program, 381 projects out of 6,700 applications were awarded funding. This is a success rate of 5.7%.

In the seventh and most recent round, 39 projects out of 627 eligible won funding (success rate of 5.4%).

APPLICATION PROCESS

- The applicant must create an account on 'Grants.gov', a process that usually takes 2-4 weeks to complete.
- The applicant must obtain a data university numbering system (DUNS) number.
- Register with the System for Award Management (SAM) at SAM.gov.
- Applications must include the standard form 424 (application for federal assistance), the project narrative, and any additional required attachments. Application should include evidence of project readiness and include a description of how the project addresses the needs of the area, creates economic opportunity, and sparks community revitalization, particularly for disadvantaged groups.
- Application should follow the guideline of steps one through eight: 1. Project Description 2. Project Location 3. Project Parties 4. Grant Funds and Sources 5. Selection Criteria 6. Cost Benefit Analysis Results 7. Project Readiness 8. Federal Wage Rate Certification.
- https://www.transportation.gov/sites/dot.gov/files/docs/2016%20TIGER%20NOFO%20FR.pdf

Transportation Infrastructure Finance and Innovation Act

DESCRIPTION

The TIFIA provides direct loans, loan guarantees and standby lines of credit to finance surface transportation projects of national and regional significance. The grant will provide the lesser of up to $50 million or 33.3% of a State's annual appointment of federal aid funds or $15million in the case of ITS.

ELIGIBILITY REQUIREMENTS

- The grant will only cover a maximum of 33% of eligible project costs;
- Must be supported in part or whole by user charges or other non-Federal dedicated funding sources and be included in the State's transportation plan;
- Foster partnerships that attract public and private investment for the project;
- Creditworthiness: ability to satisfy creditworthiness standards, achieve investment grade rating, and adequate coverage requirements to ensure repayment; and,
- Construction can occur no later than 90 days after execution of a TIFIA credit instrument.

PROJECT ELIGIBILITY REQUIREMENTS

This grant provides support to following projects:

- Any type of project eligible for federal assistance through existing surface transportation programs is eligible;
- International bridges and tunnels;
- Intercity passenger bus and rail facilities and vehicles;
- Publicly owned freight rail facilities;
- Private facilities providing public benefit for highway uses;
- Intermodal freight transfer facilities or projects providing access to such facilities; and,
- Service improvements on or adjacent to the national highway system and projects located within the boundary of a port terminal under certain conditions.

ELIGIBLE APPLICANTS

The following stakeholders can apply for a TIFIA grant:

- State or group of states;
- Metropolitan planning organization serving an urbanized area with a population above 200,000;
- Unit of local government or a group of local governments;
- Political subdivision of a State or a group of local governments;
- Special purpose district or public authority with a transportation function, including a port authority;
- Federal land management agency that applies jointly with a State or group of States;
- Tribal government or a consortium of tribal governments; and,
- Multistate or multijurisdictional group of entities described above.

EVALUATION CRITERIA

The projects will be evaluated against the following criteria:

- Environmental impact;
- Significance to the national transportation system;
- Extent to which the project generates economic benefits;
- Extent to which the project leverages private capital;
- Extent to which the project promotes innovative technologies; and,
- Senior debt must be rated investment grade by two rating agencies unless the project cost is less than $75 million.

APPLICATION PROCESS

- Must submit detailed letters of interest to the department of transportation for evaluation on creditworthiness and other eligibility requirements
- Complete letter of interest form found at the following page: https://www.transportation.gov/tifia/tifia-letter-interest-form-doc
- Application form is found at the following page https://www.transportation.gov/sites/dot.gov/files/docs/TIFIA_Application_Form.pdf

Railroad Rehabilitation and Improvement Financing

DESCRIPTION

This program provides direct loans and load guarantees up to $35billion to finance the development of railroad infrastructure. Priority is given to those that provide public benefits, including benefits to public safety, the environment, and economic development. The grant can be used to finance up to 100% of a railroad project with repayment periods up to 35 years and interest rates equal to the government cost of borrowing.

ELIGIBLE PROJECTS

Funding can be used for the following projects:

- Acquire, improve, or rehabilitate intermodal or rail equipment or facilities, including track, components of track, bridges, yards, buildings and shops.
- Refinance outstanding debt incurred for the purposes listed above.
- Develop or establish new intermodal or railroad facilities.

ELIGIBILITY REQUIREMENTS

- Must purchase steel, iron, and other manufactured goods produced in the United States for the project.
- Cannot use financing for operating expenses.
- There are no matching requirements.

ELIGIBLE APPLICANTS

- Railroads;
- State and local governments;
- Government sponsored authorities or corporations; and,
- Group of two or more entities, at least one of which is a railroad, in a joint venture

APPLICATION PROCESS

- The pre-application generally begins with a meeting with FRA staff.
- Applications, once submitted, are vetted for completeness.
- Upon acceptance, an outside advisor to FRA begins an independent due diligence of the application that takes 45 days, followed by another 45 day internal analysis.
- Applications are then transmitted to the DOT Secretary's Office and the Office of Management and Budget for final decision.
- http://www.fra.dot.gov/Page/P0128

Community Facilities Direct Loan & Grant Program

DESCRIPTION

This program provides affordable funding to develop essential community facilities in rural areas. An essential community facility is defined, by this grant, as a facility that provides an essential service to the local community for the orderly development of the community in a primarily rural area and does not include private, commercial, or business undertakings. This grant has annual appropriation of $2billion from the Federal government.

PROJECT ELIGIBILITY REQUIREMENTS

- Facilities to serve a rural area with no more than 20,000 people;
- To construct, purchase, or improve essential community facilities, purchase equipment, and pay related project expenses;
- Priority is given to healthcare, education, and public safety projects;
- Must demonstrate that the proposed community facility has substantial community support; and,
- Grants can only cover up to 75% of the cost.

ELIGIBLE APPLICANTS

- Public bodies;
- Community-based non-profit corporations; and
- Federally-recognized Tribes.

These applicants must have the following characteristics:

- Applicant must be eligible for grant assistance, which is provided on a graduated scale with smaller communities with the lowest median household income being eligible for projects with a higher proportion for grant funds;
- Applicants must be unable to fund the project from their own resources and/or through commercial credit at reasonable rates and terms; and,
- The project must demonstrate substantial public support and facilities must serve rural areas.

APPLICATION PROCESS

- Request a Data Universal Numbering System (DUNS) Number.
- Register with the System for Award Management (SAM).
- Applications are handled by the USDA Rural Development field offices.
- Approximately 45 days are needed to handle the pre-applications to determine applicant eligibility, project priority status, and funding availability.
- After the full application is submitted, the amount of time to process the application depends on project scope, environmental review, and legal issues.
- http://www.rd.usda.gov/programs-services/community-facilities-direct-loan-grant-program

Linking Iowa's Freight Transportation System (LIFTS) program

DESCRIPTION

The Linking Iowa's Freight Transportation System (LIFTS) program is a new grant funding opportunity to improve Iowa's freight transportation system. The LIFTS program seeks to address gaps in multimodal funding to assist in bolstering the freight transportation system-bet that by truck, train, barge, airplane, or several modes. The LIFTS program grants funding is not limited to a particular mode of transportation, but is designed to assist projects that contribute to effective and efficient freight transportation. The Iowa DOT has identified $2.6 million that is available for this program in 2016. The LIFTS program is a reimbursement program. If awarded a grant, invoices for completed work will be submitted to the Iowa DOT, whereupon a reimbursement up to the percentage of the match will be made. Public applicants or public-private partnership are eligible for 80% reimbursement. Private applicant are eligible for 50% reimbursement.

ELIGIBILITY REQUIREMENTS

- Must demonstrate public benefit;
- Must meet USC Title 23 Eligibility when utilizing State Infrastructure Bank funding:
  - A public freight rail facility or a private facility public benefit for highway users by way; of direct freight interchange between highway and rail carriers;
  - A modal link to transfer freight between modes;
  - A non-highway means of access to a freight facility; and
  - A service improvement for a freight rail facility or a modal transfer facility.

PROJECT ELIGIBILITY REQUIREMENTS

- Transload facilities where products are transferred between rail and truck
- Capacity improvement at barge terminals
- Intermodal facilities
- Barge transload facilities where products can be transferred from barge to truck
- Remove height or width restrictions on existing infrastructure that inhibit the movement of freight
- Ramps or docks for loading/unloading air cargo

- Increase weight capacity to use heavier 286,000 lb. rail cars
- Expand or reconfigure rail yards to increase capacity or reduce dwell time.
- Safety improvement to increase freight capacity.

ELIGIBLE APPLICANTS

The following stakeholders can apply for LIFTS grant:

- A transportation provider;
- Transportation user;
- Unit of local government or a group of local government;
- Metropolitan planning organization or regional planning affiliation;
- Any other entity with an interest in a freight transportation improvement
- Joint application and public-private partnership

ELIGIBLE COST

Activities or items eligible for funding include, but are not limited to:

- Modernization, upgrading, expansion, or reconstruction of existing and new freight modal links, including, but not limited to, air freight facilities, barge terminal facilities, intermodal facilities, transload locations, cross docks, or team tracks.
- Right of way acquisition costs.
- Matching funds, contribution, or out of pocket costs associated with obtaining a federal or private grant or loan.

EVALUATION CRITERIA:

- The Applicants are evaluated based on the following criteria:
- Freight Transportation Benefits (40%) including freight connectivity, how the project addresses freight challenges and improves freight mobility and reliability, and provides benefits to customer and shippers:
- Economic Benefits (30%) including job creation and retention, state-wide or regional influence, including benefits and cost savings to customers and shippers other investment by sponsor (leveraging private investment)
- Public Benefit (20%) including highway user benefits, safety, congestion relief, environmental and other public benefits
- Project Readiness (10%) including design status, environmental clearance, permitting, expected timeline of project.

APPLICATION PROCESS

- Applications must clearly describe the proposed project and articulate the public and freight benefits, quantifying those benefits wherever possible.
- Submit a Minority Impact Statement Form
- Application form is found at the following page: https://forms.iowadot.gov/FormsMgt/External/291320.pdf
- Completed applications are to be mailed to the following address or emailed to laura.hutzell@dot.iowa.gov.
  Attn: Laura Hutzell
  Office of Rail Transportation
  Iowa Department of Transportation800 Lincoln Way
  Ames, IA 50010

America's Marine Highway Program

DESCRIPTION

The America's Marine Highway Program is a Department of Transportation-led program to expand the use of the Nation's navigable waterways to relieve landside congestion, reduce air emissions, provide new transportation options, and generate other public benefits by increasing the efficiency of the surface transportation systems. The first round of Marine Highway Grants was awarded in September 2010. In 2016, the Consolidated Budget Act of 2016, provided $5M in grant funds for the America's Marine Highway Program.

ELIGIBLE PROJECTS

- Port and terminal infrastructure including wharves, docks, terminals and paving, etc.,
- Cargo, passenger and/or vessel handling equipment,
- Efficiency or capacity improvements in ports, terminals, aboard vessels and intermodal connectors, etc.,
- Investments that improve environmental sustainability,
- Marine Highway demonstration projects of a limited duration, and Planning, preparation and design efforts in support of Marine Highway Projects.
- Increasing the nation's economic competitiveness by adding new, cost-effective freight and passenger transportation capacity

ELIGIBILITY REQUIREMENTS

- An applicant must provide at least 20 percent of project costs from non-Federal sources.
- Use U.S. documented vessels.
- Transport passengers, containerized freight or trailer-bases freight
- Operate on a designated Marine Highway Route

ELIGIBLE APPLICANTS

- Eligible applicants are sponsors of projects that the Secretary has designated as a specific Marine Highway project under the America's Marine Highway Program.
- Project sponsors are public entities including metropolitan planning organizations (MPOs), State governments (including State Departments of Transportation), port authorities and tribal governments. Project sponsors are encouraged to develop coalitions and public/private partnerships, which include vessel owners and operators; third-party logistics providers; trucking companies; shippers; railroads; port authorities; State, regional and local transportation planners; environmental interests; impacted communities; or any combination of entities working in collaboration under a single application.

APPLICATION PROCESS

- Applications must be filed on Application for Federal Assistance, SF–424, which is available on the Grants.gov Web site.
- An application must indicate whether the proposed project is likely to require actions by other agencies

7. Summary

Based on the findings presented in this study, the development of a multimodal container terminal port facility at the proposed Muscatine site is feasible. Obviously a phased approach to the site development would be recommended, based on the volume of cargo to be handled. Overall, the greatest opportunity for marine terminal activity lies with a diversified cargo base which is handled both in bulk and containerized movements. The changing cycle of shipments warrants a broader mix that uses all of the key transportation systems available, as well as terminal capabilities. The use of containers is fundamentally for international import and export of commodities. Containers are occasionally used for domestic shipments if the revenue generated from using an international container offsets the domestic repositioning cost of that container. For example, containers are often loaded with waste paper for processing at various locations and shipped

to a location where they can be reused for export commodities. This is particularly prevalent in international shipments for containers moving back to Europe or Asia where the ocean rates can be very attractive.

In analyzing the data retrieved from various public sources and speaking with a sampling of local shippers, potential commodities that may provide for trans-load opportunities include:

- Agricultural products
- Perishable products in refrigerated or "reefer" containers. This is a fast growing international trade with both US export and US import volumes increasing.
- Petroleum based and packaged products such as chemicals and certain fuels
- PET resins. These refer to *Polyethylene terephthalate*, a common thermoplastic polymer, commonly in the polyester family.
- Grain alcohols
- Compressed gases shipped in ISO containers both domestically and internationally
- Scrap metal destined for local processing into refabricated products
- Consumer products such as manufactured goods
- Project cargo such as fabricated components for larger assembled products
- Organic and manufactured fertilizers
- Reprocessed food stuffs

Depending on volume and destination, each of the products may be moved by a single mode such as truck or rail, or more commonly by a multi-modal move consisting of truck to rail or barge (including container on barge). Commodities then commonly move by truck to a final destination. Key factors determining how the cargo will move depends foremost on total price for the entire origin and destination move, time sensitivity related to the time required to move the product, and if that is convenient for the shipper and consignee. In addition, perishable characteristics, final destination and original point of shipment, convenience of each mode, and the intermodal handling capabilities of each transfer point (in this case the river terminal) play a key role.

8. Overview and Recommendations

This section outlines the Study overview and recommendations. Specifically, business development potential, investment areas and targets, and specific recommendations are discussed.

8.1 Business Development Potential

Effective business development for new and existing facilities is based upon the gathering of information on a regular basis and capturing that data in an effective database tool. There is no single source of information that provides a "go to" location where data can be mined. Instead, business development professionals must capture data from numerous sources including conversations with perspective facility users. While data is often available from numerous public sources, often times how the data is gathered and presented is often different. For example, tonnage may be reported in metric tons, short tons or long tons; tonnage estimates may be based on actual reporting or by estimates based on vessel capacities; or containers may reported as overall totals when in fact the total may be comprised or both empty and full container moves.

Business development follows a methodical process. It is not simply marketing, but a host of key steps that focuses on informational development that leads to targeted efforts. The method follows a general path:

- Most effective and potential utilization of current assets
- Good shipper research and essential real-time data
- Development of diversified and realistic business opportunities
- Short and long term comprehensive planning
- Reasonable investment driven by business opportunities

- Comparative and competitive market pricing
- Targeted sales efforts and related effective tracking
- Stakeholder and customer relationships and service satisfaction
- Positive and balanced customer information including marketing

The effort begins with a comprehensive look at current assets. What commodities can be handled, what condition are facilities in, does the facility have the right infrastructure, what condition is the facility in, is the water of sufficient depth in the associated berths, is equipment well maintained and can handle loads efficiently and is the facility able to expand if efforts are successful. New facilities, such as the one planned for Muscatine, have excellent development potential without having to correct weaknesses in existing facilities. As opportunities develop, expansion of facilities and the related investment can be undertaken.

Good information is the key to effective business development. It is gathered from a wide variety of sources and then compared in a manner so as to paint a picture that allows the business development effort to quantify and tackle realistic opportunities. Efforts should begin with an understanding of what is moving in and out of a region and how it is being moved. This can then evolve into determining who controls cargo movement, how they make decisions as to how cargo is moved, and what the price sensitivity is. HDR began with a general overview of what was moving in the region based on an origin and destination modelling effort. A river terminal in Muscatine provides access to the Mississippi and related river system. Waterways compete with truck and rail. These movements tend to be slower but less expensive than over land methods. Time sensitive cargo generally moves by surface modes such as truck, even when it costs more.

Costs decrease because of the higher volume of cargo that can be moved in a single shipment. This is the first consideration related to cargo movement. This also takes into account transportation limitations such as rail and road congestion, access, waterway and lock closures and season issues.

Table 15. Transportation Mode Comparisons

STANDARD MODAL FREIGHT UNIT CAPACITIES	
MODAL FREIGHT UNIT	**STANDARD CARGO CAPACITY**
Highway - Truck Trailer	25 tons
Rail - Bulk Car	110 tons
Barge - Dry Bulk	1,1750 tons
Barge - Liquid Bulk	27,500 BBL

EQUIVALENT UNITS	MODE OF TRANSPORTATION		
Equivalence By Mode	1 Barge	16 rail cars	70 truck trailers
Cost per Ton-Mile (cents)*	.72 cents	2.24 cents	26.61 cents
Ton Miles per gallon of Fuel	576	413	155

Source: USDOT

Development of diversified and realistic business opportunities come from understanding how cargo moves from one region to another, both domestically or from a region to and from international markets. Once understood at the macro level, commodity movements that can be captured at the micro level can be identified. This is dependent not only upon facility capabilities and competitive transportation mode advantages and disadvantages but also cost impact to the shipper. Business activities should always be diversified so a facility is not dependent upon one single type of cargo. All cargo activity, and its related industry, goes through cycles. Bulk minerals may be substantial one year, and drop off significantly in the next, as what happened with coal in the mid-west. In 2008, the economic crisis decreased the amount of retail commodities being shipped, leading to the current glut of containers and low shipment prices. A mix of compatible activities; dry and liquid bulk, neo-bulk, container and project cargo and their respective value added services creates the best opportunity for a facility's long term viability. As a new facility, this should be a strategic goal for the Port of Muscatine.

Based on those potential opportunities, short and long term comprehensive planning can be undertaken with reasonable investment driven by realistic business opportunities. That planning also leads to the understanding of how comparative and competitive market pricing of services will factor in. In that effort, it is not the cost of facility services that is most critical, but instead the total cost of moving cargo from the point of origin to the point of destination. Attracting cargo to a facility is based upon approaching a potential customer with an understanding of their needs and challenges. Knowing what is and has to be shipped, how much time is it taking, what mode works best, and what the total cost for the entire movement is. This is the basis of the origin and destination pathway for all supply chain logistic models. Once understood, and how a shipper could benefit from a new facility in Muscatine based on all of those consideration, the business development effort can quantify and target the most likely potential customers. Targeted sales efforts must be tracked to determine if the investment in the effort is developing a return.

Stakeholder and customer relationships, as well as service satisfaction, are key to attracting and maintaining business. Much opportunity has been lost because of poor service even when cost is an advantage. Positive and balanced customer information including marketing efforts to develop and sustain the image of the facility for potential shipper consideration is essential but is ineffective without the informational foundations necessary to successful business development.

8.2 Business Development Investment Areas and Targets

The Western River system has been an effective transport mode for commodities that can be moved in larger quantities at the lowest possible costs. Bulk liquid cargoes, such as crude oil and refined products, as well as dry bulk cargoes, such as coal, grains and minerals, are transported regularly and handled at most river terminals. Some of these commodities are shifting to container due to the large number of empty containers available domestically, low international container rates, and high available container slot capacity. Loading of grain into containers is increasing in frequency because origin load costs are lower than moving the cargo in bulk and then transloading it at the distribution point. In addition, the containers are serving as intermediate storage units in many locations where high volume storage is not available[2].

Business development based on cargo handling begins with flexible infrastructure. In estimating the most viable business development potential, the same transportation and handling infrastructure that is required for bulk shipments is also, in most cases, required for container on barge shipments. Container on barge requires a load-out point for the container and then the dray to the loading port. If the load-out point is at the marine terminal, the same infrastructure is utilized and the handling costs are lowered whether the cargo moves in bulk totally by barge, or is transloaded into containers and shipped in that form. The cost savings results in the elimination of the dray to the marine terminal. The reverse is also true if the site has warehousing and distribution capacity and bulk storage.

If a terminal facility has rail, truck, and riverside handling, the options for cargo moving in numerous modes are diversified and adaptable to changing market conditions. The first step in the development of this new facility is planning that reflects on site access for all transportation modes, coupled with warehousing and storage capacity and including the ability to handle cargo in units or in bulk. Site planning should indicate all of these elements with build-out occurring as opportunities present themselves. As identified:

- Overall site improvements with improved road access
- New central gate and secondary access points including security fencing
- Utilities
- Storage capacity in the forms of dry silos, liquid bulk tanks and warehousing, including cold storage capacity
- Related load/unload racks, container tilters and loaders

2 *Halifax Commodity Study, HDR 2014.*

- Truck and rail scales
- Conveyors and pipelines
- Appropriate ground handling equipment
- Over levee infrastructure
- Two separate berths with associated mooring infrastructure and handling capability for
  - Dry/liquid bulk
  - Neo-bulk
  - Container
  - Project cargoes

After initial road access, site, mooring, and security infrastructure is put in place, other infrastructure can be developed as business opportunities present themselves. The initial should include a full build out plan, with a twenty year window, and an associated investment plan with a projected timeline estimating future costs.

The expanded designation of marine highway corridors, and increasing focus related to container on barge, warrants consideration of appropriate equipment to load and discharge containers that can transport manufactured commodities, packaged chemicals and petroleum products, bladder contained liquid commodities, agricultural products and perishables, and temperature controlled cargo.

Bulk loading/discharge infrastructure at one of the two berths should include dry and liquid bulk capability. The second berth, estimated at between 400 and 600 feet in length and fifty feet in width, should be designed to support crane capability, heavy lift and container capacity, and associated ramps and width to allow for traffic flow to and from the berth and on the wharf. To accommodate various river heights and optimize the mooring of barges alongside, a floating barge style berth would be the most appropriate.

Infrastructure development should be tied to realistic cargo opportunities. The initial development should be designed to handle multi-modal and intermodal transfer of containers and general cargo. The floating wharf and associated ramps should be constructed in such a manner as to accommodate all types of crane handled cargo. A leased construction crane with a 40 ton capacity would suffice in the initial stage of operations until such time that higher volumes of cargo require that a specialized cargo handling crane be purchased and employed.

It should be noted where a federally constructed levee and federal waterway are impacted, the US Army Corp of Engineers should be consulted and engaged early once general site concepts are accepted. The USACE will be responsible for formal permitting related to all of the waterside considerations including impacts on the waterway and river navigation.

The second step is to focus on those commodities which should remain strong or at least steady. In the commodity analysis, there was a significant drop in the handling of coal and crude. This may change with the potential for adjustments in our energy policy. Agricultural commodities (food and farm products) should remain strong because of steady demand by consumers. Petroleum products, chemicals, and manufactured goods are also projected to remain steady or increase.

General commodity data and flows should be applied to known shipper data to identify specific opportunities and potential terminal users. The sampling of shippers interviewed by HDR involved local shippers and identified a sampling of commodities that would be appropriate for a new facility in Muscatine. Those commodities included agricultural products, containerized cargo, scrap metals, minerals and chemicals.

Dynamic databases should be developed and maintained by those responsible for business development at the facility. Cooperation with, and the support of, regional economic development agencies is critical to maintaining a broad view of the regional business climate. In addition to public agencies, shippers and consignees, continual contact with brokers, common carriers particularly ocean carriers that handle containers and call on lower Mississippi River and Gulf of Mexico ports.

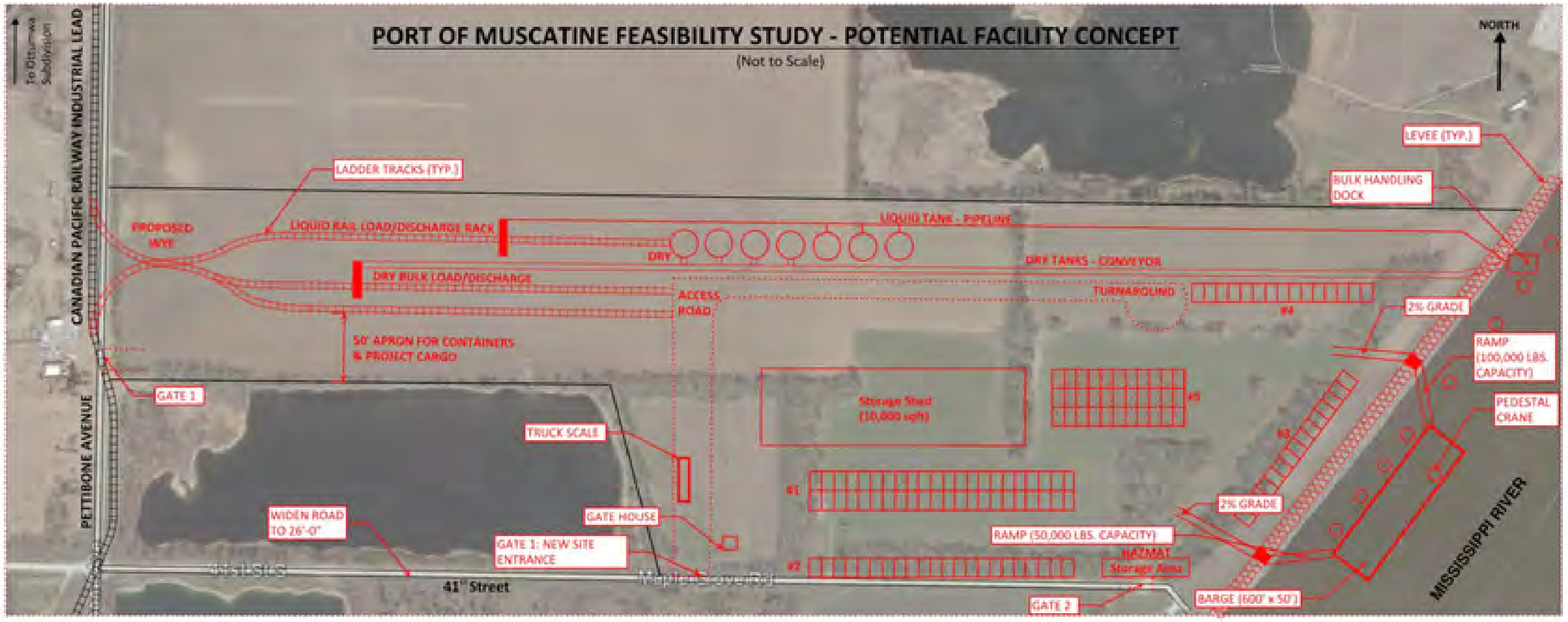
8.3 Recommendations

Based on the analysis of the proposed site, shipper interviews and commodity analysis the following is recommended for consideration:

- Develop a structure for a public association that incorporates appropriate public-private partnerships;
- Develop strategic goals and master planning objectives for the proposed Muscatine port development;
- Quantify potential funding opportunities;
- Adjust municipal zoning to create a specific and inclusive "port zone";
- Agree on an acceptable site plan for the proposed Muscatine port site;
- Develop site engineering with phased timeline and specified costing;
- Undertake the required federal and state permitting processes including USACE processes;
- Develop a business development process including shipper, consignee, broker, and carrier database;
- Develop an initial construction plan to meet basic requirements of a new marine facility, taking into account plausible short term opportunities;
- Once permits are approved, initiate construction; and
- Develop a terminal tariff, regulations, and pricing schedule for terminal users.

Appendix A

Maps

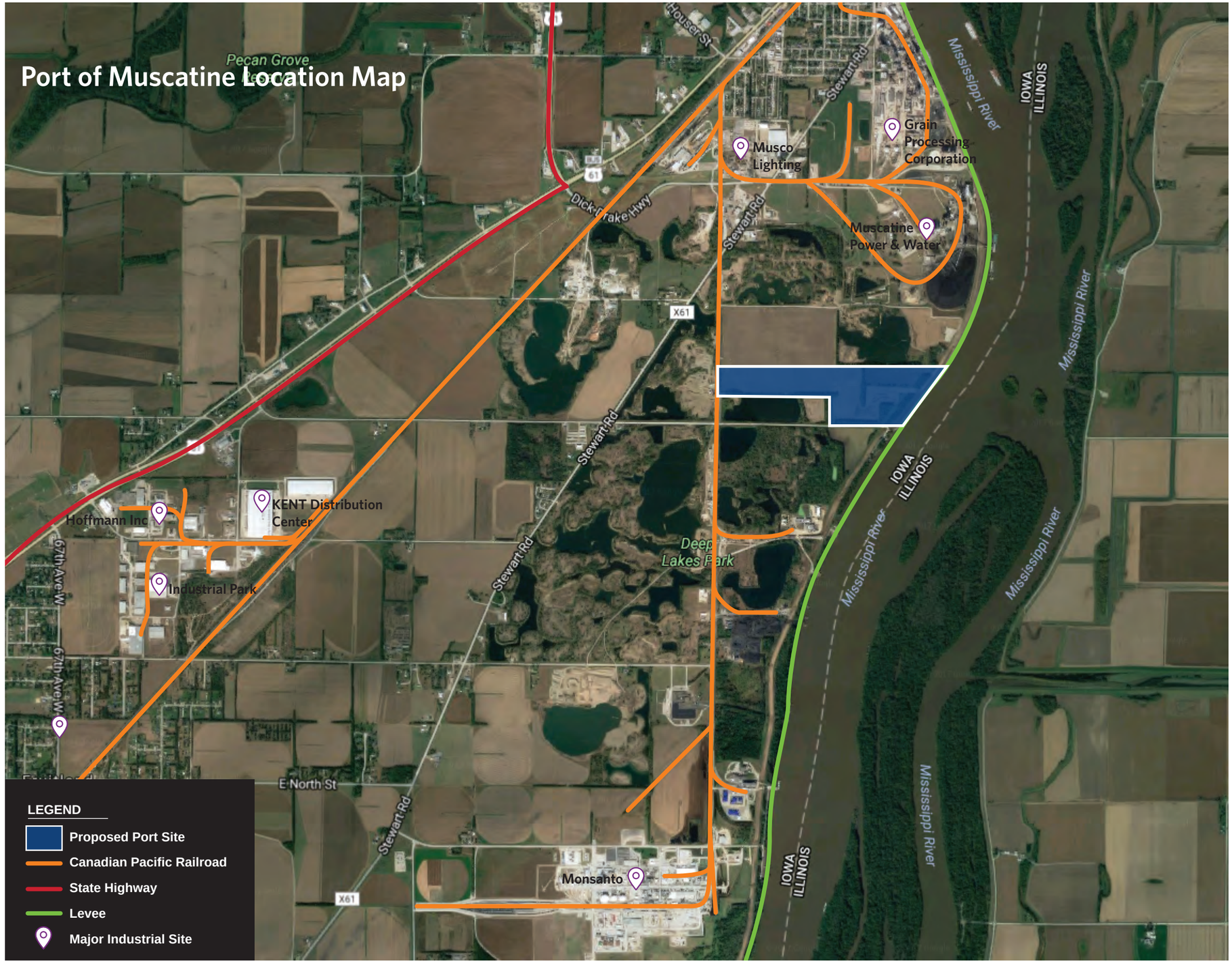


Last Revised: 12/29/16

Key
Sections #1, #2, #3, and #4: Wheeled Container Storage
Section #5: Stacked Containers

Notes
#1 - Back-to-back lanes
#2, #3, and #4 - Single row lanes
#5 - Stacked container rows (3 across and 4 high)

Port of Muscatine Location Map



Glossary

Glossary

(Excerpts from Dictionary of Maritime and Transportation Terms, Cornell Maritime Press, Monroe and Stewart, 2006-Used by Permission).

Absorption: The infusion of moisture in unprotected cargo. See also hydroscopic cargo.

Accessorial Charge: A charge assessed in addition to freight (charges), e.g., stuffing charges, loose cargo charge, terminal charge.

Accessorial Services: Service rendered by a terminal operator or carrier which is subordinate to the principal function of transportation or movement of freight across a terminal (including weighing, packing and warehousing).

Act of God: An act of nature which is totally out of control of man, e.g., tidal wave, storm, lightning, flooding.

Ad Valorem: According to value. Usually applied to a Customs duty charged upon the value only of goods that are dutiable. Abbreviated ADVAL.

Advance Charge: Funds advanced to the shipper and then collected by the carrier from the consignee at time of delivery.

"All Risks": Insurance term to cover cargo against all risks of physical loss or damage from any external cargo use irrespective of percentage. Does not cover loss due to market delay or risks of war, strikes, etc.

All Water: A shipment made exclusively by water.

Apron: The part of the pier or quay which is between the enclosed structure and the edge upon which cargo is unloaded. A reinforcing timber bolted to the after side of the stem. Also, the top surface of a pier or dock; the area along the waterfront edge of a wharf or pier.

Arbitrary: Charge assessed for shipment of cargo by water to a point beyond the original discharge port.

Atons: Aids to navigation such as buoys, ranges or other fixed aids.

Bale Cubic: The space available in a hold for the stowage of general cargo.

Barge Plan: Displays the profile view of LASH or SEABEE barge and enumerates cargoes stowed inside.

Basin: A large slip or dock partially surrounded by quays, chevron of levees.

Basin Turning: An area of water or enlargement of a channel used for turning around of vessels.

Bay: (1) An area in a transit shed or warehouse between posts and columns or the area between lateral ceiling beams or trusses projected downward to wharf or warehouse floor; the beams, trusses, columns, or posts are numbered or lettered and used to designate the location of goods on wharf in warehouse. (2) A full athwartship section of a container vessel designed for the carriage of containers.

Berth: The water area, at the waterfront edge of a wharf, reserved for a vessel; the place where a vessel is tied up when alongside a wharf.

Berth Charges: See dockage.

Bill of Lading (B/L): A contract between a shipper and a carrier that provides proof that the merchandise was transferred from the shipper to the consignee and that the carrier has assumed responsibility for the cargo until it is delivered. It serves as a document of title, a contract of carriage and a receipt for goods.

Board Measure (BM): A unit of measurement used in the lumber trade. One board foot is the equivalent of a piece of wood 1 ft x 1 ft x 1in.

Bogie: A steel frame on which is mounted road running gear having either single or tandem axles. When affixed to a chassis, this forms the running gear of a skeletal semi-trailer or full trailer – the latter requiring two bogies, the front of which is called a dolly.

Bollard: A line-securing device on a wharf around which mooring and berthing lines are fastened. Also applies to timber posts extending above the level of a wharf for the same purpose.

Camel: A wooden float, such as a large timber, placed between a vessel and a dock and acting as a fender. A decked vessel having great stability designed for use in lifting sunken vessels or structures. A submersible float used for the same purpose by submerging, attaching, and pumping out. See also caisson.

Canopy: (1) An ornamental projection over a window or doorway. (2) A rooflike covering, supported by pillars or posts, or projecting over a platform.

Caplog: The uppermost piece of timber or other material placed at the edge of a pier face or wharf edge used to provide protection to the edge of the pier from lines, equipment or environmental conditions and act as a safety stop for vehicles and personnel.

Car Seal: Used in conjunction with locking mechanism in order to seal containers. Normally, such seals are numbered and their reference made part of covering documentation.

Cargo: Merchandise or goods accepted for transportation by ship or other type of vessels. The commodities or goods that are transported in commercial enterprise, domestic trade or international trade by a common carrier.

Ad Valorum: High value cargo that usually has an additional freight charged to this type of cargo usually at a rate, based upon a percent on the declared value of the goods.

Break-Bulk Cargo: Heterogeneous items of general cargo, packaged and moved as single parcels or assembled together on pallet boards and wire or rope cargo slings as a means of lifting on and off a vessel by vessel gear or by wharf cranes.

Dry Bulk Cargo: Cargo which may be either loose, granular, free flowing or solid but is not shipped in package form, such as grain, coal, ore and the like, and is usually handled by specialized mechanical handling equipment at specially designed dry bulk terminals.

Liquid Bulk Cargo: Any form or liquid cargo such as petroleum products, chemicals, water or slurry that is carried in large quantities in tank vessels and handled through pumps and piping.

Neo-Bulk: Cargoes carried on specialized vessels that are not carried in containerized, bulk, or break-bulk form. Typical neo-bulk cargoes include automobiles, steel, logs, lumber, or scrap carried on wood products carriers and steel cargoes.

Cargo Classification: Cargo either domestic or international, which is loaded for export or outbound or received as import or inbound.

Import Cargo: Cargo that is being entered into a country engaged in international trade or is received from a domestic source.

Export Cargo: Cargo that is being moved out from a country engaged in international trade or is loaded for a domestic destination.

Inbound Cargo: Domestic cargo coming into a terminal from the waterside.

Outbound Cargo: Cargo moving out of a terminal onto water shipment.

Cargo Marks: Marks placed on cargo to identify the shipper, forwarder, and destination; marks to identify the cargo during sorting.

Charter: The leasing or renting of an entire vessel, or part of its space, for a particular trip or period of time.

Charter Party: A written contract between the owner of a vessel and the person desiring to employ the vessel (charterer) for the carriage of goods or hire of a vessel for a period of time; sets forth the terms of the arrangement such as duration of agreement, freight rate and ports involved in the trip.

Chartered Vesse: A vessel under lease by its owner to others.

Consolidated Cargo: Cargo, consisting of shipments from two or more shippers, usually shipped by a firm called a consolidator. These shipments are made by the consolidator to take advantage of lower FCL rates; parts of these savings are usually passed on to the shipper.

Container: A large standard size protective box into which cargo may be packed for shipment aboard specially configured oceangoing containerships and designed to be easily interchangeable between the three basic modes of transportation - ship, truck, and rail. The transfer unit is the container rather than the cargo contained therein. Container dimensions are usually (in feet) 8 x 8 x 40 or 8 x 8 x 20. 40 footers are called forty foot equivalent units (FEU), 20 footers are twenty foot equivalent units (TEU). Also, a truck trailer body that can be detached from the chassis for loading into a vessel, a rail car or stacked in a container depot. Containers may be ventilated, insulated, refrigerated, flat rack, vehicle rack, open top, bulk liquid or equipped with interior devices. A container may be 20 feet, 40 feet, 45 feet, 48 feet or 53 feet in length, 8′0″ or 8′6″ in width, and 8′6″ or 9′6″ in height. There are generally 5 types of containers (1) General Dry Cargo Container; (2) "Reefer" Refrigerator or Temperature Controlled Container; (3) Half High Container or Bin (flat with removable sides); (4) Tank Container; and (5) Collapsible Steel Flat. Containers can be transported intermodally by road and rail carriers and in certain sizes by air carriers.

Container Equivalents (FEU/TEU): The conversion of the various sizes (lengths) of containers in service into container equivalents (40-foot equivalents, 20-foot equivalents) to provide a common basis for comparison (20-foot equivalents are the internationally recognized standard comparison).

Container Gantry Crane: Commonly refers to rail-mounted gantry cranes located on the wharf for the purpose of loading and unloading containers.

Container-on-Flatcar (COFC): Carriage of intermodal containers (detached from their highway chassis and bogie) on rail flatcars.

Container Service: Service performed at loading port in receiving and loading cargo into containers at the container freight station (CFS) and transporting such containers from the CFS to the container yard (CY).

Contraband: Cargo which is prohibited by law.

Conveyor Gear: See dolly.

Cooper's Report: A report prepared by the person repackaging or repairing damaged or pilfered cargo.

Coupler: Device used for coupling the bottom corner casting fitting when joining two 20-foot containers, making them into a single 40-foot unit or a device for connecting railcars together.

Crane, Cargo: A crane especially adapted to the transferring of cargo between a vessel's hold and a wharf or lighter.

Crane, Fixed: A crane whose principal structure is mounted on permanent or semi-permanent foundations.

Crane, Floating: A crane mounted on a barge or pontoon which can be towed or self-propelled from place to place.

Crane, Gantry: A crane or hoisting machine mounted on a frame or structure spanning an intervening space and designed to handle containers into and out of a ship. It can be mounted on the ship as a semi-permanent part of the vessel.

Crane, Portal: A type of gantry crane with vertical legs of sufficient height and width to permit passage of vehicles, railroad equipment, or oversize cargo beneath the lifting mechanism.

Crane, Semi-Portal: A type of gantry crane with one support on the pier or wharf and the other on shed roof.

Crane, Wharf: Any crane located on a wharf or pier accessible to the hold of a vessel alongside.

Customs Duty: Tax assessed against all merchandise imported into the U.S., unless specifically exempted. Rates of duties are classified as ad valorem, specific, or compound, and vary according to commodity.

Deadheading: Moving containers in one direction without revenue cargo in container. Standard term throughout U.S. transportation industry.

Demurrage: In Charter Parties: Excess time taken for loading or unloading of a vessel not caused by the vessel operator, but due to the acts of a charterer or shipper. A penalty charge against shippers or consignees for delaying the carrier's equipment beyond the allowed free time provision of the tariff at the rail ramp. In International Transportation: A storage charge to shippers which starts accruing after a container or cargo is discharged from a vessel. The charge varies according to rules of the appropriate tariff.

Dock: A shoreside facility designed to moor vessels, technically one in which the water may flow below the apron area. A cargo handling area parallel to the shoreline. Wet docks are utilized for the loading and unloading of ships. Dry docks are utilized for the construction or repair of ships. A place such as a wharf or platform, for the loading and unloading of materials form ships. The part of a carrier's building where freight is sorted, loaded and unloaded from vehicles.

Dockage: A fee charged to a vessel for using a pier or wharf.

Dray: The short haul truck move from one terminal or mode of transportation to another terminal or mode of transportation.

Dry Freight: Nonliquified cargo not requiring controlled temperature protections.

Dwell Time: The amount of time that cargo remains at a terminal before vessel loading or after vessel discharge.

Equipment Interchange Report (EIR): A document executed by a truck carrier and a terminal transferring possession of a container or chassis from one to the other, and showing equipment condition at time of transfer.

FCL/FCL: Same as CY/CY. Full container load with cargo to be packed therein and unpacked there from at the shipper's elected point or place and at shipper's expense.

FCL/LCL: Same as CY/CFS. Full container loads stuffed by the shipper at the shipper's elected point or place and stripped by the carrier at destination. See also terms of carriage.

Fender: The term applied to devices built into or hung over the sides to prevent the shell plating from rubber or chafing against other ships or piers; a permanent hardwood or steel structure which runs fore and aft on the outside above the waterline and is firmly secured to the hull; wood spares, bundles or rope, used automobile tires, woven cane, or covered cork hung over the sides by lines when permanent fenders are not fitted.

Fender Pile: A standard wood or steel pile with a fibrous or synthetic coating above the water edge which provides a bearing surface that vessels can rest against when moored.

Free on Board (FOB): (1) The goods are placed on board a ship by the seller at a port of shipment named in the sales contract. The risk of loss or damage to the goods is transferred from the seller to the buyer when the goods pass the ship's rail. (2) FOB Airport is based on the same main principle as the ordinary FOB term. The seller fulfills his obligations by delivering the goods to the air carrier at the airport of departure. The risk of loss or damage to the cargo is transferred from the seller to the buyer when the goods are so delivered.

Gate Fee: Same as a terminal fee and charged when the cargo enters or leaves the terminal gate.

Glad Hands: The air pressure and electrical connections between a truck or tractor and a trailer or chassis.

Gross Vehicle Weight (GVW): The combined total weight of a tractive unit, trailer or chassis, and its container.

Header Bar: A beam or bar which may be swung to one side or removed to improve access. These can usually be found above the end doors of an opentop container.

Hydroscopic Cargo: Any sensitive cargo that is prone to the rapid absorption of moisture which results in damage or a change in the nature of the commodity.

Inland Points Intermodal (IPI): See micro-bridge.

ISO: International Standards Organizations.

ISO Container: A container built to ISO specifications.

KGM: See kilogram.

Letter of Indemnity: A certification that cargo is covered by a bond in case of damage.

Lifting Eye (Securing Eye): Rings or loops attached to a container or unit of cargo for lifting or securing.

Load Frame: Hydraulic-pinning barge cane spreader on a LASH vessel.

Locking Bar: Device which secures container doors at top and bottom.

MCR: Manifest correction report. An inbound document similar in use to a freight correction notice.

Methylbromide: An odorless and dangerous poison used occasionally as a fumigant to rid containers of infestation.

MTC: Metric ton or cubic meter. Most often used in reference to shipping charges, i.e., metric tons or cubic meters, whichever produces the greater revenue.

N/M: No marks.

N/N: No marks, no numbers.

Nautical Mile: International standard of measurement for ocean, bay and harbor distances equal to 6,076 feet or 1852 meters. Note: River distances are established in the U.S. in statue miles, equal to 5,280 feet.

Ocean Carrier: Ship or its owners undertaking to carry cargo for financial considerations on international or domestic ocean passage.

Over, Short & Damage Report (OS&D): A report made by the terminal listing the exceptions taken on cargo for shortages, overages, or damage.

Overall External Dimension: Maximum external overall dimensions of a container, including any permanent fitting or attachment.

Overall Weight :Maximum weight of a container or chassis, including all fittings and dunnage.

Pad: (1) Area where containers are cleaned. (2) The bottom of a chassis landing leg. See also landing gear.

Pall: Specially designed pallets, 8 feet x 4 feet.

Palletized Cargo: Individual items of cargo loaded on a pallet.

Pier: The location in a port at which cargo arrives or departs. A shoreside facility to which a vessel is secured. A structure used for loading and unloading vessels, which projects into the water. Piers extending at right angles to the shore line are called finger piers.

Place of Destination: Location at which goods or cargoes are delivered into the custody of the consignee or agent.

Port Pairing: A balanced load of inbound and outbound containers, so that a vessel will load the same number of containers it has discharged.

Prepaid at Destination: Refers to charges which are paid by the consignee at the port or place of destination prior to the release of the original bills of lading.

Receiving Pit: Receptacle into which a bulk commodity is dumped from a truck or railcar.

Reclaim Pit: A receptacle in which a bulk commodity is dumped when being removed from storage for loading aboard ship.

Roll On - Roll Off: A dry cargo vessel which loads and discharges wheeled cargo via ramps from the side or stern. Also known as Ro/Ro.

Semi-Containership: A conventional freighter carrying break-bulk cargo and a limited number of containers on deck, in hatch squares or in hatches fitted with cell guides.

Sheet Pile: Structural steel on the outside of a wharf, pier or seawall that provides a barrier for infill or other material behind the structure and a solid face on the water side.

Shipping: A quantity of goods physically tendered by a shipper at one point of origin at one time on one shipping document, for a consignee at one point of destination.

Shortage: That part of a shipment which remains undelivered.

TDCC: Transportation Data Coordinating Commission. A joint industry/government program sponsored by the Office of Facilitation, Research and Special Programs Administration, U.S. Department of Transportation. The primary purpose of the committee is to set standards for data transmission within the transportation industry.

Terminal Handling Fee: Charge assessed to a unit of freight for handling at the terminal prior to loading or after discharge from a vessel.

Terms of Carriage: Various terms (e.g., CY/CY, FCL/FCL, Door-to-Door) used to describe methods of delivering and receiving containerized cargo.

TIR (EIR) - Trailer (Equipment) Interchange Report: Document that is the delivery order for a piece of equipment either empty or loaded which also acts as the equipment receipt.

Tonnage: Weight equal to Short: 2000 lbs. Long: 2240 lbs. Metric: 2204.6 lbs.

Tonne (Metric Ton): 1000 Kilograms (2204 lbs.)

Tonnage Types: The various types of measurements associated with vessels.

Cargo Deadweight Tonnage or Cargo Capacity Tonnage: The deadweight tonnage minus items which are not part of the cargo, such as fuel, water, stores, dunnage, etc. The cargo deadweight is the maximum amount of cargo, in long tons, which the ship is able to carry; 2,240 pounds. It is the difference between the light ship weight and the displacement loaded.

Deadweight Tonnage: The displacement loaded minus the displacement light. The payload or carrying capacity of the vessel based in Long tons).

Displacement Tonnage (Loaded): The weight of the vessel including the cargo, stores, fuel, dunnage, water, and other items necessary for use on a voyage, when the vessel is loaded down to its maximum draft. This weight is equal to the weight of water displaced by the vessel when in the above condition. (Long tons).

Gross Tonnage: A measure of the internal volume of spaces, within a vessel in which 100 cu ft is 1 ton. Gross tons includes a ship's internal volume, excluding such spaces as the double bottom, peak or deep tanks used only for water ballast, open-ended poop, bridge or forecastle, certain light and air spaces, sky lights, anchor and steering gears spaces, the wheelhouse, toilets, and certain passenger spaces. Net tonnage is the gross tonnage less certain additional spaces such as officer and crew spaces, chart room and percentage of the propelling machinery spaces.

Lightweight Tons (lwt): Actual weight of the empty ship.

Net Tonnage: The internal cubic capacity of a vessel which remains after the capacities of certain specified spaces have been conducted from the gross tonnage. Tonnage should not be confused with displacement. This differs from gross tonnage in that certain additional spaces have been deducted, such as crew's spaces, etc.

Tractive Unit: The front (or towing) part of an articulated vehicle.

Trade Routes (TR): Trade route numbers assigned by U. S. Maritime Administration to encompass all U. S. and worldwide trading areas.

Trailer Interchange Report (TIR): See equipment interchange report.

Transfer Unit: Chassis equipped with a device which, when attached to a container, enables it to be pulled from railcar onto semi-trailer.

Trimmer: A compact machine having a short endless belt moving at high speed, usually attached to the outlet of a pouring spout for bulk materials, which will throw the commodity into the ends and corners of a cargo hold.

Triple Stacker: A forklift, front-end loader, or straddle carrier capable of stacking containers three-high.

Unit Packing List (UPI): A form listing all cargo loaded into a container. Also referred to as a container load plan, container manifest, container flat manifest, unit load list, stuffing manifest and unit load plan.

Unstuffing: Unloading cargo from container. See also devanning.

Vent: Ventilated container used for carriage of perishables or other cargo requiring ventilation in transit.

Wharf: A shoreside facility which extends out into deeper water to which ships secure to. Place for loading or unloading vessels. The term is also used specifically for a berthing structure of open piling construction, aligned parallel with the shoreline and referred to as a marginal wharf.

Wharf Demurrage: Penalty charge assessed against merchandise which remains on the wharf premises beyond the specified free time.

Wharf Storage: The charge assessed against freight after expiration of free time, when it has been declared and accepted for storage.

Wharfage: Charge assessed by a pier or dock owner against freight handled over the pier or dock or against a steamship company using the pier or dock.

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