Port Connectivity Report
2020-2021 TEXAS PORT MISSION PLAN

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INTRODUCTION

Texas’s seaports rely on a strong multi-modal freight network with landside connections including roadways, railroads, and pipelines that facilitate the movement of materials, goods, and people to and from the ports. Even the perception of landside mobility challenges can cause shippers to re-route goods and the cruise industry to re-route ships away from Texas ports. Investments in inland connectivity not only make the individual ports more competitive, but also contribute to the competitiveness of the state and nation so that it can continue to be a maritime trade leader. To continue to support this economic vitality, the State should consider strategic investments in infrastructure to sustain expected increases in shipping activity. These investments could include inland connectivity improvements.

The Texas Department of Transportation (TxDOT) Maritime Division has completed this Port Connectivity Report as part of the 2020-2021 Texas Port Mission Plan (PMP), the maritime mission plan required in Chapter 55 of the Texas Transportation Code. The PMP highlights the importance of investing in the port system in order to meet the growth potential of global trade opportunities. The Port Connectivity Report was developed to assess the current state of inland connectivity at 14 public ports along the Texas Gulf Coast. It focuses on roadway connections between the port gates and major freight corridors, what some may know as the first/last mile for a port. While each port has unique challenges, there are several connectivity challenges that are shared by multiple ports. This study evaluates the existing conditions of landside port access roads, identifies problems or areas of concern, and proposes potential solutions to address those issues. The outcome of this analysis is a list of recommended solutions that the ports and TxDOT can evaluate for potential implementation.
Description of Issue
Local roadway access routes between Texas ports and the highway network provide the final, critical link in the complex system that has evolved to move freight through the state and beyond. The location, design, and operational conditions of local truck routes affect both the efficiency of freight movement and the impacts of truck traffic on port communities. By designing roadways that better support the movement of trucks, connecting goods to the transportation system can be made more efficient, safer, and less disruptive to residents and the traveling public. Local roadways providing the “last mile” connections between ports and the highway network may have narrow lanes, lack sufficient shoulders, have small turning radii at key intersections, and may lack wayfinding signage. Additionally, these roads may not be constructed for oversize/overweight (OS/OW) vehicles that are often traveling in and out of ports, which may deteriorate pavement conditions faster than anticipated. Even on limited access facilities, freight design is important since trucks need longer acceleration and deceleration lanes than passenger vehicles. Because of their higher center of mass, trucks are susceptible to overturning on sharp roadway curves. Changes in roadway elevation can limit sight distance, which can affect safe stopping distances. With the trends of freight movement by truck projected to increase, designing for freight is critical to maintaining safe and operational roadways.

Case Study
The Port of Port Arthur is an important facility for handling break-bulk cargo, including forest products, steel, and military deployments. It is located 20 miles from the National Highway Freight Network and the heavy truck traffic generated by port activities rely on the state and local networks to move goods into and out of the Port. Currently, the intersection of SH 82 and SH 87 is a crash hotspot due to inadequate turning radii, short turn lanes, and an adjacent at-grade railroad crossing. The existing left-turn lane is approximately 80 feet long, which is only enough storage for one truck. With a freight-conscious redesign of the intersection, a longer turn lane would provide storage for more vehicles, reducing congestion and delays and potentially improving safety. Additional lane reconfiguration, restripping and retiming of traffic signals would alleviate heavy peak period traffic at this intersection.

Solution
Consider these roadway design factors during rehabilitation or reconstruction planning for local roads that accommodate significant freight traffic:

Direct link to Highway Freight Network: A local freight route can minimize conflicts with other roadway users and adjacent land uses when it offers the most direct practical connection. The shortest route between the port and the freight network that offers the least indirectness of travel for trucks is the most desirable. Routes that present few complexities such as turns or one-way street segments ease navigation.

Adequate Road Geometry: Trucks and other large vehicles operate most efficiently when roadway design is appropriate for their size, turning ability, and acceleration/deceleration characteristics. Important geometric considerations include number of lanes, intersections with adequate turning radii and queuing lanes for long vehicles, adequate shoulder width to allow disabled trucks to move out of traffic, absence of physical bottlenecks that can cause congestion, minimal steep grade changes, and the absence of right-of-way encroachments.

Adequate Bridge and Pavement Maintenance and Design: Deteriorated pavement and structures are causes of concern for truck operators. Trucks create high levels of wear on roadway surfaces and bridges. In some cases, pavement or bridge conditions may deteriorate to the point that weight restrictions are necessary, forcing trucks to find alternate connections to the freight network.

Adequate Vertical Clearances: Bridges, sign structures, utility lines, signal structures and other overhanging items can cause safety and operational issues for truck traffic. Older bridges, especially those not constructed to current vertical clearance standards, can be particularly problematic, especially if roadway overpasses have gradually reduced these clearances even further.

Operational Characteristics: Several key roadway operational factors can affect the utility of truck routes. Such factors include adequate signal clearance phases or protected turn phases and adequate signage for trucks to utilize designated routes for port access.

Freight movement by truck is projected to increase. Designing for freight is critical to maintaining safe and operational roadways.
**TRUCK QUEUING**

**Description of Issue**
Safely and efficiently accommodating high volumes of truck traffic is critical to port operations and requires specially designed facilities. These accommodations include truck queuing lanes, designated truck parking areas, and designated staging areas. During peak activity, trucks often must wait along state and local roadways to access the port entrances, exacerbating congestion and causing safety problems by blocking cross streets and creating bottlenecks along thoroughfares. Not providing proper accommodations for trucks creates inefficient and unsafe conditions for trucks and other users.

**Solution**
Texas ports generate high volumes of truck traffic. Without adequate storage, accommodating these volumes can have negative consequences for safety and operations of the roadway system. Transportation officials can identify appropriate areas to provide truck queuing lanes, staging areas, and parking for trucks. The facilities can be located in proximity to port terminals and intermodal operations and can be designed to facilitate truck movement to and from the regional highway system.

**Case Study**
The Port of Corpus Christi Authority experiences an influx of truck traffic along the Joe Fulton International Trade Corridor during the grain season when product must be transferred quickly to its destinations. Currently, the port facilities have limited parking and queuing areas for trucks waiting to access loading areas. There is limited roadway space on the access route and trucks often have to wait on the side of the road, affecting mobility in the area. The Port of Corpus Christi Authority was recently awarded Rider 45 funding for a roadway improvement project that will add a truck queuing area with a buffer zone to separate trucks from moving traffic. Constructing this queuing area will improve safety and ease congestion on the Joe Fulton International Trade Corridor.

**MODAL CONFLICTS**

**Description of Issue**
When thinking about mobility needs for ports, it is important to consider the various types of commercial activity and users a port serves. Mixing multiple modes such as trains, trucks, passenger vehicles, and pedestrians can cause safety issues and may lead to increased congestion, even in areas where land use is largely industrial or devoted to port activities. At-grade railroad crossings can cause significant delays for trucks and passenger vehicles as well as safety concerns at more remote crossings which may be located on higher speed roadways with limited signage and advanced warning. Additional safety concerns arise when pedestrians and cyclists are mixed with vehicular traffic, both with and without proper accommodations such as sidewalks and shared use paths. It is difficult for pedestrians to cross streets with heavy truck traffic due to the vehicles’ slow acceleration and deceleration and limited maneuverability.

**Solution**
Transportation facilities should balance the mobility needs of various users. Pedestrian facilities should be provided where needed for public safety. Such facilities would benefit cruise passengers and port employees by safely separating them from truck and rail traffic. This could include improvements such as sidewalks or separated paths, pedestrian signals at intersections, street hardscaping, pedestrian lighting, and wayfinding.

**Case Study**
The Port of Galveston is the only cruise port in Texas and is the 4th busiest in the United States. The Port also handles containerized cargo, dry and liquid bulk, break-bulk, roll-on/roll-off cargo, and project cargo. Cruise terminals require civilian access separated from the secured port operating facilities. Port Industrial Road serves as one of the principal routes taken by traffic entering and exiting the Port of Galveston facilities. In addition to serving heavy truck traffic, this road is used by cruise ship passengers, many of whom park in the parking lots west of the terminal and then walk or shuttle to the terminal. Although shuttles to the cruise terminal are provided, some passengers choose to walk to the terminal even though the road is in poor condition and doesn’t have pedestrian facilities. This leads to safety concerns for pedestrians.

**Pedestrians walk to the Port of Galveston cruise terminal.** Photo Credit: TxDOT

**Trucks queued at entrance to the Calhoun Port Authority.**

**Trucks queued during grain season on the Joe Fulton International Trade Corridor in Corpus Christi.**

**Trucks queued during the Calhoun Port Authority.**

**Pedestrians walk to the Port of Galveston cruise terminal.** Photo Credit: TxDOT
PREVIOUS CONNECTIVITY ACTIVITIES

While the state has funded multi-modal infrastructure, funds are limited since they can only come from sources that are not constitutionally dedicated to highway purposes. This greatly limits the flexibility to fund port access roads, many of which are off-system facilities that do not fall under traditional TxDOT planning processes and funding sources.

During the past two legislative sessions, the Texas Legislature has included two separate riders to help fund port access improvements. The 84th Legislative Session adopted Rider 48 which allocated up to $20 million of Texas Mobility Fund (TMF) funds to port capital improvements. The 85th Legislative Session adopted Rider 45, which allocated up to $20 million each fiscal year for a total $40 million to be spent on port access improvements. The $60 million from these two riders has been committed to twenty public roadway projects proposed by the ports, selected by the Port Authority Advisory Committee, and approved by the Texas Transportation Commission. Together, these projects will help address many of the low-cost, high impact projects around Texas ports.

INCOMPATIBLE LAND USES

Description of Issue

Many cities grew up around ports, but as port operations and industries have grown, the presence of the port can impact community quality of life. Truck traffic can create conflicts with surrounding land uses due to noise and emissions from diesel engines, induced congestion, increased safety risk, vehicle width, hazardous cargo and other factors. Heavy truck traffic is especially disruptive to residential areas and conflicts may arise between transportation users in areas with considerable pedestrian and bicycle activity, such as schools, parks, small scale retail districts, transit routes, or areas sensitive to noise such as hospitals, cemeteries, and community facilities.

Case Study

The Port of Beaumont is located adjacent to a residential area with parks, schools and places of worship. Trucks and trains accessing the Port must traverse through this neighborhood. As the Port facilities have expanded over time to handle increasing port activity, safety has become a major concern for the residents due to conflicts between port traffic and others. Aggregate material dump trucks accessing the east port entrance and trucks accessing the Exxon facility do not have a direct access route and must drive along residential streets to reach their destinations. Because of the lack of a direct route for industrial uses, trucks carrying hazardous cargo to and from the Exxon facility often use the same road that serves as a bus route through the community.

Solution

Designated or highly utilized truck routes should be located in areas with low intensity uses, lower traffic volumes, and lower development density such as industrial or agriculture areas. Where feasible, provide alternate routes to remove truck traffic from areas with incompatible land uses and to separate heavy truck traffic from local traffic such as passenger vehicles, pedestrians and bicyclists. In the case of the Port of Beaumont, providing a direct access road that serves both the Port and Exxon would minimize conflicts and improve safety and quality of life in the neighboring community while also improving truck operations in the area.
SOLUTIONS TO ENHANCE TEXAS PORT CONNECTIVITY

Existing issues and concerns were identified through a technical review of the needs assessment completed for each port (see detailed assessments in Appendix A). Additional consideration was given to areas noted by the Ports as areas of concern on the roadway network. A list of potential improvements has been identified based on existing operational deficiencies, historic and existing crash data, and gaps in the network. These solutions focus on the key access routes used by trucks to reach the port gates and leverage existing or available pavement and right of way. Several ports included in the study do not have any recommended projects at this time.

CONNECTIVITY FUNDING NEEDS

Texas Mobility Freight Plan 2017
The FAST Act of 2015 established a national policy for improving and maintaining the National Multimodal Freight Network and created the National Highway Freight Program (NHFP) to provide dedicated funding for freight projects. Texas’ Freight Program apportionments are roughly $550 million for FYs 2016-2020, but this only covers a small portion of the state’s freight needs.

The Texas Freight Mobility Plan 2017 (Freight Plan) is a comprehensive and multi-modal plan for addressing freight transportation needs. While the plan identified roughly $3.2 billion worth of port-related projects including both roadways and railroads, Texas ports have to compete with freight needs statewide, contending with over 2,500 projects with an estimated project cost of $66 billion. At the time of the Freight Plan’s adoption, only two port-related projects were selected to receive funding through the NHFP. Since the Freight Plan was developed, roughly $200 million worth of port-related projects identified in the plan have been funded through sources such as Riders 48 and 45, state transportation funding sources besides the NHFP, and other sources. This leaves roughly $3 billion worth of unfunded port-related projects in the Freight Plan.

2020-2021 Texas Port Mission Plan: Port Connectivity Report
This study focused on first and last mile connectivity challenges and identified 42 total projects with an estimated cost of $210 million. Some of the projects identified in this study are also included in the Texas Freight Mobility Plan 2017.

The potential improvement projects identified in this study fall into seven categories: Interchange/Intersection, Capacity, New Roadway, Railroad Crossing, Bridge, Safety, and Pedestrian.

This study focused on identifying and evaluating transportation solutions within the ports’ first/last mile between the port gates and freight corridors and examined both on and off-system roadways. These smaller scale projects provide valuable support to the movement of goods within the transportation network and can supplement larger scale transportation projects that address the broader mobility needs of each port. This study identified 42 solutions to address connectivity and safety concerns within the study area. These projects total approximately $210 million. A summary of the projects identified in this study are presented in the subsequent section and are further detailed in the Texas Port Connectivity Report: Full Report.

Port of Galveston truck traffic on Old Port Industrial Road
Photo Credit: TxDOT

Texas Mobility Freight Plan 2017
- $3.2B Port-Related Projects
- $3B of the $3.2B port-related projects are unfunded.
- $62.8B other Freight Projects

Texas Port Connectivity Report Projects
- Interchange/Intersection: 10 projects
- Capacity: 6 projects
- New Roadway: 4 projects
- Railroad Crossing: 8 projects
- Bridge: 1 project
- Pedestrian: 9 projects
- Safety: 10 projects

$3B Port-Related Projects
$62.8B other Freight Projects
$210M

2020-2021 Texas Port Mission Plan: Port Connectivity Report
2020-2021 Texas Port Mission Plan: Port Connectivity Report
DATA COLLECTION AND METHODOLOGY

To assess each port’s connectivity to the roadway network, data were collected from a number of sources including available Geographic Information System (GIS) datasets, information from previous reports and studies, and interviews with port officials. Relevant data were compiled into GIS to provide a visual assessment of the current conditions and needs and to identify and locate barriers to connectivity. Following this needs assessment, potential solutions were identified, evaluated for their ability to address identified needs, and ranked against performance criteria to generate a final list of solutions to enhance port connectivity.

Data collection focused on roadway performance measures, conflicts with railroads, identifying primary and secondary freight routes between port facilities and the highway freight network, gate and dock locations, and port development plans. Roadways were evaluated based on their capacity, truck volumes, bridge sufficiency ratings and clearances, and safety performance, among other characteristics. Performance thresholds were established in order to identify the segments with the greatest transportation inefficiencies. All of the data, performance measures and previous study information were compiled into exhibits documenting connectivity for each port.

DATA COLLECTION AND METHODOLOGY

Solutions were evaluated using performance measures in five categories:

1. Congestion Mitigation
2. Safety
3. Connectivity
4. Enhancements to Freight Mobility
5. Construction Complexity

Performance Data

**Mobility**
- Peak hour/peak direction
- Volume to Capacity (v/c) ratio
- Number of at-grade rail crossings
- Daily truck volume
- Texas Critical Freight Corridors

**Structures**
- Bridges posting
- Sufficiency rating
- Vertical clearance

**Safety**
- Fatal crashes per mile
- Incapacitating injury (K & A) crashes per mile

Data Collection

- National Highway Freight Network (NHFN)
- Texas Highway Freight Network (THFN)
- Oversized/Overweight (OSOW) Routes
- Class Railroads
- Other Railroads
- 5-years (2013-2017) of crashes, including those related to trucks and rail
- Railroad crossing type (at-grade, overpass, underpass)
- Vertical clearances at bridges
- United States Army Corps of Engineers (USACE) dock locations
- USACE maintained dredged channels

Landside Connection Evaluation Criteria

**Roadway Network Data**
- Roadway Related
- Known Railroad Conflicts
- Within 5 Miles
- Public Road
- TxDOT Facility
- Connected to NHFN
- Connected to THFN

**Port Connectivity Data**
- Within 1 Mile
- Serves Developed Terminal
- Serves Emerging Terminal

**Planned Improvements Data**
- Statewide Transportation Improvement Plan (STIP)
- 2017 Texas Freight Mobility Plans
- Rider 4845 Projects
- Port Capital Program
- 2018 Updated Transportation Plan (UTP)
- 2017 Texas Port Access Study

This study focused on identifying and evaluating transportation solutions within the ports’ first/last mile. The solutions focus on safety, intersections, railroad crossings, bridges, capacity, new roadways, and better accommodating pedestrian travel.

Using these measures, solutions were prioritized for each port and graphically represented on individual figures. Order of magnitude cost estimates were developed for each, and they were related to the state’s priorities for transportation and economic development as well as potential funding sources.
## PORT CONNECTIVITY PROJECT LIST

<table>
<thead>
<tr>
<th>Port</th>
<th>Improvement Type</th>
<th>Project Name</th>
<th>Cost Estimate ($M)</th>
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</thead>
<tbody>
<tr>
<td>Port of Beaumont</td>
<td>Bridge</td>
<td>Reconstruct Bridge on SH 380 at Franklin St</td>
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<td></td>
<td>Safety</td>
<td>Conduct Safety Study for SH 830 at College St</td>
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<td>Port</td>
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<td>Access Management Study on SH 380 between I-10 and Ewing St</td>
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<td>New Roadway</td>
<td>New connector from Carroll St to SH 380</td>
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<td>Feasibility Study to Raise MLK Bridge Over Sabine River</td>
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<td>Port Houston</td>
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<td>Clinton Dr between I-610 and Federal Rd - Reconfigure Travel Lanes</td>
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<td>Clinton Dr between I-610 and Federal Rd - and Penn City Rd</td>
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<td>Capacity</td>
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## Total

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<th>Port</th>
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<td>Port of Bay City</td>
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<td>Railroad Crossing</td>
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<td>Navigation Blvd Railroad Crossing Enhancements</td>
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<td>New Roadway</td>
<td>Port Rd - Construct New 2-lane Roadway</td>
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**Total** $210
REFERENCES

1. Texas Freight Mobility Plan, TxDOT 2017
2. Rider 48 Projects and Rider 45 Projects, December 2017 update

Photos shown are provided by the port unless otherwise indicated.
Front Cover: An aerial view of Port of Port Arthur.
Back Cover: An aerial view of Port of Galveston cruise terminal.