The Texas Freight Network Technology and Operations Plan (FNTOP) developed by the Texas Department of Transportation (TxDOT) Freight Planning Branch builds upon the goals introduced in the 2018 Texas Freight Mobility Plan (TFMP) and outlines identified strategies to guide technology and operations-related investments on the Texas Multimodal Freight Network (TMFN). The FNTOP engaged key public and private sector stakeholders throughout the development of the strategies to obtain feedback, suggest refinements, and evaluate priority levels. The establishment of priorities informed TxDOT’s selection of six strategies for Concept of Operations development, which is the next critical step to the implementation of the FNTOP.

A Concept of Operations document provides a high-level overview of a proposed technology concept that is traceable to stakeholder needs. The Blocked Rail Crossing Traffic Management System Concept of Operations that was developed as part of the FNTOP follows both Federal Highway Administration (FHWA) guidance as well as approved standards developed by the International Council on Systems Engineering (INCOSE). This document will be accessible to public and private stakeholders as a starting point for the future deployment of this technology concept.

What is a Concept of Operations?

It is a document that provides answers to the following questions:

- **WHY**—What is the problem or opportunity addressed by the system?
- **WHO**—Who are the stakeholders involved with the system?
- **WHAT**—What are the elements and the high-level capabilities of the system?
- **HOW**—How will the system be developed, operated, and/or maintained?
- **WHERE**—What is the geographic and physical extent of the system?
- **WHEN**—What is the sequence of activities that will be performed?

Overview

At a high level, the Blocked Rail Crossing Traffic Management System would be a notification system that alerts truckers and other roadway users of situations when a highway-rail at-grade crossing has been occupied for an extended period of time.
WHY What is the problem or opportunity addressed by the system?

- **IMPROVE** freight mobility in and around locations that are blocked/occupied by stopped or slow-moving trains for an extended period of time.
- **REDUCE** secondary incidents caused by queuing by providing alternatives to waiting in the queue.
- **PROVIDE** real-time notifications of potential delays so that freight, emergency vehicles, transit, and other roadway users can divert onto an alternative route.
- **IMPROVE** interagency coordination and overall traffic management at the local level.
- **INCREASE** Traffic Management Centers’ (TMCs) situational awareness as the events occur in the field.
- **PROVIDE** historical and real-time data (e.g., highway-rail at-grade blocked crossing duration) for better traffic operations and management, as well as awareness of citizen complaints regarding highway-rail at-grade crossing blockages.

WHO Who are the stakeholders involved with the system?

- **Owner**
  - TxDOT Divisions, TxDOT Districts

- **Key Stakeholders**
  - TxDOT Divisions, TxDOT Districts, Texas Department of Public Safety, Local Communities, Metropolitan Planning Organizations, Railroads

- **End-Users**
  - Truckers, Trucking Companies/Dispatchers, Emergency Responders, Other Roadway Users

WHAT What are the elements and the high-level capabilities of the system?

<table>
<thead>
<tr>
<th>FEATURES</th>
<th>MAIN FUNCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real-Time Blocked Rail Crossing Notifications</td>
<td>Trucks and roadway users would be informed of potential delays and options to take alternative action. This information may also include gate downtime. The information may be provided to the Advanced Traveler Information System (ATIS) directly or via the Advanced Traffic Management System (ATMS). Connected Vehicles would also receive real-time notifications.</td>
</tr>
<tr>
<td>Historical Blocked Rail Crossing Information</td>
<td>Transportation agencies would be able to respond to citizen complaints of excessive highway-rail at-grade crossing blockages with data-supported information.</td>
</tr>
<tr>
<td>Estimated Train Arrival Times</td>
<td>Roadway users would be able to receive notifications of when a train is expected to arrive at a highway-rail at-grade crossing, allowing them to make informed decisions regarding whether to cross or seek an alternate route. Having a prediction of train location based on speed and length would offer a proactive, dynamic map routing.</td>
</tr>
<tr>
<td>Historical Train Arrival Times</td>
<td>Trucking companies and truckers would be able to utilize historical information to make informed departure decisions as part of trip planning activities.</td>
</tr>
</tbody>
</table>
CONCEPT OF OPERATIONS: BLOCKED RAIL CROSSING TRAFFIC MANAGEMENT SYSTEM

The main anticipated benefits of the system include:

► The system would provide real-time highway-rail at-grade crossing information, enabling truckers and other roadway users to make rerouting decisions or change their schedule, which would help increase traffic throughput.

► Advanced notification of blocked highway-rail at-grade crossings would help reduce the number of rail-related incidents.

► This system would help increase TMC operator efficiency by increasing the number of tools at their disposal.

► This system would allow truckers and other roadway users to make more informed travel decisions and improve their overall traveler experience.

HOW How will the system be developed, operated, and/or maintained?

The Blocked Rail Crossing Traffic Management System can either be integrated into the TxDOT ATMS or operated as a separate standalone system that could feed notifications to the ATMS. A standalone system may be present on or off premises at TxDOT, depending on how the specifications are written at the time of procurement, and could be hosted as part of a cloud server. As the data are processed, the notifications are sent out to the field, to TMC operators, and to the ATIS (DriveTexas™ or others) to notify of an event. Many of these processes could be automated, depending on the final design.

WHERE What is the geographic and physical extent of the system?

With approximately 9,500 public, active, at-grade railroad crossings in Texas, TxDOT and stakeholders would need to provide input as to which locations would benefit the most from the deployment of this system. High-priority locations may be based on high-traffic freight routes, frequent delays, and the availability of alternate routes.

WHEN What is the sequence of activities that will be performed?

The table below outlines a time-phased series of activities that are needed to accomplish the planning, implementation, and eventual full deployment of the Blocked Rail Crossing Traffic Management System.

<table>
<thead>
<tr>
<th>Legend</th>
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<tbody>
<tr>
<td>✔️</td>
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<td>✗</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Near-Term Actions (0-2 years)</th>
<th>Medium-Term Actions (2-5 years)</th>
<th>Long-Term Actions (5-7 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing TxDOT Program/Initial Next Steps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No; Coordinate with existing local agency programs</td>
<td>✔️</td>
<td>✗</td>
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</tbody>
</table>
OPERATIONAL SCENARIO
Alternate Route Taken at Blocked Rail Crossing

THE PROBLEM
Charlie, a short-haul commercial truck driver with 15+ years experience picks up a large shipment from a distribution center near Alliance Airport.

His navigation system instructs Charlie to exit I-35 W onto an arterial route.

THE APPROACH
Charlie is concerned about a potential 30 minute delay at the at grade rail crossing ahead.

He passes a sign with two beacons flashing rapidly and follows instructions to the signed alternate route.

THE SOLUTION
Charlie makes his delivery on time!

Charlie avoids 15+ minutes of delay by taking the alternate route.