

## PROJECT SUMMARY REPORT

# 0-7165: Logistics Sprawl Impacts on E-commerce Travel Patterns

## Background

In the dynamic landscape of modern commerce, the exponential growth of e-commerce has sparked a transformative shift, transcending geographical boundaries. This surge, with implications for travel patterns and infrastructure demands, emphasizes the critical need to understand the intricate interplay between e-commerce expansion, population dynamics, employment trends, and escalating vehicle volumes is crucial. As e-commerce contributes to urban sprawl, TxDOT faces the imperative to effectively formulate and implement strategic plans for new logistical facilities. This study discusses the current e-commerce boom and its repercussions, focusing on where these facilities might be placed and how TxDOT can proactively manage and influence their location for sustainable land use and travel patterns.

This project's three objectives were:

1. Develop a database of logistic and e-commerce-related travel patterns across Texas.
2. Determine locations for potential major warehouses and shipping facilities.
3. Develop a tool to predict and model the locations of future facilities, such as warehouses, fulfillment centers, and distribution (WaFuD) centers.

## What the Researchers Did

To accomplish the stated objectives, the researchers did the following:

- Reviewed the current travel patterns and facility placement criteria of e-commerce companies,
- Developed an ArcGIS database of current WaFuD centers in a case study area -- San Antonio,
- Established twelve facility placement criteria and strategies, and determined how each categorization of logistic company emphasizes (or ranks) these strategies when choosing a site and location for a new facility in each of three region types: urban, suburban and rural,
- Designed a robust and defensible methodology to forecast future facility locations across metropolitan

and rural regions in Texas in the form of a Decision Support System (DSS),

- Developed a prototype ArcGIS database for forecasting future locations for the WaFuD centers for the case study region of San Antonio, along with guidelines for the use of the forecasting methodology and ArcGIS database tool in other environments that span any district, MPO, or city in Texas, and
- Offered two prospective combinations for the 2028 and 2033 forecasts, outlining potential locations for the placement of WaFuDs in San Antonio.

## What They Found

Researchers identified several companies that have risen to the forefront of the e-commerce industry. These companies have established and expanded their online presence and networks at global, national, and state-wide scales. To analyze this rapid growth in scale, the researchers split the e-commerce industry into categories—shipping companies (such as UPS and FedEx), retail companies (specifically those with a significant online presence such as Target

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and Walmart), and companies that do both (such as Amazon). Researchers delineated three distinctive facility types associated with e-commerce companies: warehouses (primarily serving as storage facilities); fulfillment centers (storing goods while also handling order processing and direct shipment to customers); and distribution centers (primarily functioning as transit hubs for goods throughout the shipping process). Moreover, it became evident that each category of company and type of facility exhibits a distinct presence in various types of regions, including urban, suburban, and rural areas.

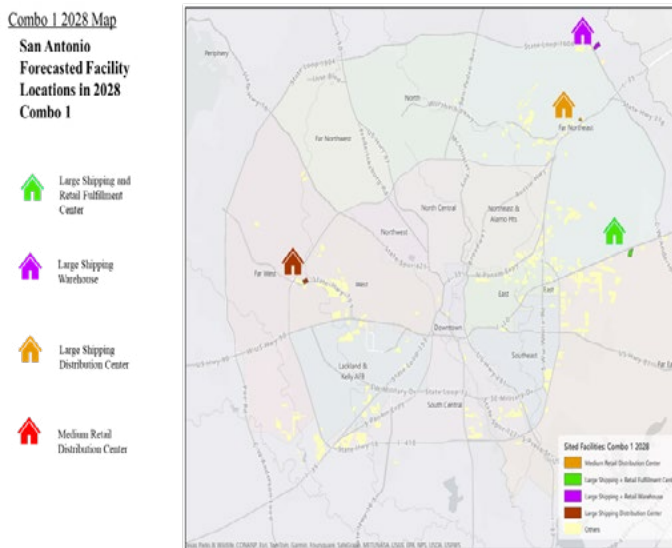
Using current market, demographic, spatial, geographic, and temporal information, researchers developed twelve placement criteria to help guide future e-commerce facility placement forecasting. The researchers found that different companies in different region types prioritized each location criteria differently. Leveraging these insights, the researchers designed a forecasting tool and geographic prototype, and demonstrated the implementation of the prototype for two scenarios—one emphasizing a lower count

of large facilities and the other envisioning a higher number of smaller facilities—for the placement of e-commerce facilities in the San Antonio case study region. The projections extended over both 5-year and 10-year timeframes, offering a comprehensive outlook on the evolving landscape of e-commerce infrastructure in the area.

### What This Means

At the end of the project, the researchers provided TxDOT with the findings in a transparent manner that will allow TxDOT to predict the location of WaFuD centers. This can then be used as input to TxDOT’s travel demand models, as well as provide insights for broader planning and policy analysis efforts. From a planning standpoint, the products from the research present unique tools to predict and monitor facility placements in at least four different types of regions within the state (a large city urban region, a mid-to-small urban region, a suburban region, and a rural region). From a policy standpoint, insights regarding possible levers to influence the potential placement of facilities across Texas have been provided.

In addition, the results from the review of e-commerce company siting policies and strategies were translated into a standalone decision support system (DSS) and knowledge base matrix (KBM) to broaden the ease of accessing and understanding (a) the current location and facility placement strategies of e-commerce companies, and (b) possible proactiveness measures to influence future WaFuD center placement. This DSS, along with the ArcGIS database of current and predicted facility locations, provides “at the finger tips” information for reviewing the current and future extent and size of facilities across the state, through both visual and tabular means.



### For More Information

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