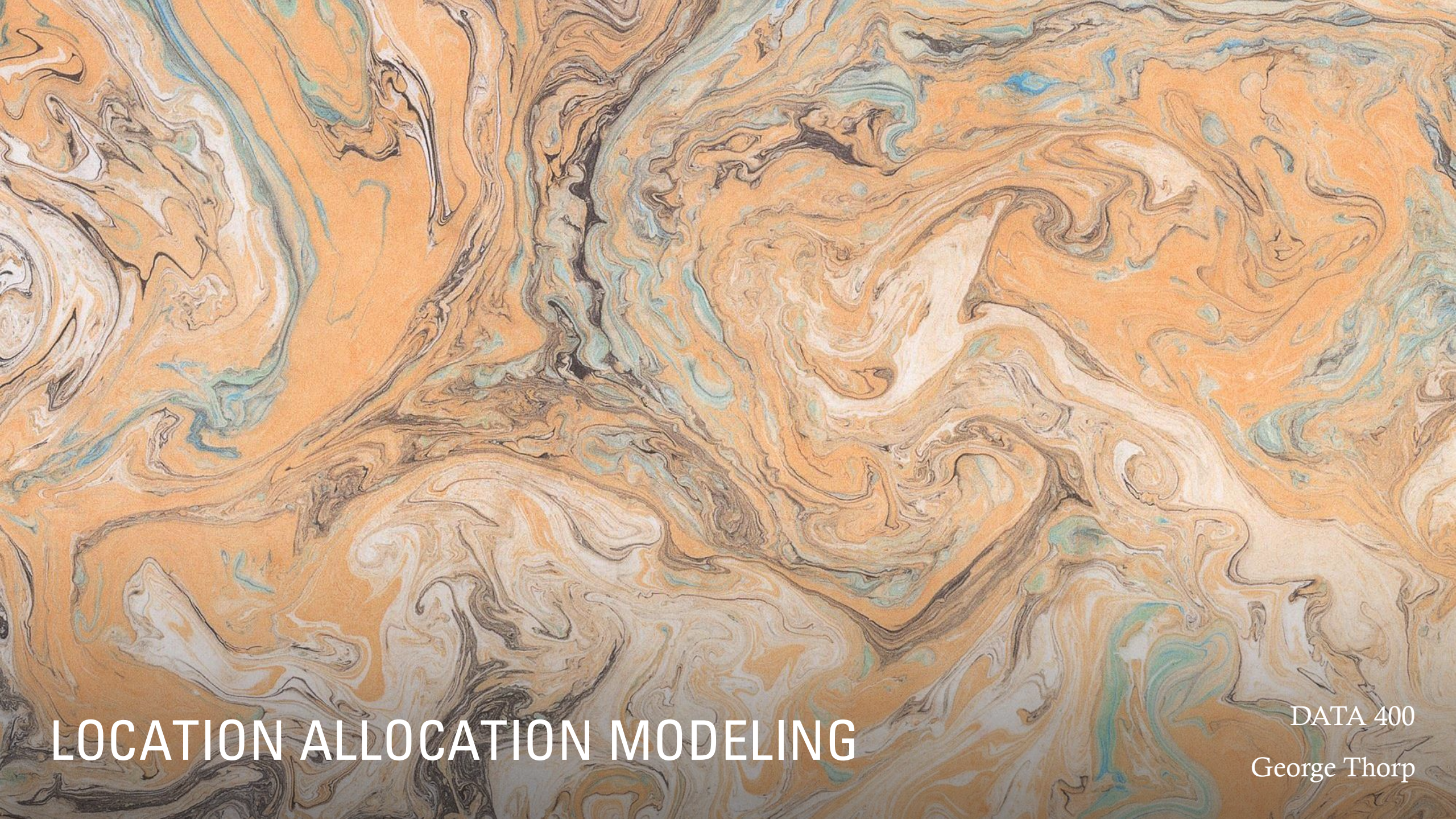


LOCATION ALLOCATION MODELING

DATA 400

George Thorp

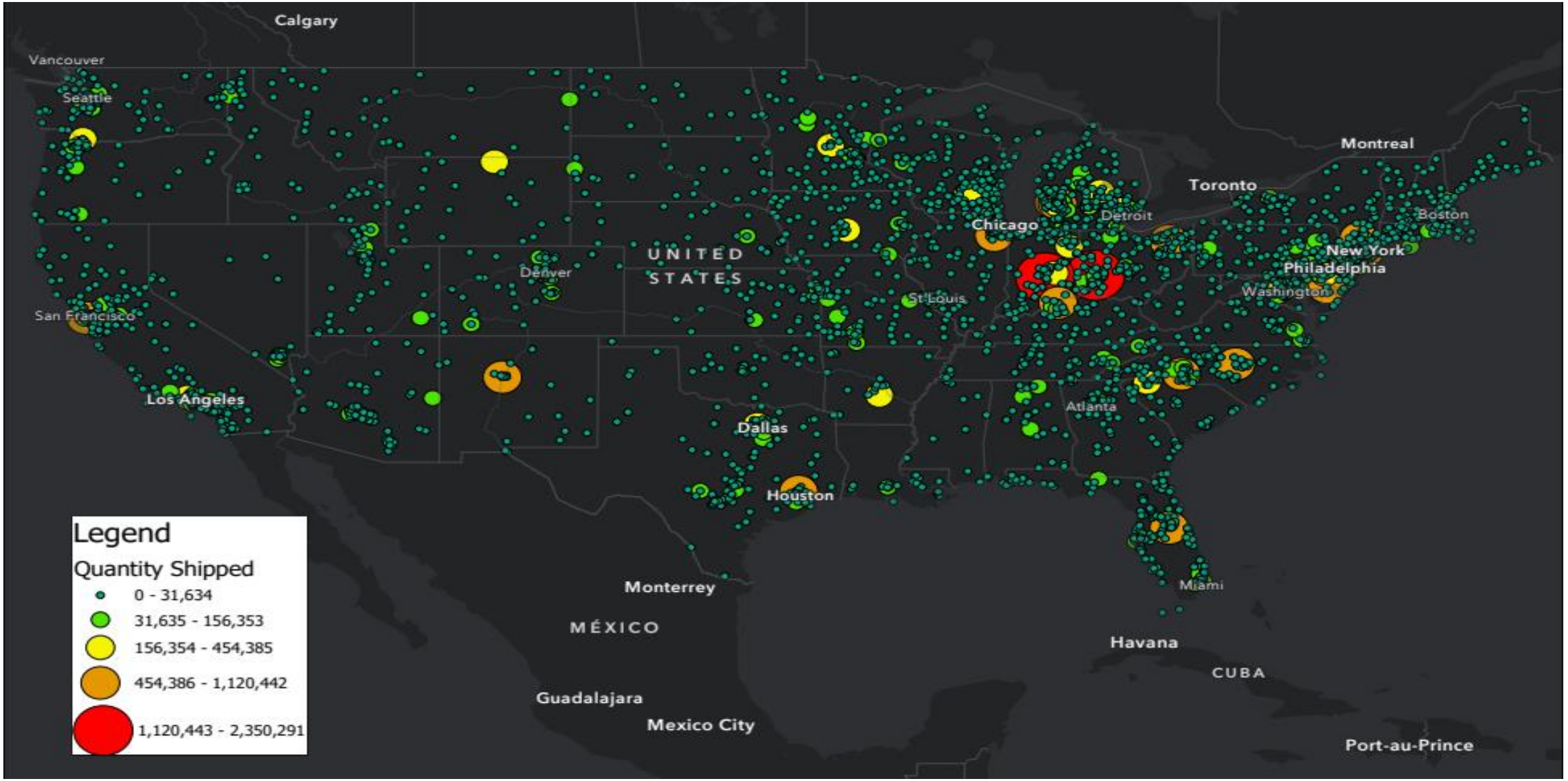
COMPANY & DATA REVIEW

- The company that I am working with is called Notions Marketing. They are an arts and crafts wholesale distributor based out in Grand Rapids, MI. Notions Marketing is partnered with UPS and does all shipping through them.
- I obtained all the B2B storefronts in the United States excluding Alaska and Hawaii. There was more than 1,000 storefronts.
- I got their data from Tableau and had to do some extensive cleaning such that some stores' cities were spelled wrong, or stores were in states they shouldn't have been.
- Warehouse data was an excel sheet, I created with the attributes of State, City, Latitude and Longitude coordinates.

WHAT IS THE PLAN?

- We are looking to find a new location on the west coast of the United States to be the home for a new distribution warehouse.
- This warehouse would receive inbound cargo ships full of products exported from Asia and the warehouse would centralize the distribution to all the companies that purchase from Notions Marketing in the western side of the country.
- The goal is to find the best location for a new warehouse in relation to the distance between all the storefronts, with taking the Michigan warehouse into consideration.

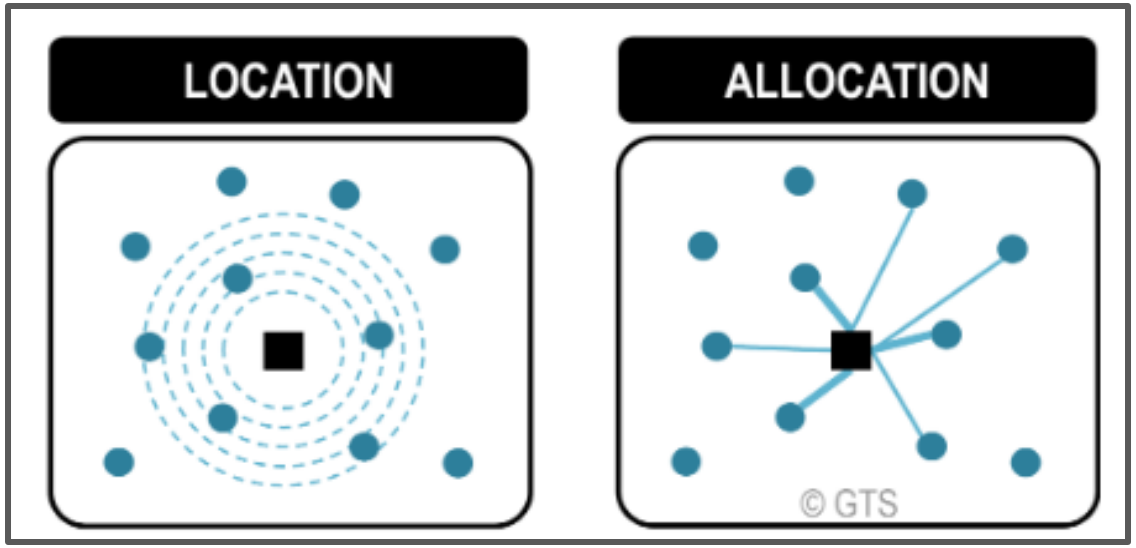
B2B STOREFRONTS AND QUANTITY SHIPPED



WHAT IS SPATIAL ANALYSIS?

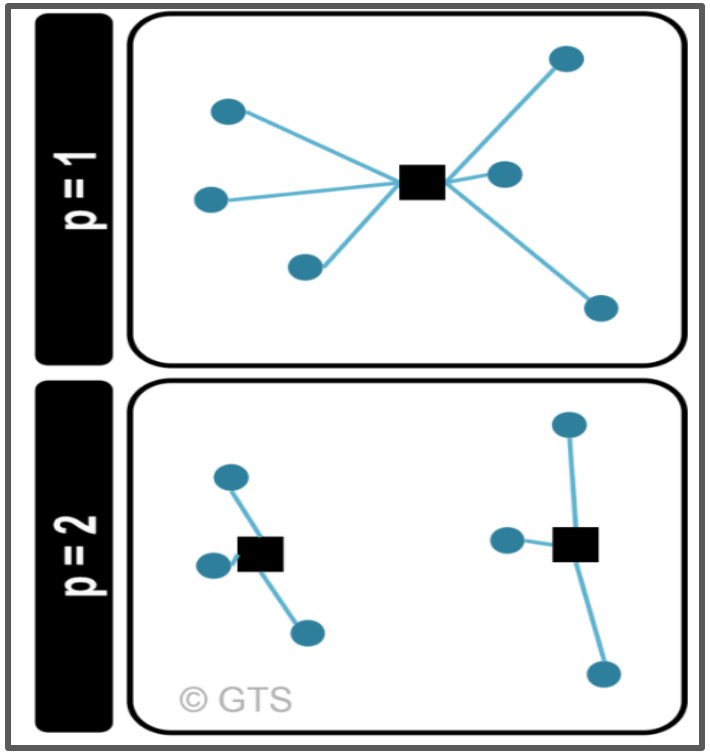
LOCATION ALLOCATION MODEL

- Location: The most suitable location(s) considering the demand distribution. Suitability is commonly the outcome of minimizing transportation costs, often using distance as a proxy.
- Allocation: The most suitable allocation of flows from points of distribution to points of demand. As for location, suitability is commonly the outcome of minimizing transportation costs. Some demand points may turn out to be unserviceable.



THE P-MEDIAN PROBLEM

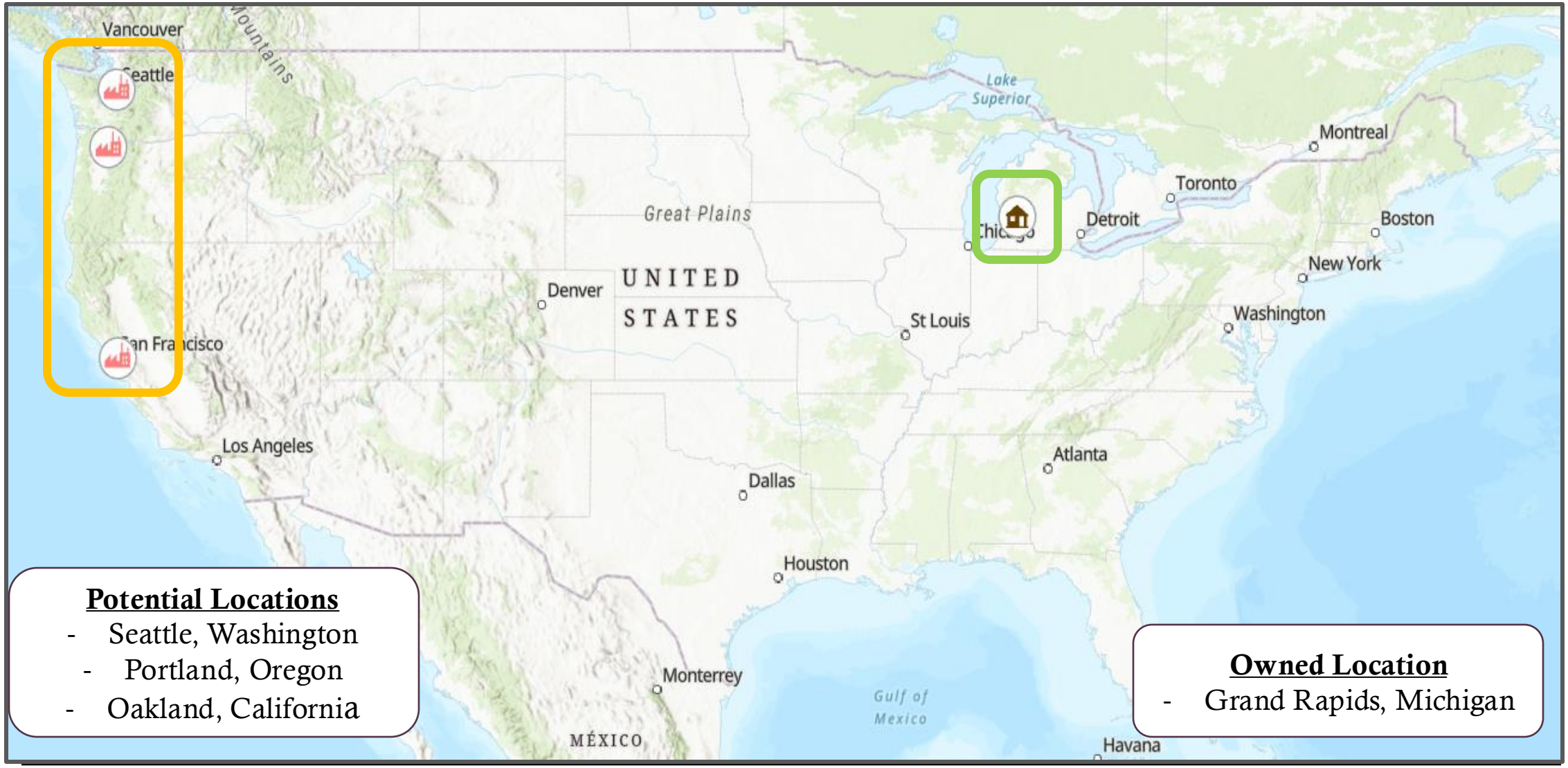
- Within the Location Allocation Model, the p-median problem is used to locate a P number of facilities to minimize distance between demand nodes and the selected facilities.
- When looking at the p-median problem, there are three parameters that are considered in calculating the result:
  - Facilities
  - Demand points
  - Type of Problem



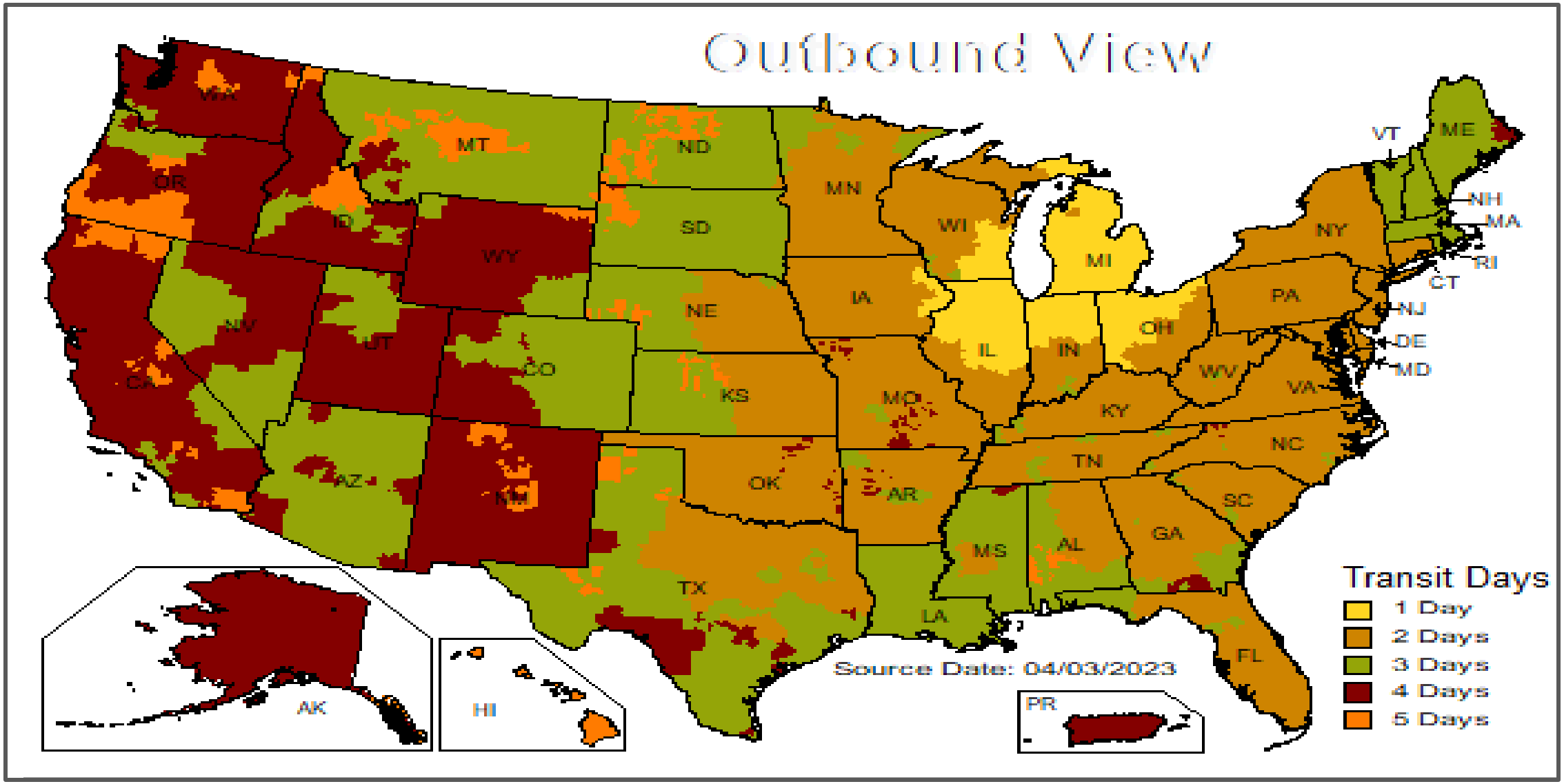
OPTIMIZING THE SOLUTION

- The P-Median problem requires the type of problem we are trying to solve for in the model.
- There are several types of problems to consider when running the model, such as minimize impedance, maximize coverage, minimize facilities, maximize attendance, and more. Each type of problems has their importance in their respective situations. For our problem, we will focus on minimizing impedance.
- Minimize Impedance: Reduces the overall transportation costs of delivering goods to outlets.

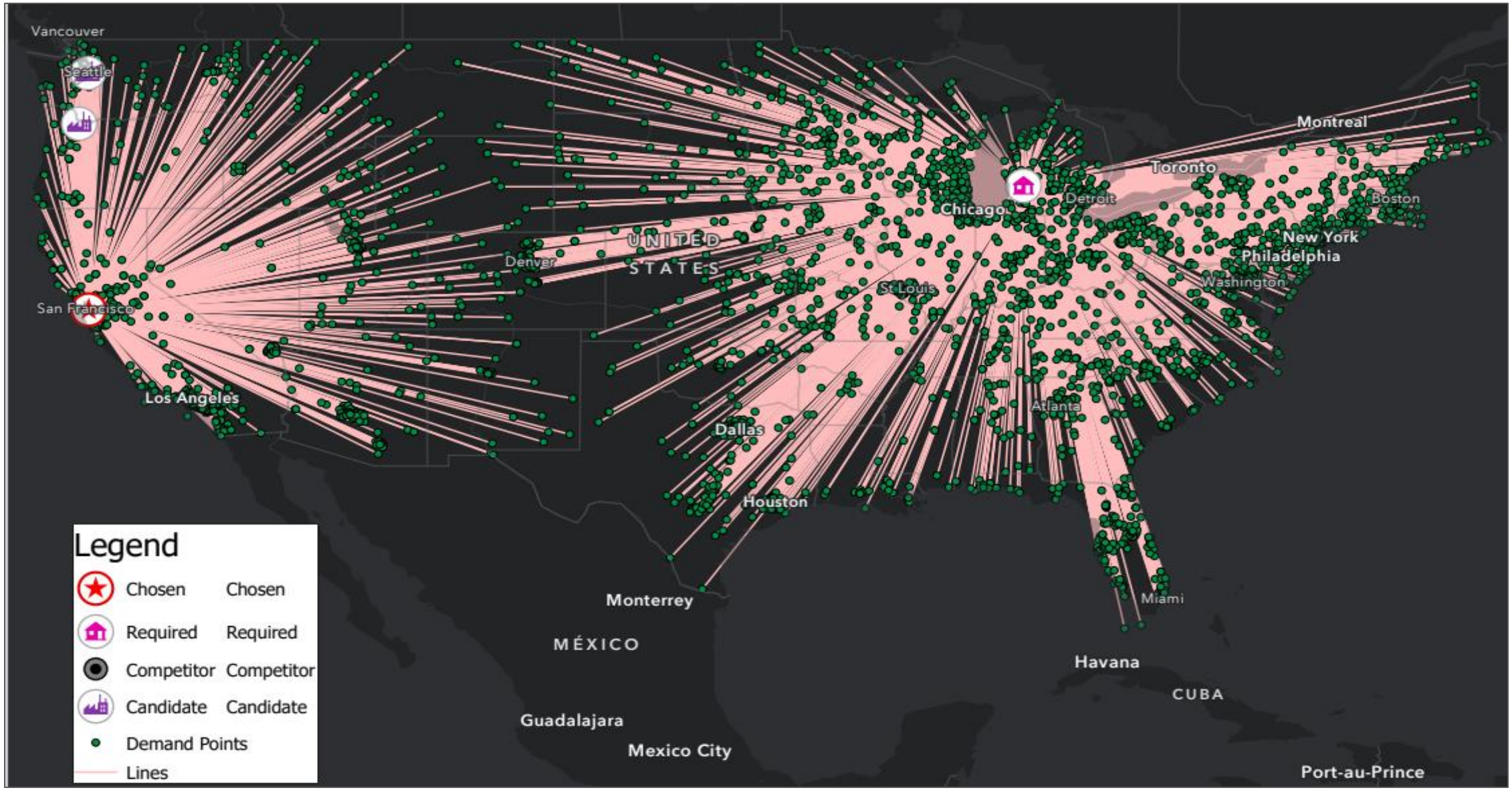
WAREHOUSES


Vancouver
Seattle
Mountains
Lake Superior
Montreal
Toronto
Great Plains
Detroit
Boston
Chicago
New York
Denver
UNITED STATES
St Louis
Washington
San Francisco
Los Angeles
Atlanta
Dallas
Houston
Monterrey
Gulf of Mexico
MÉXICO
Havana
Potential Locations
- Seattle, Washington
- Portland, Oregon
- Oakland, California
Owned Location
- Grand Rapids, Michigan

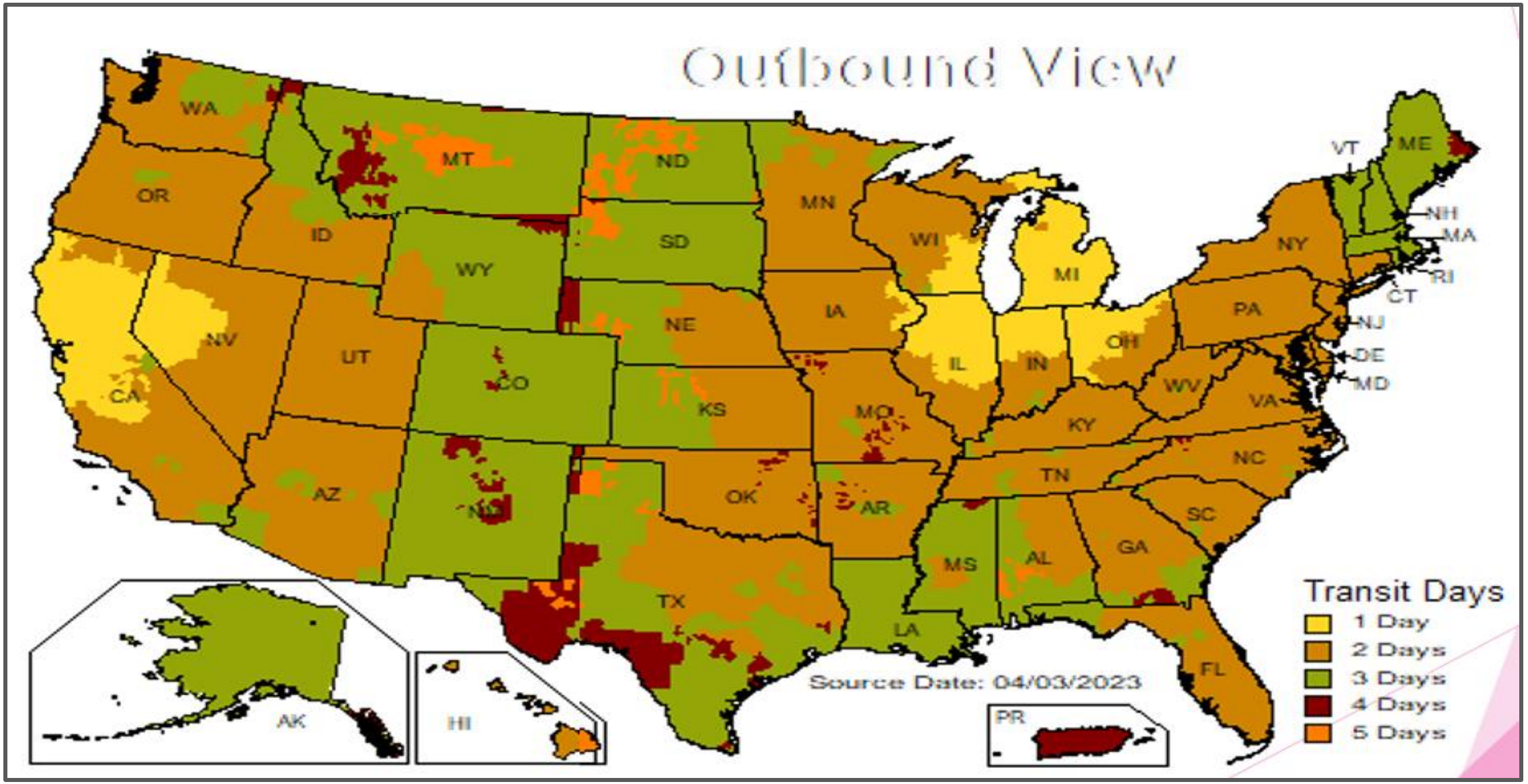
UPS GROUND SHIPPING CAPABILITIES



LOCATION-ALLOCATION MODEL RESULTS



UPDATED UPS GROUND SHIPPING MAP



COMPANY BENEFITS

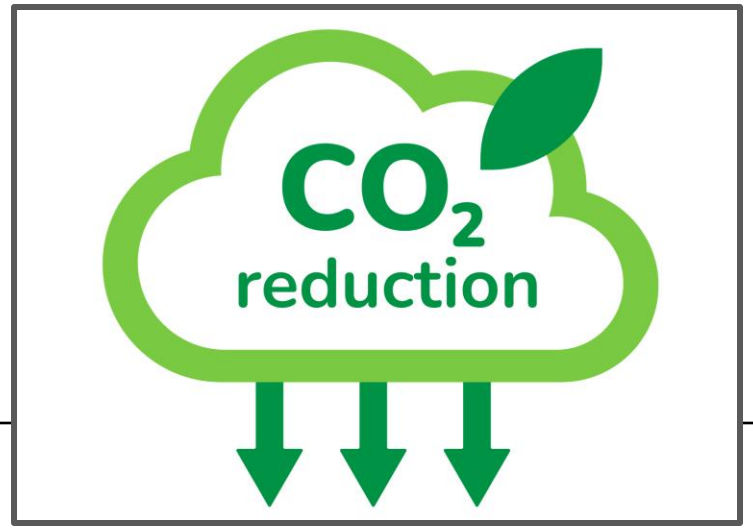
- With the addition of a new west coast warehouse, shipping costs to the Michigan warehouse would become cheaper. The outbound distribution costs to all storefronts on the western side of the US would now cost less money, resources, and time for Notions Marketing. These costs referring to trucking to and from the warehouse.

- The new warehouse also creates new opportunities for companies to expand their business and branding with this new location, they can promote themselves to more companies on the west coast and in the Midwest for hopes to increase customers and sales.

ETHIC/LEGAL/SOCIETAL CONCERNS

- Emissions transmission would be lowered with the introduction of this new warehouse due to shorter distances for trucking deliveries across the country, consumption of less fuel would also be a positive outcome from this.

- Job openings for truckers, distribution mangers, logistic planners, product pickers, and many more job to come out of this warehouse expansion, would significantly benefit the people in the surrounding area due to the sheer size of the warehouse and all the need people to make it a functional workplace.



CREDITS & CITATIONS

- A.9 – location-allocation models: The Geography of Transport Systems. The Geography of Transport Systems | The spatial organization of transportation and mobility. (2023, May 5). https://transportgeography.org/contents/methods/location-allocation-models/#:~:text=Location%2Dallocation%20models%20are%20designed,of%20equal%20or%20different%20value.
- “ArcMap.” Location-Allocation Analysis-ArcMap | Documentation, desktop.arcgis.com/en/arcmap/latest/extensions/network-analyst/location-allocation.htm. Accessed 20 Dec. 2023.
- Malinowski, N. (2022, August 26). UPS Ground Map - Shipping Zone Calculator. OTW Shipping. https://www.otwshipping.com/post/ups-ground-map