PRESENTATION TITLE: *ADVANCED GEOSPATIAL ANALYTICS TO IDENTIFY FREIGHT ACTIVITY AREAS IN FLORIDA*

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Presentation Outline

- Context
- Methodology Development
- Pilot Study Outcomes
- Statewide Analysis
- Results
- Next Steps and Conclusions

CONTEXT

Motivation

- The Strategic Intermodal System (SIS) is a statewide network of high-priority transportation facilities, including the State’s largest and most significant airports, spaceports, deep-water seaports, freight rail terminals, passenger rail and intercity bus terminals, rail corridors, waterways and highways.
- These facilities represent the state’s primary means for moving people and freight between Florida’s diverse regions, as well as between Florida and other states and nations.

Motivation

- Freight transportation planning in the public sector has traditionally focused on major transportation hubs - airports, seaports, spaceports and intermodal rail terminals.

- There has been agglomeration of other freight activity generators like distribution centers, warehouses, and manufacturing facilities in last decade.

- This has led to an increased interest among public agencies and private firms to identify the major Freight Activity Areas for their planning, operational and other transportation projects.

Objectives

- Define Freight Activity Area (FAA)
- Identify and evaluate datasets
- Develop and implement a methodology to identify FAA for pilot study
- Implement the methodology for statewide analysis

Approach

- Spatial locations of FAA are identified – unlike other hubs*.
- Input datasets used for designation are real (as opposed to estimates or forecasts) and non-proprietary.
- The process is simple, intelligible and repeatable.

*Includes airports, seaports, spaceports, intermodal logistics centers or freight rail terminals.

Potential Variables of Interest
Facility Type
Catchment Area
Size
Employment
Truck Trip Generation
Tonnage
Annual Container Volume
Commodity Value
Intermodal Activity Level
Economic Impact/ Contribution to State GDP

METHODOLOGY DEVELOPMENT

Definitions

- **Freight Activity Area (FAA)** is defined as a cluster/group of freight facilities which generate, distribute or attract significant freight activity and has a significant impact on Florida's transportation system and economic development.*

*FAA do not include airports, seaports, spaceports, intermodal logistics centers or freight rail terminals.

Datasets

Selected Data-Source	Final Measure
Florida Department of Revenue (DOR)	Total Living Area or Floor Area per parcel
Florida Department of Economic Opportunity (DEO)	Annual Average Employment per establishment
Florida Department of Transportation (FDOT)	Observed Annual Average Daily Truck Traffic

Excluded Data-Source	Reasons for Exclusions
Institute of Transportation Engineers	• Lack of standard bridge between ITE-NAICS and ITE-DOR • It will be further explored in next phase of analysis
Info group	• Data is proprietary • Latest copy of available data is 2014 • Data sharing agreement prevents its usage for non-modeling projects.
Demand Models	• Disaggregation of data is not sufficient • Requirement of this project warrants use of real data only

Potential Measures

Measures of Interest	Action Taken	Remarks
Facility Type	**Selected for Pilot study**	**Identified using employment and parcel data**
Floor Area / Total Living Area	**Selected for Pilot study**	**Identified using parcel data**
Employment	**Selected for Pilot study**	**Identified using employment data**
Truck Counts	**Selected for Pilot study**	**Identified using FDOT truck counts**
Tonnage	Not available	Difficult to acquire private information; not available at a parcel level
Commodity Value	Not available	Need to acquire proprietary information; not available at a parcel level
Economic Impact/ Contribution to State GDP	Not considered	Synthetic estimate as opposed to real data
Truck Trip generation	Will be explored in next project phase	ITE trip generation 10th edition was investigated, but it doesn't have sufficient information

Freight Facility Types

DOR Code	Description
029	Wholesale outlets, produce houses, manufacturing outlets
041	Light manufacturing, small equipment manufacturing plants, small machine shops, instrument manufacturing, printing plants
042	Heavy industrial, heavy equipment manufacturing, large machine shops, foundries, steel fabricating plants, auto or aircraft plants
043	Lumber yards, sawmills, planning mills
044	Packing plants, fruit and vegetable packing plants, meat packing plants
045	Canneries, fruit and vegetable, bottlers and brewers, distilleries, wineries
046	Other food processing, candy factories, bakeries, potato chip factories
047	Mineral processing, phosphate processing, cement plants, refineries, clay plants, rock and gravel plants
048	Warehousing, distribution terminals, trucking terminals, van and storage warehousing
049	Open storage, new and used building supplies, junk yards, auto wrecking, fuel storage, equipment and material storage
068	Dairies, feed lots
091	Utility, gas and electricity, telephone and telegraph, locally assessed railroads, water and sewer service, pipelines, canals, radio/television communication
092	Mining lands, petroleum lands, or gas lands
096	Sewage disposal, solid waste, borrow pits, drainage reservoirs, waste land, marsh, sand dunes, swamps

Florida Freight Floor Area – Select Land Use Codes

Land Use Code	Total Living Area (Square Feet)	Number of Parcels
029-Wholesale	12,823,056	565
041-Light Manufacturing	278,105,527	10,994
042-Heavy Industrial	52,072,508	633
043-Lumber/Sawmill	12,905,655	474
044-Food Packing Plants	18,052,685	466
045-Canneries, Bottlers, etc.	11,980,958	115
046-Other Food Processing	15,688,924	326
047-Mineral Processing, gravel, etc.	11,407,696	1,043
048-Warehouse, Distribution Center, etc.	946,695,398	43,333
049-Open Storage	11,115,200	4,228
068-Dairies, Feed Lots	17,313,353	4,484
091-Utilities	34,958,565	10,381
092-Mining	2,061,950	1,408
096-Sewage, Solid Waste	359,598	19,535
Total	**1,425,123,585**	**97,985**

Freight Employment Types

NAICS Codes	Description
11	Agriculture, Forestry, Fishing and Hunting
21	Mining, Quarrying, and Oil and Gas Extraction
31	Food, Beverage, Tobacco Product, Textile Manufacturing
32	Wood, Paper, Petroleum and Coal Products, Chemical, Plastic, Rubber, Nonmetallic Mineral Product Manufacturing
33	Primary Metal, Fabricated Metal Product, Machinery, Furniture, Electrical and Computer Manufacturing
42	Whole Sale Trade
48	Transportation and related services
49	Warehousing and related services
56	Administrative and Support and Waste Management and Remediation Services

Please note: Refer 6 digit NAICS code table list for complete understanding of selected facility types

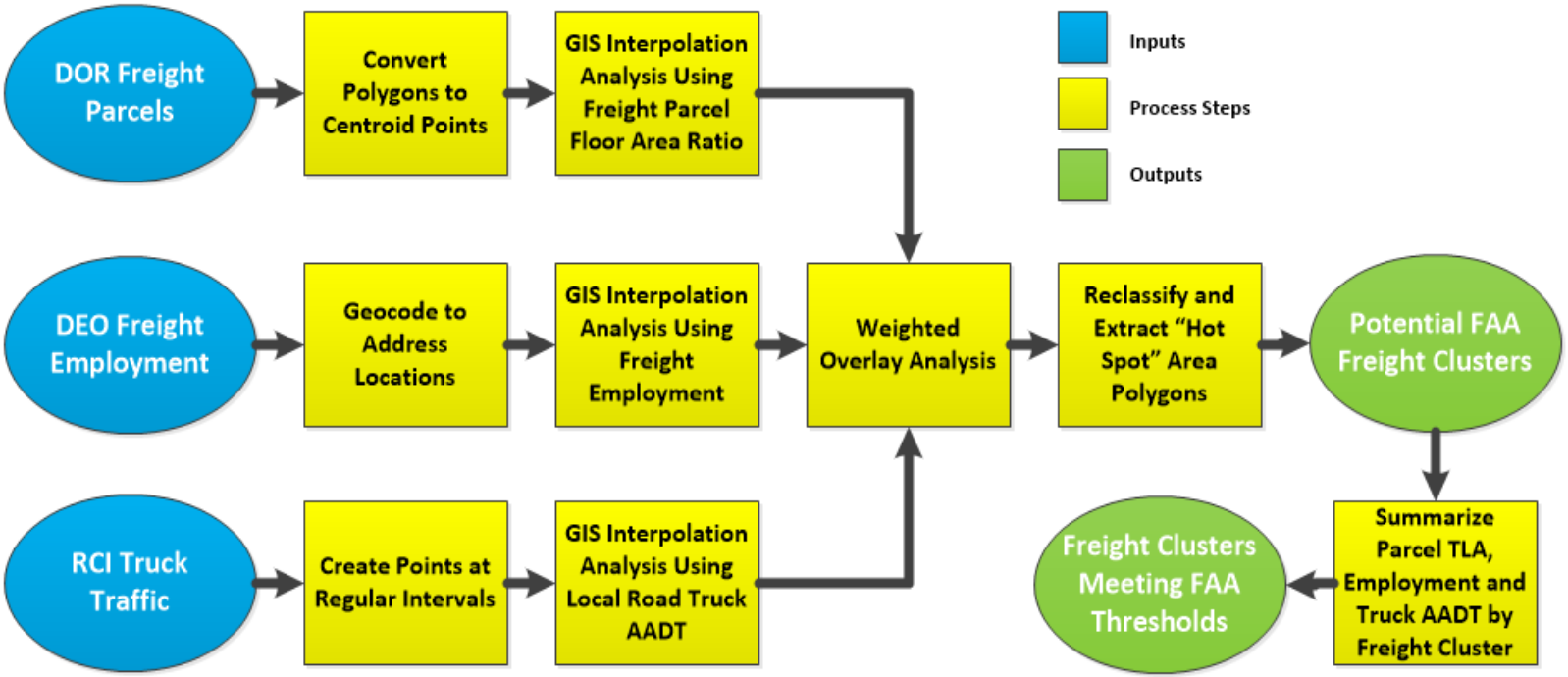
Florida Freight Employment – Select NAICS Codes

NAICS Code	All establishments	
	Employment	Number of Establishments
11-Agriculture, Forestry	41,057	2,486
21-Mining	3,660	296
31-Manufacturing	48,633	2,460
32-Manufacturing	86,369	4,905
33-Manufacturing	179,811	8,723
42-Wholesale Trade	263,859	31,884
48-Trans. & Warehousing	65,174	8,556
49-Trans. & Warehousing	102,230	2,938
56-Waste Management	17,542	1,221
Total	**808,335**	**63,469**

Local Road Truck AADT Network – FDOT RCI Functional Classification Table

FUNCLASS	Functional Class Description	Selected Roadways
01	RURAL – Principal Arterial – Interstate	No
02	RURAL – Principal Arterial – Freeways and Expressways	No
04	RURAL – Principal Arterial – Other	No
06	RURAL - Minor Arterial	Yes
07	RURAL - Major Collector	Yes
08	RURAL - Minor Collector	Yes
09	RURAL - Local	Yes
11	URBAN – Principal Arterial – Interstate	No
12	URBAN – Principal Arterial – Freeways and Expressways	No
14	URBAN – Principal Arterial – Other	No
16	URBAN - Minor Arterial	Yes
17	URBAN - Major Collector	Yes
18	URBAN - Minor Collector	Yes
19	URBAN - Local	Yes

Methodology Framework for Pilot Study



Data Sources:
Parcel Data – Florida Department of Revenue (DOR)
Employment Data – Florida Department of Economic Opportunity (DEO)
RCI Truck Traffic Data – Florida Department of Transportation (FDOT)

Analysis Techniques

Preparing Employment Data

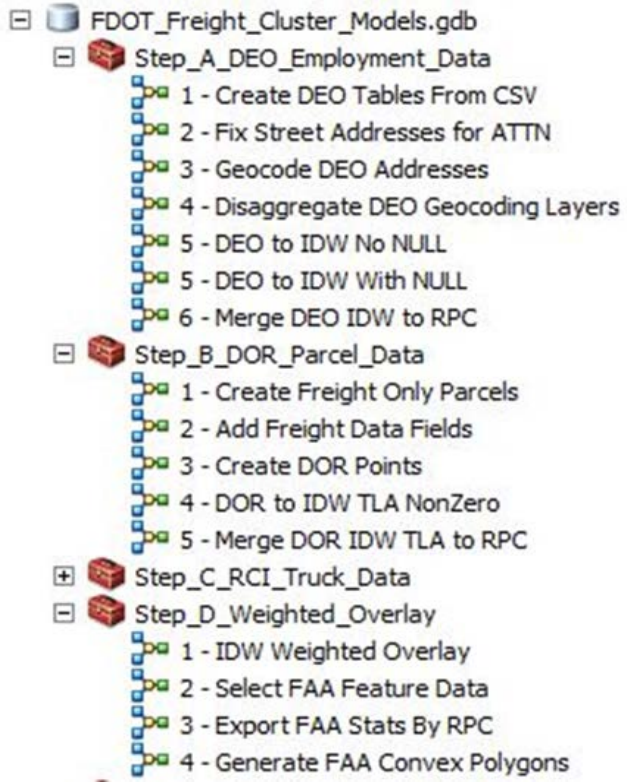
- Selecting freight establishments
- Manual fixing of street addresses
- Geocoding of data using street address information
- Creation of IDW output rasters

Preparing Parcels Data

- Selecting freight parcels
- Converting parcel polygons to points
- Creation of IDW output rasters

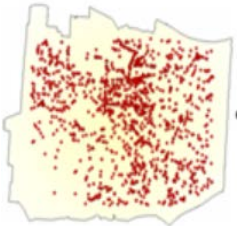
Preparing Truck Data

- Roadway network sampled every 100 meters to generate a point with a Truck AADT value equal to that of the roadway segment at that point
- Creation of IDW output rasters

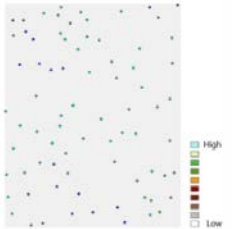


Toolboxes and Models used to generate Freight Activity Areas

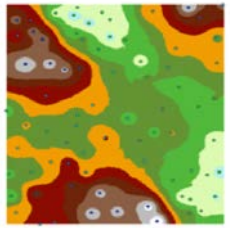
Inverse Distance Weighting (IDW) Clustering



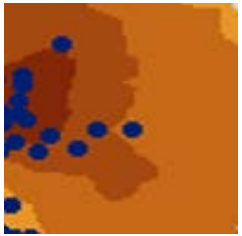
Associate a numeric freight metric (e.g., employment) with each DOR centroid



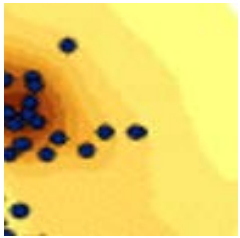
Perform kriging on the point layer based on the employment value.



Kriging output is a raster layer that interpolates employment for entire area.



The kriging “prediction surface” shows areas of low to high employment



The kriging “quantile surface” shows which areas are higher than X% of all data

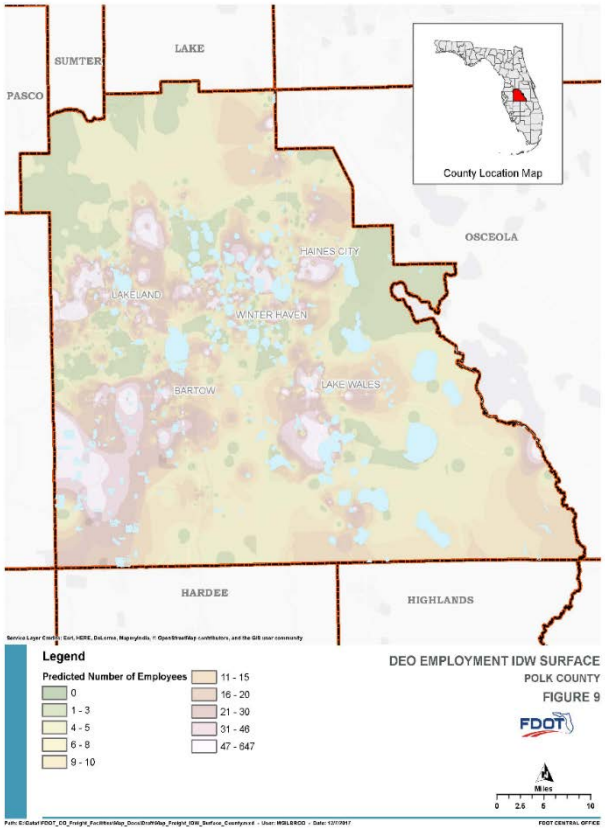
Post-Processing

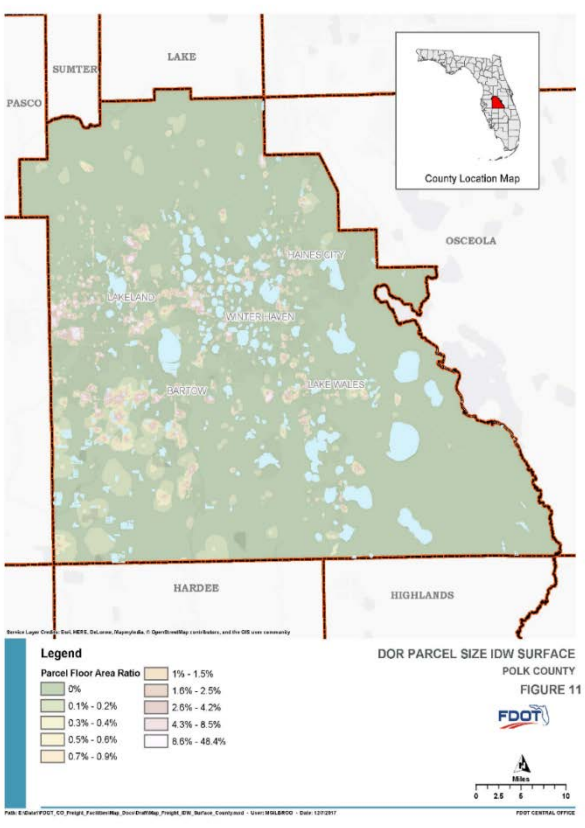
- **Weighted Overlay analysis** combines IDW raster outputs for employment and parcel data.
- **Reclassify** analysis for both the parcel and employment data converts IDW output to a normalized 1 to 10 scale based on a 10-class quantile classification.
- Raster areas with a threshold value of 6 and above are retained as polygons.
- **Minimum Bounding Geometry tool** is used to create a smoother boundary.

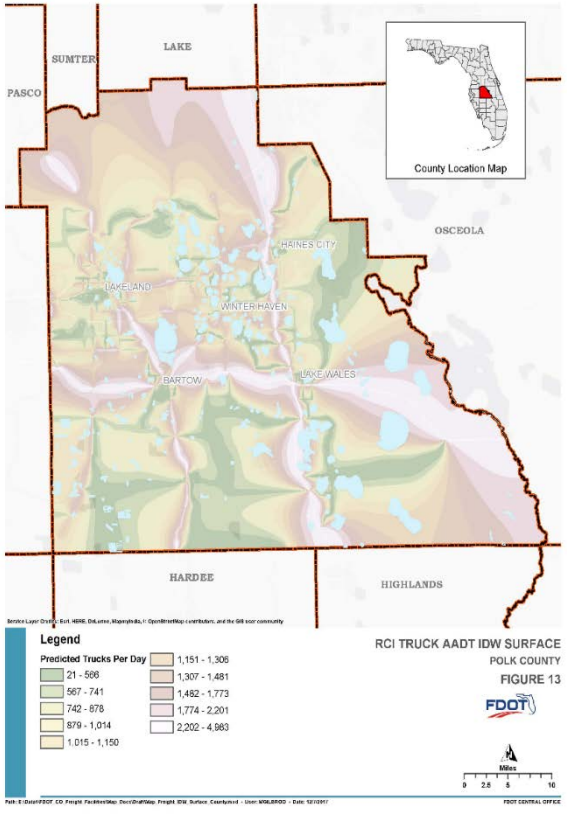
PILOT STUDY OUTCOMES

POLK COUNTY (FLORIDA)

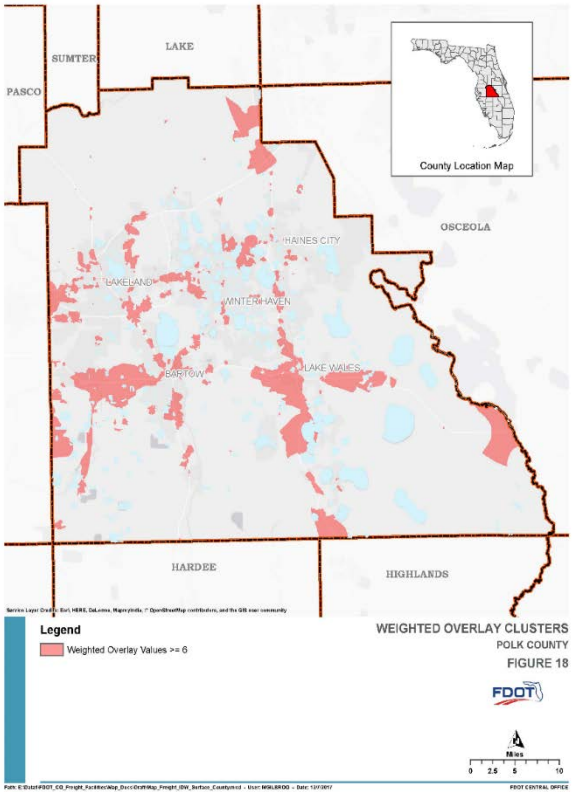
IDW Results (Pilot Study)



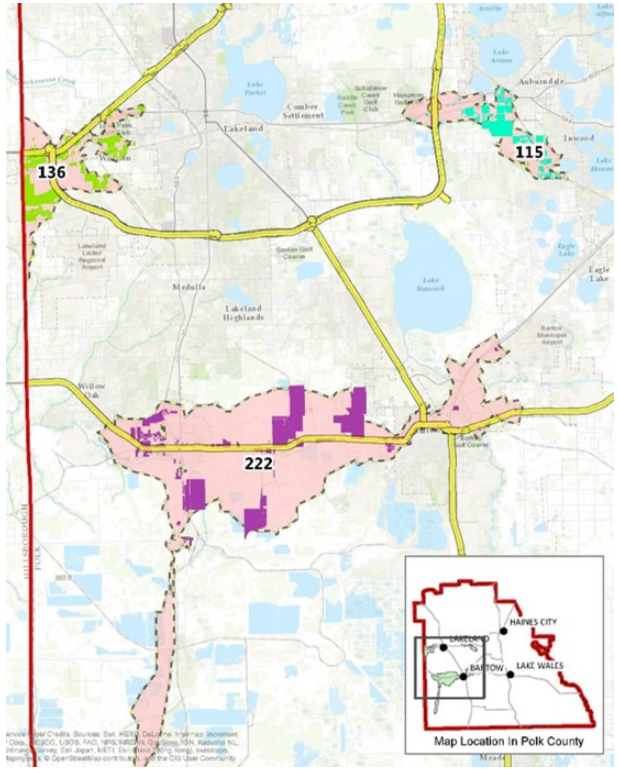




Important Outcomes (Pilot Study)



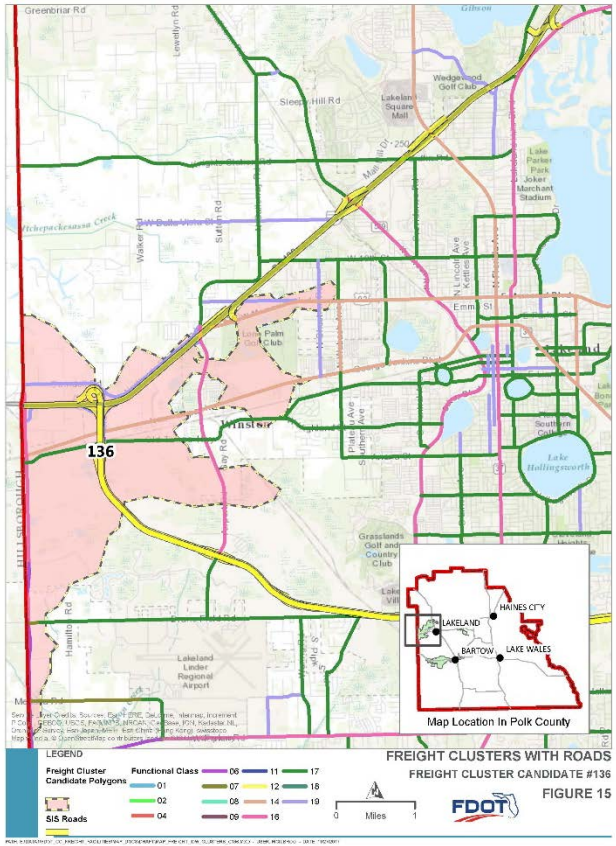
Weighted Overlay Clusters



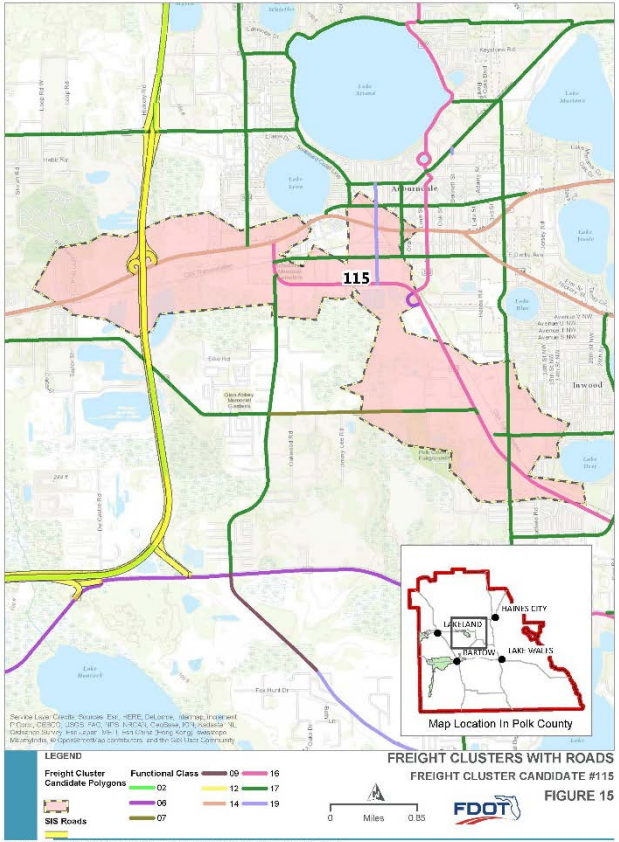
Example of Elongation of the Cluster Polygons

Pilot Study – Top 3 Clusters

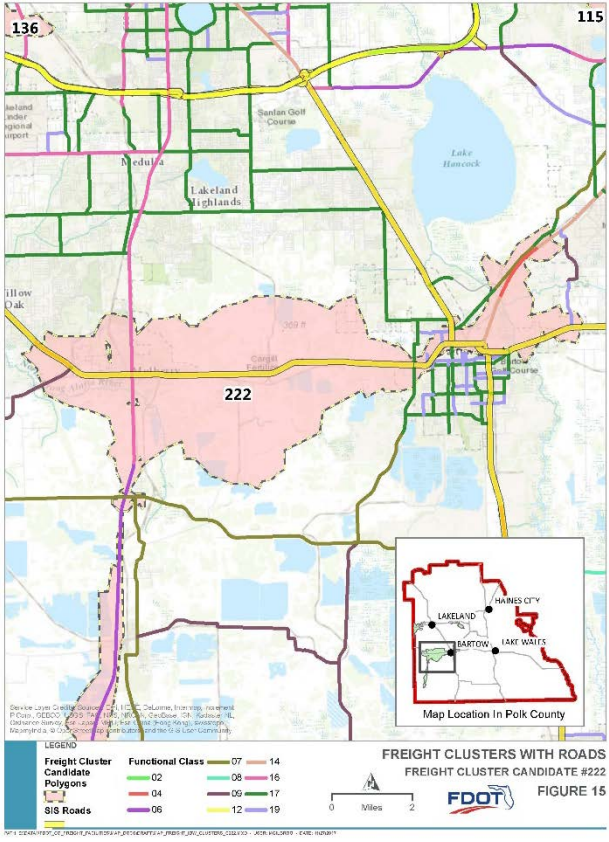
Cluster #136



Cluster #115



Cluster #222



Pilot Study – Top 3 Clusters

Cluster #136

7.31 sq. miles	Cluster Size
14.5 M sq. feet	Floor Area
5,932	Employment

Major Freight Facilities: Publix Distribution Center, Amazon Fulfillment Center, Rooms To Go Distribution Center, Stryker Sustainability Solutions (Medical Instrument Manufacturing), WellDyne, Inc. (Drug Wholesaler)

Cluster #115

5.15 sq. miles	Cluster Size
6.78 M sq. feet	Floor Area
2,732	Employment

Major Freight Facilities: Cutrale Citrus Juices USA, Inc., Carpenter Contractors of America, Bynum Transport, Coca Cola

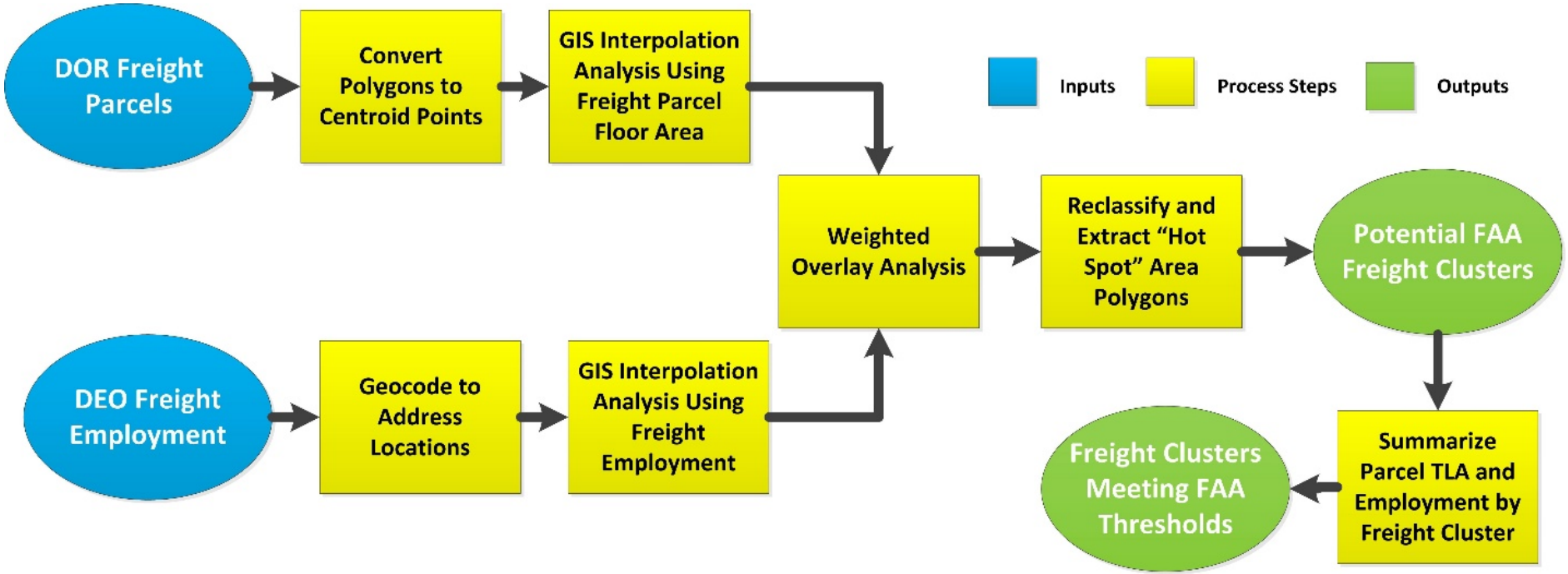
Cluster #222

38.0 sq. miles	Cluster Size
4.99 M sq. feet	Floor Area
3,778	Employment

Major Freight Facilities: Mosaic Fertilizers, US Agri Chemicals Corp., PrecisionAire, Highland Distribution Service (Industrial Paper Wholesaler), Arr-Maz Products Limited (Farm Supply Wholesaler)

Cluster #136 - Major Freight Facilities

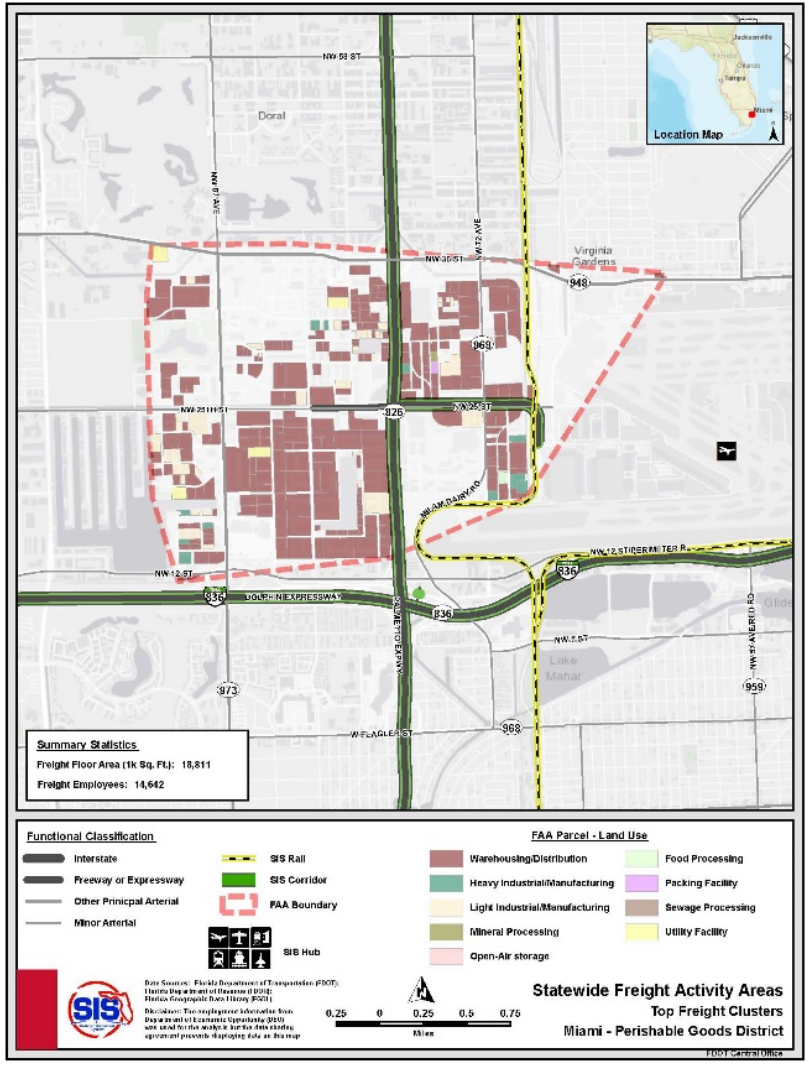
Final Methodology Framework



STATEWIDE ANALYSIS RESULTS

Statewide Analysis Results

- Methodology resulted in more than 1,200 freight clusters in Florida.
- Six significant freight clusters had more than **1%** of Florida Freight TLA and more than **1%** of Florida Freight Employment.
- These clusters were in close proximity to major transportation hubs or major interstate corridors.
- The six significant FAAs constitute 7.69% of Florida Freight TLA and 8.1% of Florida Freight Employment.



Top Cluster (Miami-Dade)

FAA Profile

- **18+ million** square feet freight floor area with 306 freight parcels
- **14,000+** freight related employment with 1189 freight establishments
- Primarily located in **City of Doral**
- Major network segments within FAA: Palmetto Expressway and Florida East Coast (FEC) LR rail line
- **Parcel and floral services**
- Warehouses, distribution centers and some light and heavy manufacturing parcels
- United States Postal Service, United Parcel Service, Bel Incorporated, Quality Acquisition Company, LLC, United States Medical Supply, LLC, Floral Logistics Of Miami, Inc., and Passion Growers, LLC and Lasership, Inc.
- Miami Airport Industrial Park, Expressway Industrial Park, West Pointe Business Park and Transit Warehouse parks
- Proximity to Miami International airport
- Truck Traffic AADT on Palmetto Expressway is **10,000+**

NEXT STEPS AND CONCLUSIONS

Next Steps

- The FAAs can be further classified/characterized by regions, freight industry mix, employment and freight parcel living area.
- Alternatives for truck transportation activity are enhanced trip generation studies or probe datasets like truck GPS data.
- Further analysis is necessary to identify the roadway segments that connect the FAA to major roadway corridors and provide strategic freight growth opportunities.

Conclusions

- This study defined FAA, identified and prepared statewide datasets for analyses, developed and implemented methodology, and generated results to assist with the identification of FAAs.

- Multiple data sources were evaluated during the pilot study before settling on the parcel, employment and truck AADT. But, truck AADT had limitations. Hence, it was not considered for further statewide analysis.

- The methodology developed in this study can be replicated for other regions and states in a seamless manner to derive similar outcomes, if similar datasets exist for other states and regions.

THANK YOU