



Freight Supply Chain Resilience Study

December 2022

Disaster Impacts on Communities & Supply Chains

Hurricane Katrina August 29, 2005

- Flooded 80% of New Orleans
- More than 1,800 deaths and \$125 billion in damage
- Millions of pounds of perishable food ruined
- Port closed for more than two weeks
- Communications and supply chain issues worsened the disaster



David J. Phillip/AP News

Why Are Supply Chains Relevant?

- Nearly everything in your home or workplace is touched by a supply chain
- Supply chains help create livable, prosperous, and resilient communities
- **If Hillsborough County communities are equitable, resilient, and sustainable under normal circumstances, the more resilient and better prepared they will be to withstand and recover from emergency situations**



Supply Chain of
Plant City Strawberries

Study Objectives

Identified key supply chains in Hillsborough County and how they could be impacted or disrupted under certain disaster scenarios. Key study objectives:

- Mapped the supply chains of 5 commodities / services
- Identified potential supply chain vulnerabilities due to disruptions from disaster scenarios
- Recommended actions that:
 - Mitigate impacts and strengthen resilience of supply chains for **the communities that they support**
 - **Build safety and resilience of Hillsborough County communities**
 - Establish ongoing engagement with key supply chain partners and communities
 - Will be implemented in partnership with supply chain actors, stakeholders, and communities to **integrate and uphold neighborhood context, roadway safety/Vision Zero initiatives, and quality of life goals**

Timeline



Task 1
Commodity / Service &
Disaster Scenario Selection
February – March 2022



Task 2
Commodity Flow Analysis &
Supply Chain Resiliency
Analysis
March – July 2022



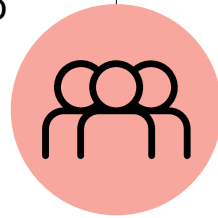
Task 3
Supply Chain Resiliency
Recommendations
May – December 2022



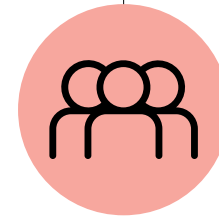
7 Stakeholder
Small Group
Interviews



7 Stakeholder
Individual
Interviews



Corporation to
Develop Communities
of Tampa, Inc.



University Area
Community
Development
Corporation

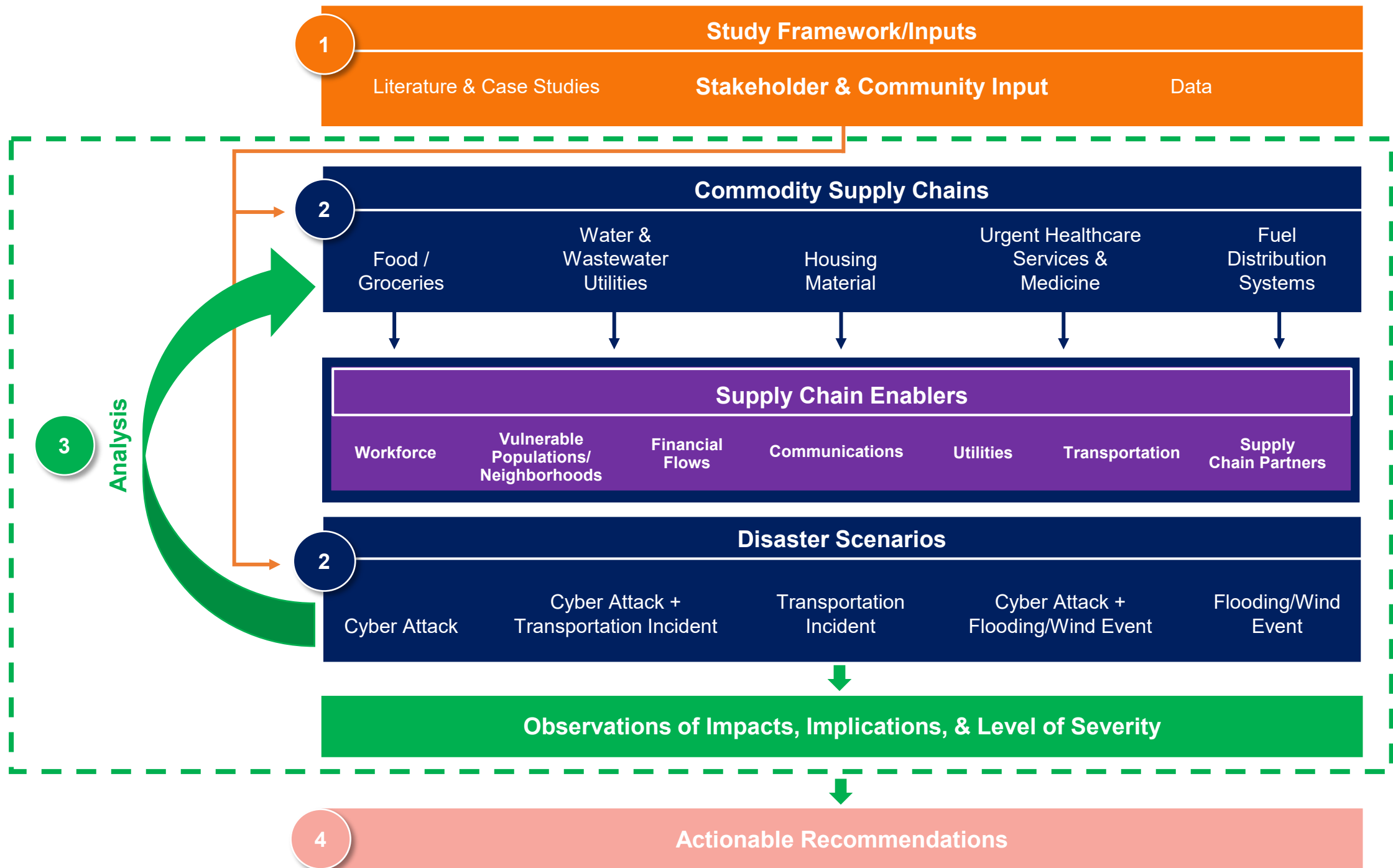


Hillsborough
County
Local
Mitigation
Strategy
Working
Group



TBRPC
ONE BAY
Livable
Communities
Working
Group

Supply Chain Disruption Methodology



Study Framework/Inputs

Literature & Case Studies

Hillsborough County Multi-jurisdictional Local Mitigation Strategy 2020 Plan Update

Catastrophic Hurricane Michael Strikes Florida Panhandle October 10, 2018

Supply Chain Resilience Guide

Technical Memorandum Resilient Tampa Bay: Transportation Pilot Program Project

COMMUNITY LIFELINES IMPLEMENTATION TOOLKIT

VIDEO: I-85 bridge in Atlanta collapses during massive fire

ATLANTA - A massive fire that caused an overpass on Interstate 85 to collapse in Atlanta was caused as of late Thursday.

Version 2.0 November 2019

Stakeholder & Community Input

Stakeholder Small Group Interviews

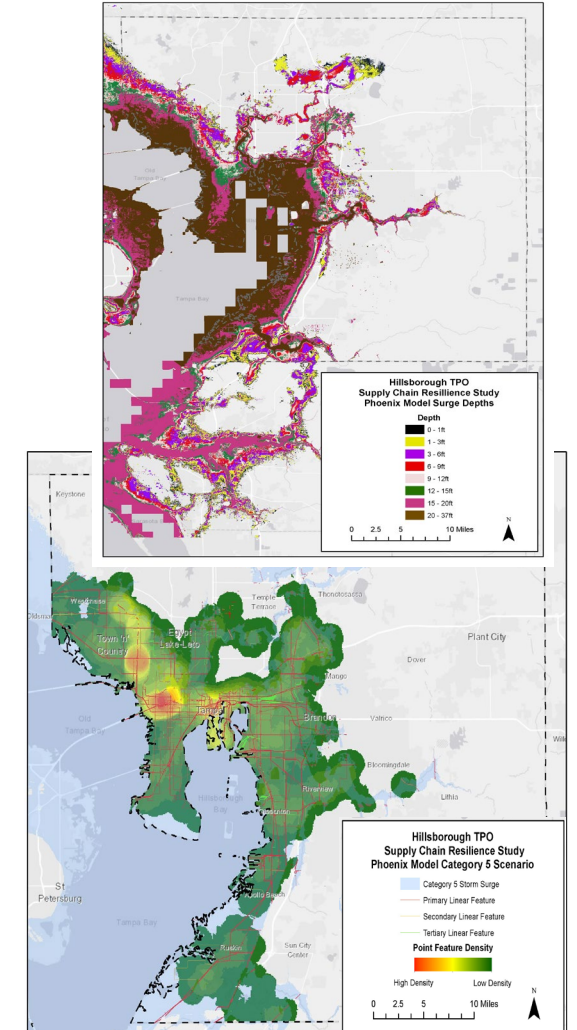
Community Sessions

Individual Stakeholder Interviews

TPO Freight/Supply Chain Study (Tampa CDC 5-20-22)

TPO Freight/Supply Chain Study (University Area CDC 5-27-22)

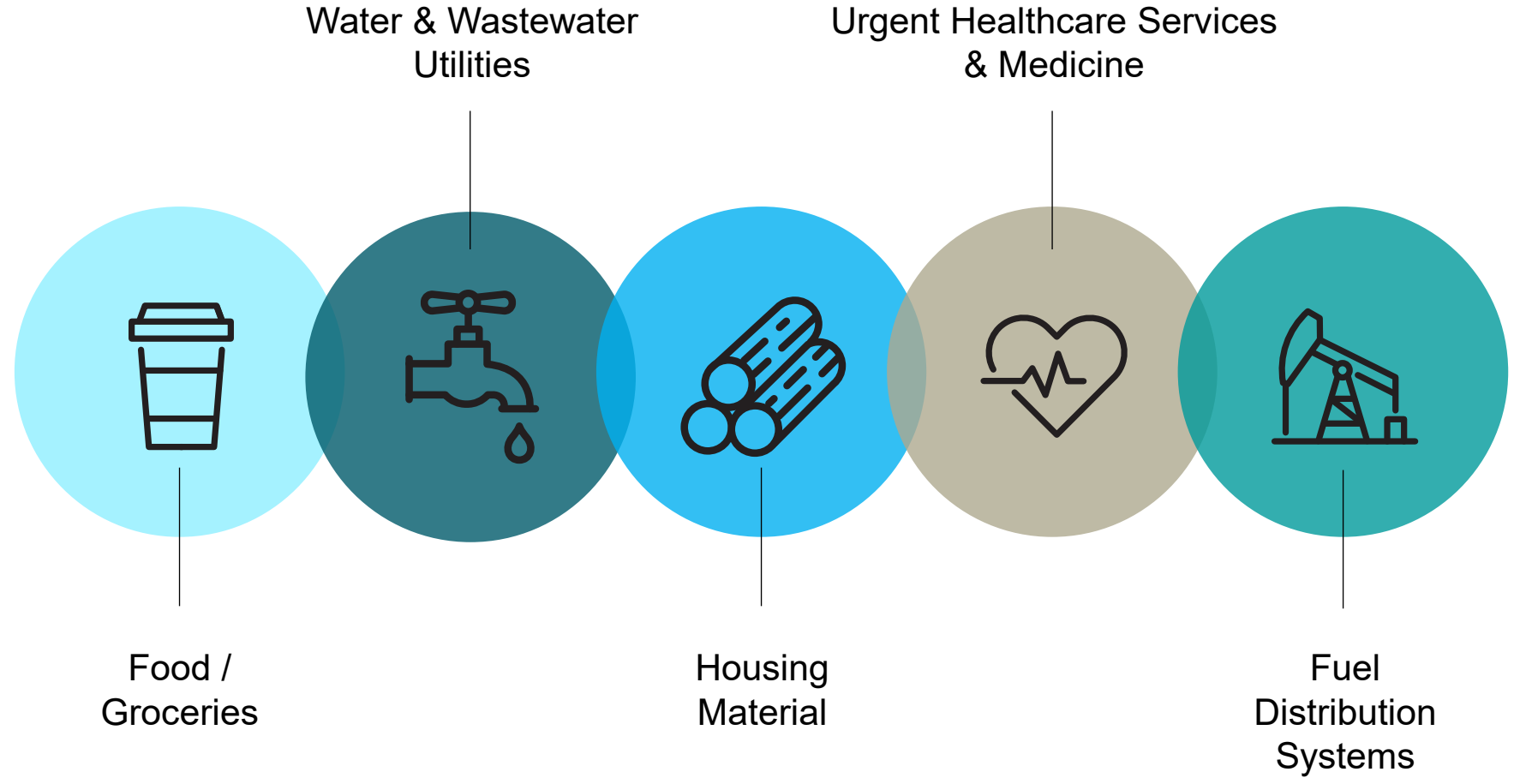
Data (HAZUS & Project Phoenix Models/ GIS Layers)



Commodities Studied

FEMA Community Lifelines

- Safety & Security
- Food, Water, & Shelter
- Health & Medical
- Energy
- Communications
- Transportation
- Hazardous Material



Commodity Supply Chain Maps

1

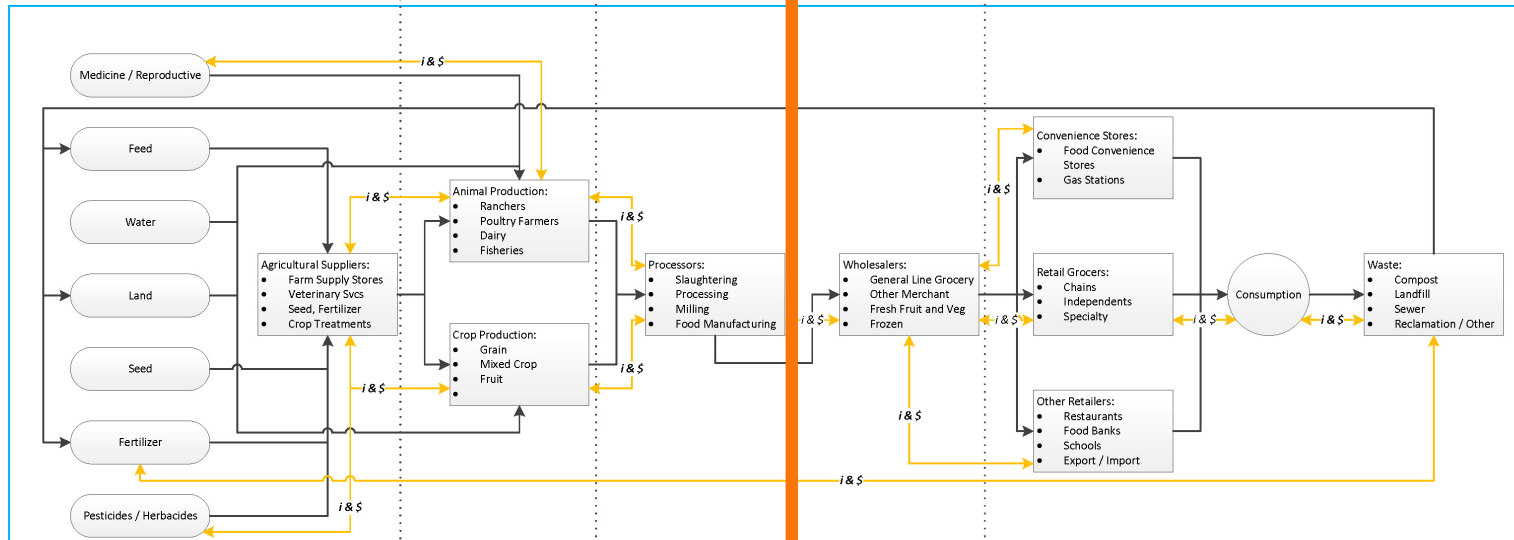
Hillsborough Transportation Planning Organization
Freight Supply Chain Resilience Study
Food/Groceries Supply Chain Map

Hillsborough TPO
Transportation
Planning Organization

2

05/24/2022

Supply Chain Flow Diagram

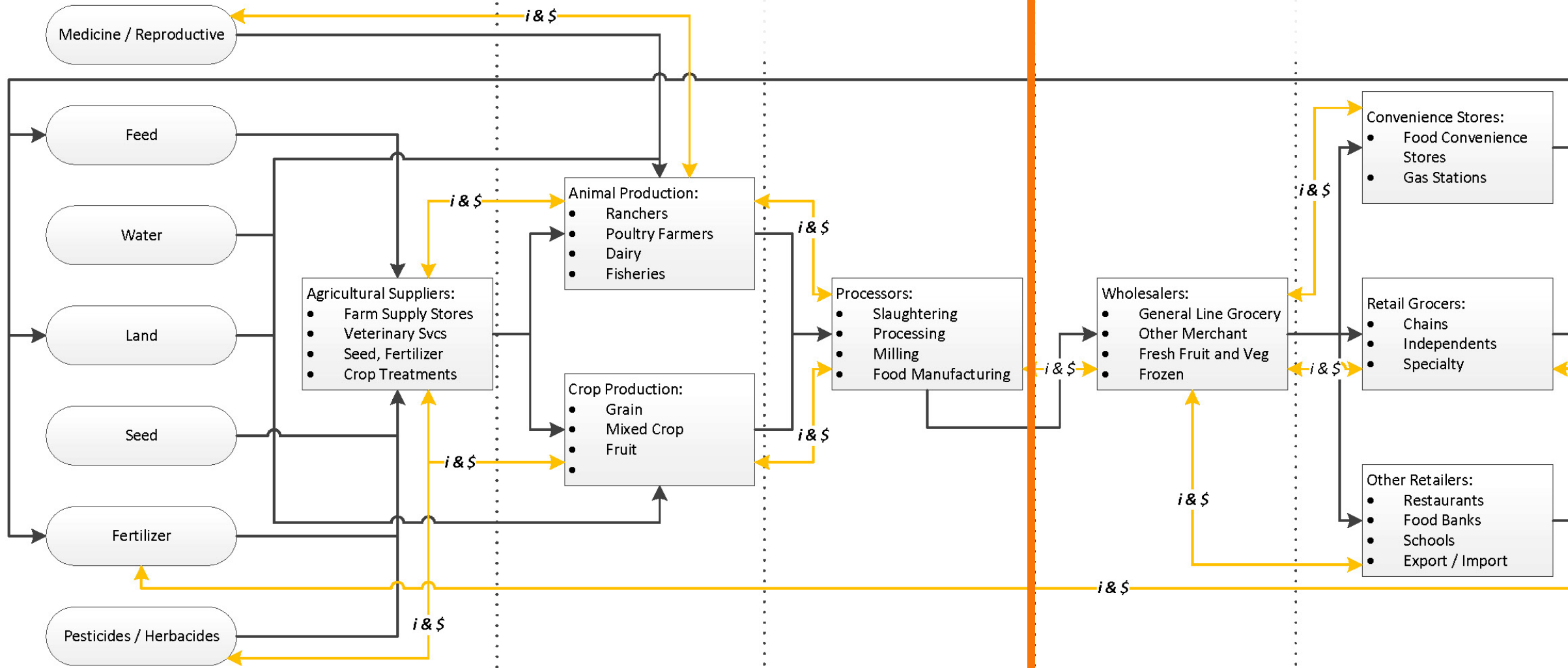


	<p>3</p> <p>Knowledge Supply Chain Partners</p> <ul style="list-style-type: none"> Tampa Bay Chamber of Commerce Farm Bureau Local 4H Universities and Trade Schools Trade and Labor Unions 	<p>Financial Supply Chain Partners</p> <ul style="list-style-type: none"> Banks Insurance Funding Agencies Chicago Mercantile Exchange (CME) 	<p>Other Supply Chain Partners</p> <ul style="list-style-type: none"> Utilities (Electricity, Water, Communication) Governmental Agencies Regulatory Bodies and Compliance Safety, Security and Emergency Management Agencies 		
Modal Split	<p>Air: 5.8%</p> <p>Rail: 23.6%</p> <p>Water: 10.9%</p> <p>Truck: 59.7%</p>	<p>Air: 3.1%</p> <p>Rail: 24.2%</p> <p>Water: 7.2%</p> <p>Truck: 65.4%</p>	<p>Air: 2.7%</p> <p>Rail: 18.3%</p> <p>Water: 2.4%</p> <p>Truck: 76.6%</p>	<p>Air: 15.2%</p> <p>Rail: 5.3%</p> <p>Water: 3.2%</p> <p>Truck: 76.4%</p>	<p>Air: 12.8%</p> <p>Rail: 10.4%</p> <p>Water: 1.1%</p> <p>Truck: 75.7%</p>
Import Percent	<p>Import % Tampa Purchases: 42.2%</p> <p>In-Tampa MSA % Purchases: 57.8%</p>	<p>Import % Tampa Purchases: 58.6%</p> <p>In-Tampa MSA % Purchases: 41.4%</p>	<p>Import % Tampa Purchases: 76.0%</p> <p>In-Tampa MSA % Purchases: 24.0%</p>	<p>Import % Tampa Purchases: 12.0%</p> <p>In-Tampa MSA % Purchases: 88.0%</p>	<p>Import % Tampa Purchases: 7.1%</p> <p>In-Tampa MSA % Purchases: 92.9%</p>
Key Suppliers / Vendors	<ol style="list-style-type: none"> Mosaic Trademark Nitrogen Corp Cargill Tractor Supply Co Agromic Resources Helm Fertilizer Company Fox's Feed Depot Causeway Hydroponics Supply Suncoast Irrigation Hay Exchange 	<ol style="list-style-type: none"> Fancy Farms Inc Grimes Produce Davis Farms Sweetwater Organic Farm Voyager Farms Oak Ridge Fish Hatchery Bob's Blueberry Farm Sunripe Farms Sharp Tree Farm & Nursery Polygro 	<ol style="list-style-type: none"> Coca Cola Darling Intl Catalina Finer Foods Corp Tampa Florida Brewing Pepsi JM Smucker Karma Kitchen Joe & Son's Olive Oil Minute Maid Lettuce Help 	<ol style="list-style-type: none"> Performance Food Group Great Bay Distributors Inc Pepin Distributing Company Johnson Brothers of Florida Wishnatzki Packing House American Food Distribution Bulk Nation Pinellas Wholesale Meats Pet Food Warehouse Food Parade Wholesale Meats 	<ol style="list-style-type: none"> Publix Winn-Dixie McDonald's Burger King Chili's Whole Foods Market Subway ALDI Trader Joe's Cracker Barrel

Industry and transportation purchase data is obtained from EMSI, a proprietary source of industry employment and output data. Industry purchase data are based on proprietary modeling from EMSI, including the BEA's make and use tables. The transportation purchase propensities should be considered directional as opposed to precise. Business listing data was extracted from ESRI Business Analyst, using business listing data provided by Infogroup.



1 Raw Materials and Production

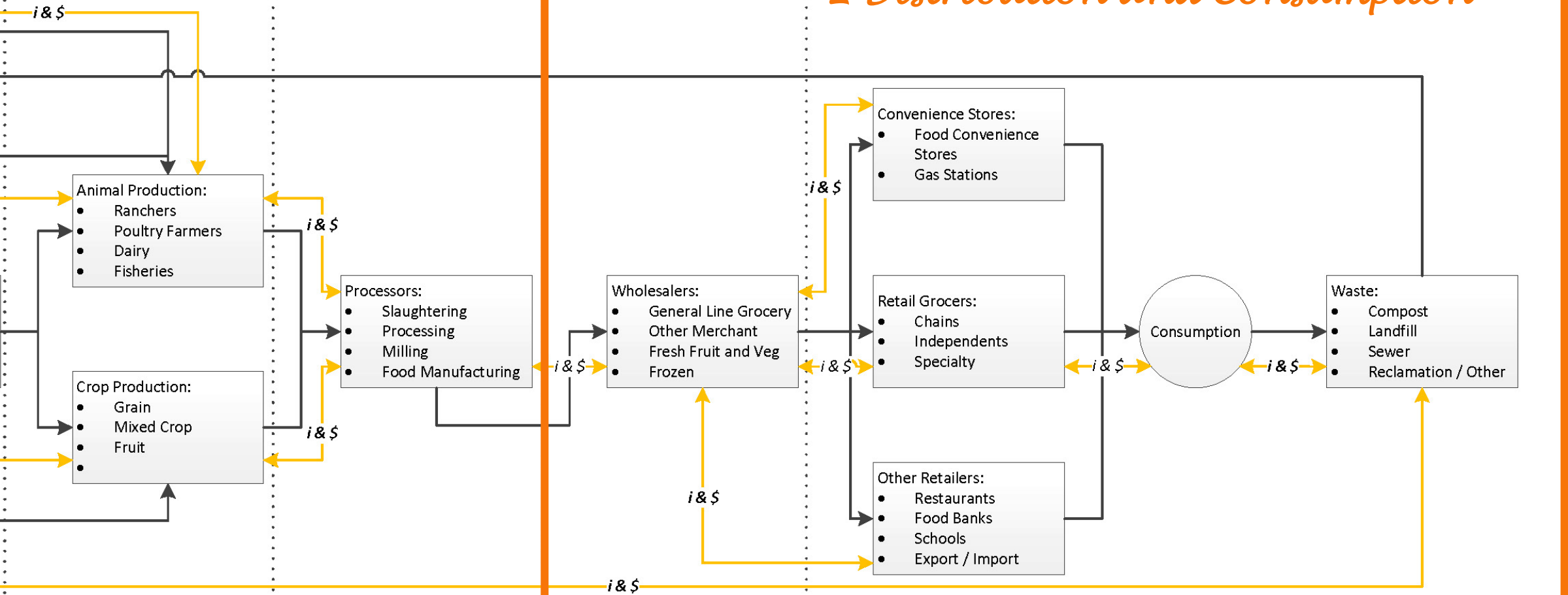


- Knowledge Supply Chain Partners**
- Tampa Bay Chamber of Commerce
 - Farm Bureau
 - Local 4H
 - Universities and Trade Schools
 - Trade and Labor Unions

- Financial Supply Chain Partners**
- Banks
 - Insurance
 - Funding Agencies
 - Chicago Mercantile Exchange (CME)

- Utilities (Ele...)**
- Government
 - Regulatory B...
 - Safety, Secu...

2 Distribution and Consumption



i & \$

Financial Supply Chain Partners

- Banks
- Insurance
- Funding Agencies
- Chicago Mercantile Exchange (CME)

i & \$

Other Supply Chain Partners

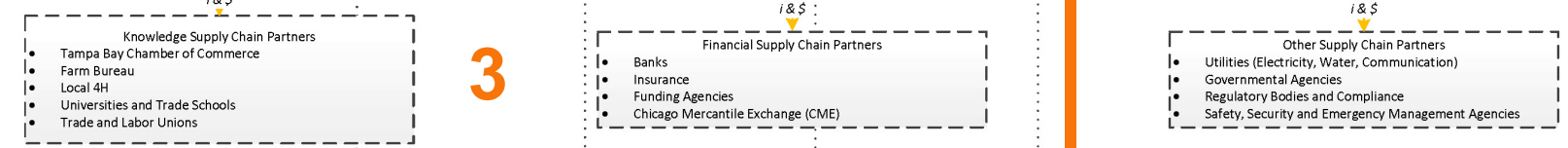
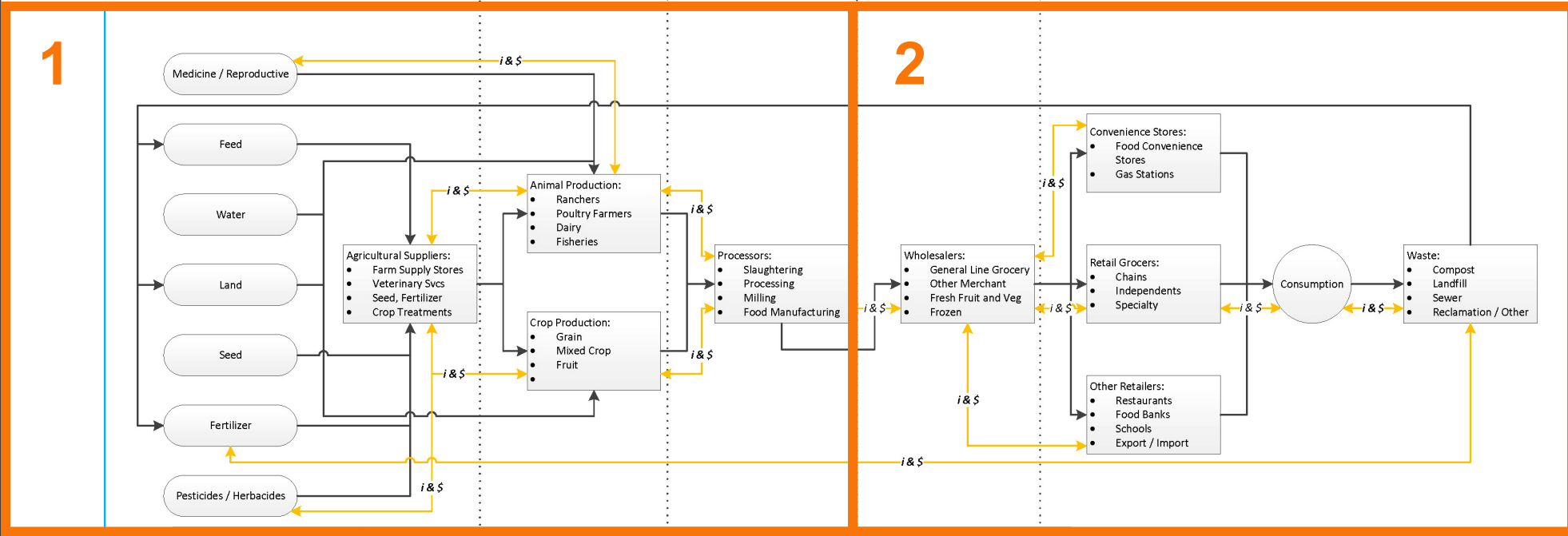
- Utilities (Electricity, Water, Communication)
- Governmental Agencies
- Regulatory Bodies and Compliance
- Safety, Security and Emergency Management Agencies



3 Modal Split per Supply Chain Component

Knowledge Supply Chain Partners		Financial Supply Chain Partners		Other Supply Chain Partners	
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Supply Chain Flow Diagram



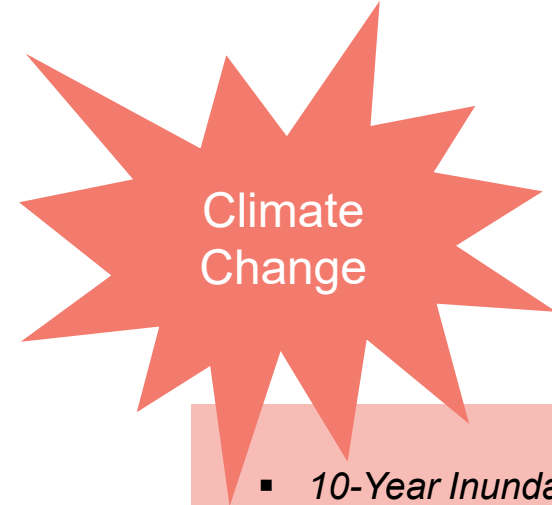
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Disaster Scenarios Considered

Cyber Attack

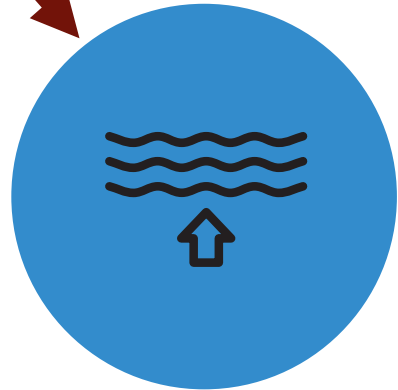
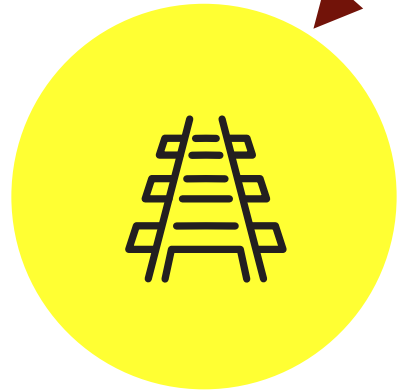
A Supervisory Control and Data Acquisition (SCADA) system of the Tampa Electric network has been infiltrated and compromised by malware, creating subsequent blackouts.



- 10-Year Inundation Event
- 25-Year Inundation Event
- 9 Inches of Rainfall in 24 Hours

Transportation Incident

A tanker truck heading eastbound on I-4 collides with the median supports of the southbound I-75 overpass which sparks a fire causing the I-75 southbound bridge to collapse.



Flooding/Wind Event

Category 5 Hurricane Chaos makes landfall in Downtown Tampa.

Disaster Impacts

Disaster Impact Matrices by Commodity

Water and Wastewater Utilities									
Disaster Scenario	Metrics	Workforce	Vulnerable Populations/Neighborhoods	Financial Flows	Utilities	Communications	Transportation	Supply Chain Partners	
	Severity: Moderate Scope: Regional	Water and wastewater utilities	Severe Regional Would create water accessibility issues as the infrastructure is destroyed. Portions of vulnerable communities would not have the transportation options to access clean drinking water available outside of the impacted areas.	Low Regional	Severe Regional Would destroy wastewater treatment plants and sewer treatment plants or the infrastructure they rely on to clear sewage or deliver water. City of Tampa wastewater plant is on Hookers Point; this area would experience 15-37 feet of inundation, making it inaccessible to the workforce. The workforce present would need to evacuate. Fire fighting infrastructure, which relies on the water system, will not be able to fight fires if pumping needed.	Low Regional Most cell towers have a required generator capacity of 24 hours - if they have 9-1-1 routing equipment, the requirement is 72 hours. Partial cell capacity will be available on units not destroyed or damaged in the event.	Moderate Regional If ports or roadways are contaminated by the destruction or inoperability of plants, those ports and roads could be temporarily inaccessible. Destroyed or damaged pipe infrastructure would have	---	---
			Moderate Local The site drains to Palm River, with vulnerable populations and neighborhoods potentially downstream. If there is additional runoff, it would pollute the water.	Low Local	Low Local Underground communications utilities on the north side of I-4 disrupted due to accident; minor disruption to internet service.	Low Local			
			Severe Local Portions of vulnerable communities would not have the transportation options to access clean drinking water available outside of the impacted areas.	Low Regional	Severe Regional The electric grid failing would cause wastewater treatment plants to fail and water to no longer reach consumers. Fire fighting infrastructure, which relies on the water system, will not be able to fight fires if pumping needed.	Low Regional Most cell towers have a required generator capacity of 24 hours - if they have 9-1-1 routing equipment, the requirement is 72 hours. Partial cell capacity will likely be available.			
			Severe Regional Vulnerable communities would have water accessibility issues if the weather event took down public transportation. A simultaneous cyber attack would widen the scope and severity of the downed water infrastructure.	Low Regional	Severe Regional Water infrastructure, like the wastewater plant on Hookers Point would likely encounter inundation resulting from the weather event. This would be combined with potential electrical failures created by grid outages, likely leaving residents without access to clean water and with inoperable sewage plants. Fire fighting infrastructure, which relies on water system, will not be able to fight fires if pumping needed - fires created by the weather event through downed facilities or electrical malfunctions would be more difficult to maintain. Two phosphate gypsum stacks are located in or next to the inundation zone north of the Alafia River near Gibsonton. Contaminated water from these stacks escapes and enters Tampa Bay as well as groundwater.	Moderate Regional Combining the potential infrastructural destruction with the total reliance on generators within the first 72 hour period would create more stress on the cell towers. Rather than distributing the traffic to the towers with generators during a grid outage, some of those will be destroyed.			
			Severe Local The populations closest to the site would have issues with runoff from the initial destruction and the resulting construction. The grid outage could make it more difficult to access clean water through this potential contamination and reduced transportation options.	Low Regional	Severe Regional The electric grid failing would cause wastewater treatment plants to fail and water to no longer reach consumers. Fire fighting infrastructure, which relies on the water system, will not be able to fight fires if pumping needed.	Low Regional Most cell towers have a required generator capacity of 24 hours - if they have 9-1-1 routing equipment, the requirement is 72 hours. Partial cell capacity will likely be available.	Moderate Regional If the electric grid is sabotaged, sewage would back up as the wastewater treatment plants are unable to perform. This back up would end up on the streets or polluting the ports, causing temporary inaccessibility.	---	---

Severe
Regional

Vulnerable communities would have water accessibility issues if the weather event took down public transportation. A simultaneous cyber attack would widen the scope and severity of the downed water infrastructure.

Severe
Regional

Would destroy wastewater treatment plants and sewer treatment plants or the infrastructure they rely on to clear sewage or deliver water. City of Tampa wastewater plant is on Hookers Point; this area would experience 15-37 feet of inundation, making it inaccessible to the workforce. The workforce present would need to evacuate. Fire fighting infrastructure, which relies on the water system, will not be able to fight fires if pumping needed.

Understanding Access to Essential Goods During Disasters

CHALLENGES / DISRUPTIONS

LESSONS LEARNED

Reduced Store and Pharmacy Hours

Lack of Transportation Options for Extended-Shift Workers

POWER IS KING!
(no water, no fuel, no cooking, no perishable foods, etc. without it)

Price Inflation
(gas, food)

ALL American Logistics Aid Network
Mobilizing for Emergency Response



Road and Bridge Closures/
Access Issues

Panic Buying/Shortages
(food, toiletries, & medication)

Disrupted Communication Systems

Backup Power Sources Needed



Truck Driver Shortage – Lack of Workforce/Training/Specialists

Finite Fuel Supply

Lack of Sterilization Chemicals
(for water treatment & medical use)



REDUNDANCY IS KEY!

Have Resource Substitutions Available

Have Emergency Staffing Plans in Place

Cross Training of Staff on Use of Equipment/Operations is CRITICAL



- Link between climate change; Environmental, Social, and Corporate Governance (ESG) principles; and supply chain resilience – these factors create habitability and interoperable lifelines
- To create resilient communities, **supply chains must be resilient and solutions must balance freight needs and community needs**
- Other hazards (such as cyber attacks, transportation incidents, etc.) need to be considered
- Hillsborough County has redundant transportation infrastructure overall – there are network gaps at critical facilities; backup facilities are not equipped to handle demand of primary facilities

Recommendations

- Most recommendations are transportation-related; others are workforce-related or pertain to general resilience/recovery
- To be implemented with supply chain partners, stakeholders, & communities
- Categorized by TPO Role & Type
 - TPO Role: Leader, Collaborator, or Facilitator
 - Type:

Transportation

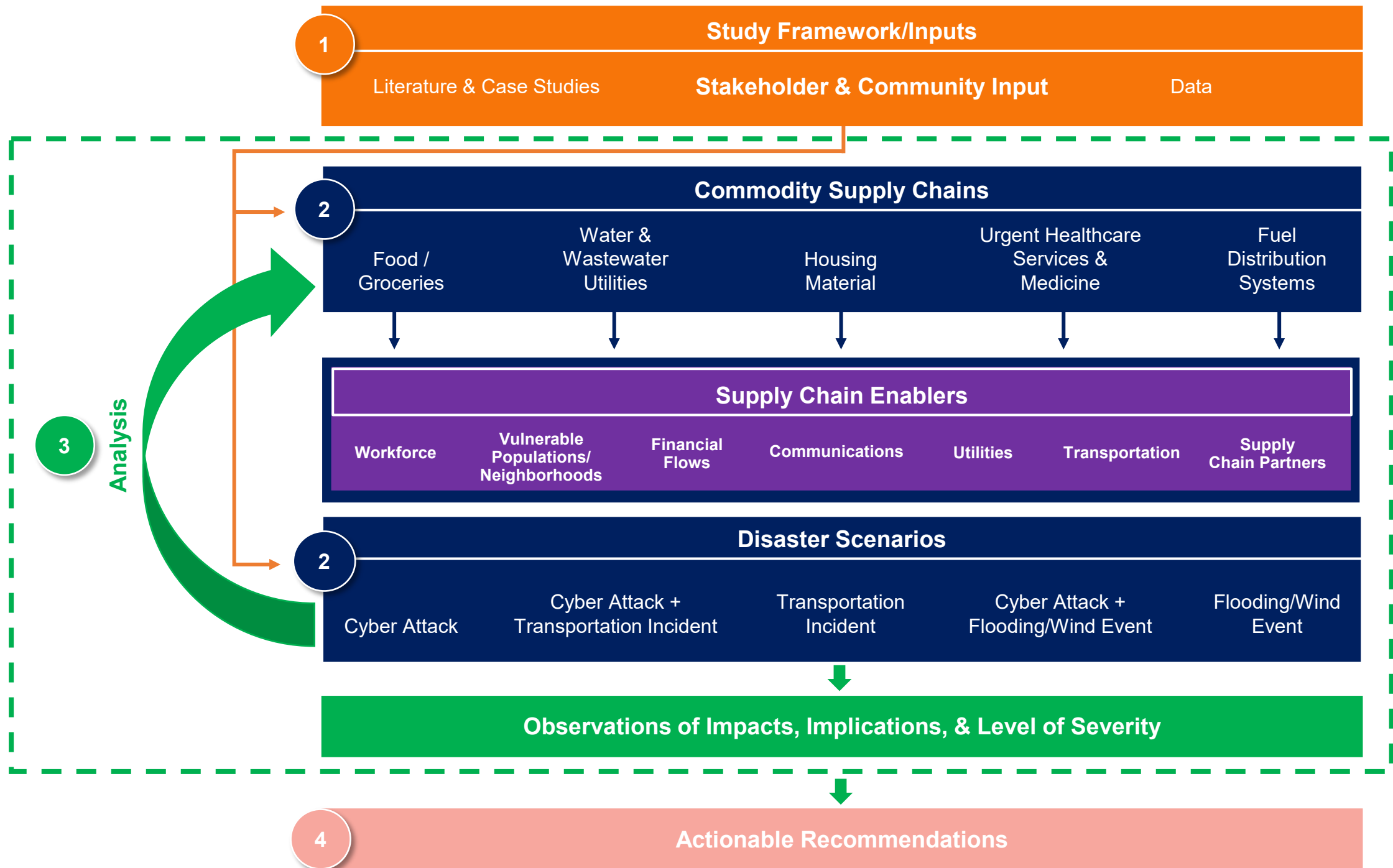
Study/Guide/Research

Coordination

Training/Tool/Education

Grant Opportunity

Supply Chain Disruption Methodology



Recommendations – Focus on Resiliency of Strategic Facilities

- **Critical freight facilities identified**
- **Many of the critical facilities are susceptible to inundation from storm events**
- **Climate change makes maintaining these facilities more critical**
- **Communities along or near strategic facilities have bicycle/ped needs**



Commerce Street Looking West

Designing to Coexist



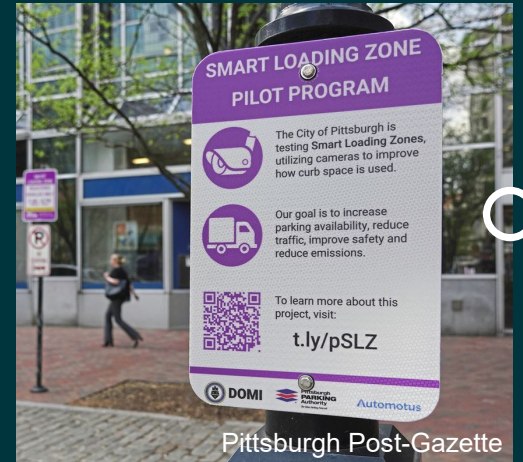
Joint Ped & Truck Infrastructure



Separate Bike/Ped Infrastructure



- Center solutions for all three aspects on Community Need
- Better define space for pedestrians and bicyclists
- Design infrastructure to withstand freight vehicle access
- Create stormwater infrastructure that brings additional benefits to the community



Smart Loading Zones



Stormwater Parks

Designing to Coexist



Buried Utilities



Rail Upgrades



Complete Street Features & Enhanced Stormwater Facilities



Improved Access



Stormwater Improvements

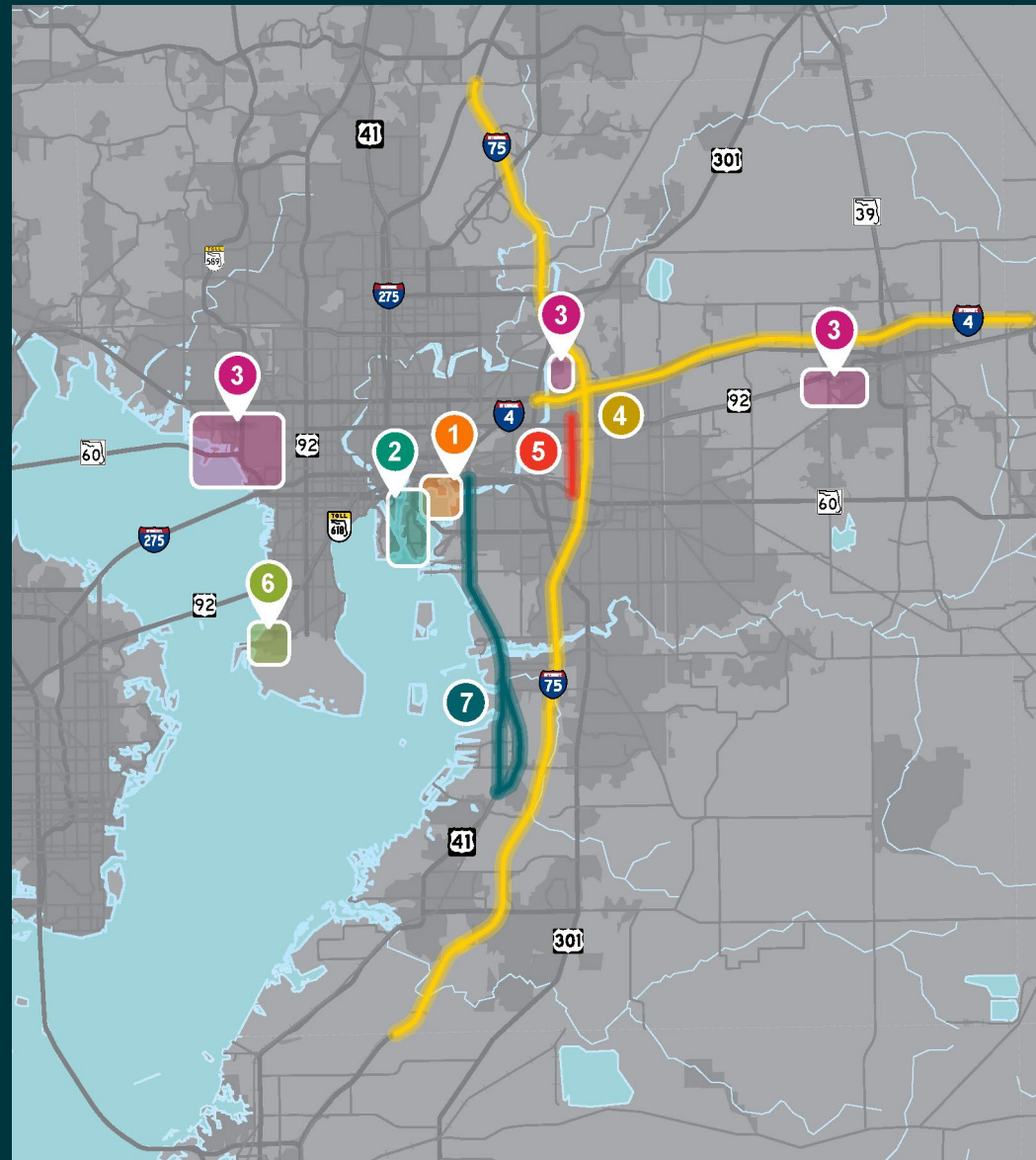


Raised Road Profile



Strengthened/ Enlarged Culvert Structure

Recommendations – TPO Role: Leader / Type: Transportation



- 1 **Ybor Channel Complete Street/Freight Access/Resilience Study**
- 2 **Hooker's Point Road/Rail Access Resilience Study**
- 3 **Hillsborough County Airports Access Study**
- 4 **Study Managed Lanes Infrastructure/Policies to Enhance Access to Port**
- 5 **Falkenburg Road County Facility Access Resiliency Study**
- 6 **Port Tampa Bay Road/Rail Access Resilience Study**
- 7 **US 41 Corridor Road/Rail Access Resilience Study**

Other Recommendations – Type Examples

Study/Guide/Research

Develop a local supply chain resilience best practices guide [S-2]

Training/Tool/Education

Develop supply chain resilience best practices training for managers in critical retail and distribution positions [E-5]

Coordination

Facilitate annual Hillsborough County supply chain focused tabletop or functional practice exercise [C-2]

Grant Opportunity

Assess Infrastructure Investment and Jobs Act (IIJA)/Bipartisan Infrastructure Law (BIL) grants to study Alternative Fuel Corridors - opportunity to work with Florida Department of Transportation [G-1]

Recommended Action

Accept Freight Supply Chain Resilience Study

Study Contact Information

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Global Supply Chain & Logistics
AECOM
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jason.smeak@aecom.com

Freight Supply Chain Resilience Study Website:

<https://planhillsborough.org/freight-supply-chain-resilience-study/>

