

Northeast Kingdom Agricultural Transportation Feasibility Study

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Prepared by

Rosalie J. Wilson Business Development Services

Resource Systems Group, Inc.

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Introduction

About this Study

This Agricultural Transportation Feasibility Study is an outcome of the *Storage and Distribution Report for Local Food in the Northeast Kingdom* (2016) which is part of a substantive five-year update to the Regional Food System Plan for the Northeast Kingdom. The goal of this study is to assess the feasibility of freight service and shared-use delivery vehicle business models. Affordable and accessible delivery and distribution mechanisms have been key barriers to growth for the region's producers.

About the Regional Food System Plan for the Northeast Kingdom

In 2011, the Center for an Agricultural Economy partnered with the Northeastern Vermont Development Association to create a plan for a Regional Food System. The Plan Update has been funded by a Rural Business Development Grant from USDA Rural Development. The ultimate goal of the plan is to drive the development of new and more diverse agricultural activity and to develop a comprehensive strategy to stimulate this innovative food system sector for the Northeast Kingdom. Although the regional food system plan primarily focuses on Caledonia, Essex, and Orleans Counties, it does not – and cannot – rigidly adhere to those geopolitical boundaries. The plan, as well as this study, demonstrate the interdependence of our producers, growers, and distributors with adjoining regions such as the New Hampshire side of the Connecticut River, and regional metropolitan markets such as Boston and Burlington.

About the Northeastern Vermont Development Association

Formed in 1950, the Northeastern Vermont Development Association (NVDA) serves as both the Regional Planning Commission and Regional Development Corporation for Caledonia, Essex and Orleans counties. As the Regional Planning Commission, NVDA assists with a wide variety of planning and technical services. From assisting municipalities with regulatory options, to administering grants, creating maps, and implementing transportation and natural resource plans, NVDA is actively working with land use issues in the region. As the Regional Development Corporation, NVDA works on infrastructure improvements, assists companies relocating to the area, helps existing businesses to grow, and administers revolving loan funds. NVDA also fosters key partnerships with the Small Business Development Center, the Northeast Kingdom Collaborative, the Northeast Kingdom Travel and Tourism Association, and the various Chambers of Commerce in the region.

About the Consultants

ROSALIE J. WILSON BUSINESS DEVELOPMENT SERVICES

RJWBDS, founded by Rose Wilson, specializes in business planning and market development for public and private entities within the farm and food sector. Since 2004 RJWBDS has consulted with more than two hundred clients on business planning, market development, and feasibility studies. Rose has authored numerous studies on the regional agricultural economy and hosted marketing, financial, and business planning workshops across Vermont and New Hampshire. Rose is a member of NOFA Vermont, Rural Vermont, and the Vermont Fresh Network and serves on the NOFA Loan Committee.

RESOURCE SYSTEMS GROUP, INC.

RSG applies state-of-the-art modeling, mapping, and analytics to transportation planning, market strategy, environmental management, and custom software development, helping organizations make critical decisions with confidence. Since its founding by Dartmouth professors in 1986, RSG has provided actionable insights through the skilled application of advanced, creative, and customized techniques and tools to serve a broad portfolio of public- and private-sector clients locally, regionally, nationally, and internationally. RSG is a 100% employee-owned (ESOP) company and has been honored with several national workplace excellence awards. RSG is headquartered in White River Junction, Vermont, and has additional offices in Burlington, Vermont; Arlington, Virginia; Evansville, Indiana; Chicago, Illinois; Salt Lake City, Utah; and San Diego, California.

For 30 years, RSG has influenced innovations in transportation throughout northern New England and across the globe. Comprehensive transportation planning requires a multidisciplinary approach to identifying and developing appropriate solutions. RSG's blend of transportation and market knowledge, and our unique set of multidisciplinary capabilities, yields innovative, actionable, and cost-effective results.

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Executive Summary

Overview

Affordable, flexible, and accessible delivery and distribution mechanisms represent key barriers to growth for Northeast Kingdom producers. The region's low population density often requires producers to seek external markets to achieve critical mass. Are there business models and delivery service options that could facilitate these producers' access to markets? What are these options?

As explored in the *Storage and Distribution Report for Local Food in the Northeast Kingdom*, this study seeks to identify and present existing "Freight Service" delivery solutions available to producers, map current and desired delivery end points and volumes, and explore the feasibility of delivery business models and "shared use" delivery vehicles for producers of all sizes and scales to access affordable, efficient food-safe transportation.

Three models explored in this study include the following scenarios:

Model 1: Leased Vehicle

- user pays mileage and reefer hourly charge to cover wear and tear
- user pays fuel (~0.23 / mile)
- user pays a daily charge of capital costs, insurance, registration
- shared lease models
- reviewing lease vs ownership costs

Model 2: Owned Vehicle

- user pays a mileage charge to use the truck, offsets owner's/core user's truck carrying costs
- user pays for fuel (~0.23 / mile)
- user must pay/provide insurance to supplement primary insurance

Model 3: Aggregator

1. An aggregator, be it a third party or the group of producers, coordinates freight shipping service
2. Per unit (pallet or case) fees cover the costs of service (TCO + labor, overhead)
3. Trips are designed to optimize volume per load to geographic destination points
4. Short-Haul and Long-Haul trucking options are investigated

This study also explores the potential benefits of the Northeast Kingdom's Foreign Trade Zone, as they pertain to producers.

Conclusions & Recommendations

- The average Total Cost of Ownership¹ of a refrigerated box truck using observed Vermont data for 1 to 2-truck fleet operations ranges from \$1.02 - \$1.66 per mile at an average annual usage of 20,000-30,000 miles per truck.
- Leasing trucks is an option that should be considered when miles per truck are above 15,000 per year or if Total Cost of Ownership is above the observed average \$1.30 per mile.
- Key concerns to establishing a shared-use delivery vehicle service include liability coverage, driver requirements, food safety requirements, repairs and maintenance, roadside assistance, coordinating vehicle access, and cost.
- Producers and shippers are often uncertain of their actual shipping costs, especially labor and time, in addition to the marginal shipping costs. Appreciating the logistical and financial analysis complexities of asset management, shipping, and transportation will help increase sustainability of individual businesses and the food system as a whole.
- A key recommendation from this study, therefore, is to ensure that food producers and agricultural entrepreneurs better integrate the cost of transportation and distribution into their business plans. This training can and should be standardized and added to existing technical service providers' repertoire. For example, as the regional development corporation serving the Northeast Kingdom, NVDA regularly provides technical assistance to new and expanding businesses and enjoys dynamic partnerships with the Small Business Development Center (SBDC), Vermont Housing & Conservation Board Farm & Forest Viability Program (VHCB), Northern Community Investment Corporation (NCIC), and Center for an Agricultural Economy (CAE). NVDA maintains training facilities in St. Johnsbury, and through outreach with its partners, could coordinate and host workshops and one-on-one technical assistance to help food producers and agricultural entrepreneurs with transportation and shipping enterprise analysis. The next logical step should be to identify the costs and resources needed to develop a standardized training curriculum.

Examples of the questions a feasibility analysis should consider if a producer or organization is looking to add a shipping enterprise to their operation:

- 1) What existing options are there for shipping? Within the NEK there are at least four professional freight service providers serving food producers, with additional options being explored by individual producers. It is strongly recommended that producers determine if existing operators can provide the services needed to avoid the complexity and expense of buying, maintaining, and operating transportation assets. The existing rates for these services range anywhere between a flat fee or percent margin on the value of product being shipped. Flat fees range from \$2 - \$10 per case, \$100 - \$200 per pallet, and percent margins range up to 20% for BOL shipping throughout the New England region. Within the NEK region, three of the

¹ TCO: operating and capital costs, not including labor, overhead or depreciation.

four freight service providers already have local customers and delivery routes within northern Vermont and the NEK.

Existing frozen shipping options are extremely limited. This gap in the marketplace has been identified and none of the existing service providers have purpose built frozen capacity transportation and storage at this time sufficient to handle meaningful volume. Farm Connex is willing to expand their service to include dedicated frozen transportation should demand warrant the expansion.

2) Where is the demand?

- a. Short-Haul: Frozen short-haul is in demand from seven of the NEK producers.² Destinations are throughout Northern Vermont and New Hampshire. Refrigeration short-haul demand is also strong with eight producers looking for this service.
- b. Long-Haul: Five producers are interested in shipping Long-Haul to points south in Southern Vermont and beyond. Of these five producers, two seek delivery for meat, one for ice cream, and three for dairy products such as cheese and yogurt.³

While these producers identified a desire to reach these locations, it is not clear from the data currently available if these producers would add new customers or if they would increase production if transportation becomes accessible. Further analysis and survey data is necessary to understand the projected quantity and frequency of product movement, in addition to the value of goods being transported, to develop a business plan for one or more producers or models to assess if a specific transportation option would be feasible.

- 3) Who might be teaming partners? Costs and time for developing plans, purchasing assets, and creating a successful venture requires the support of stakeholders, business partners, and customers. The teaming arrangements and partnership should identify if any of the region's organizations or businesses would be willing and interested in overseeing and coordinating a shared use delivery vehicle service.

4) How is food safety impacting the local food system?

Food safety rules mandate that producers and handlers comply with regulations through the chain of custody and that appropriate conditions are maintained. As awareness of food safety and associated liability concerns on the behalf of customers (wholesale and direct), it is likely that a greater emphasis will be placed on refrigerated and fully-enclosed transport.

² *Storage and Distribution Report for Local Food in the Northeast Kingdom, 2016, NVDA.*

³ *Storage and Distribution Report for Local Food in the Northeast Kingdom, 2016, NVDA.*

- 5) How will the asset be used? As a depreciable asset a truck's most cost effective use would be to maximize its utilization, lowering its per hourly, per mileage, and per unit shipping costs. As the *Storage and Distribution Report for Local Food in the Northeast Kingdom* noted, some producers are willing to incur a significant cost to purchase an asset if it gives them the added confidence to ensure that sales and deliveries take place. While the actual shipping or trucking costs may not cover themselves, the business is willing to absorb these costs to protect the company's revenue generating activities. Reliability of service is an important consideration for any shipping operation or producer. Once a customer relies on a set schedule or available option it becomes one of the most heavily valued traits of the relationship with their supplier, especially in the perishable food industry. Therefore, for any sustainable transportation model, it is paramount to consider how to build redundancy into the system, including having vehicles on-call for roadside assistance, having a plan for reinvesting in new vehicles as the existing fleet ages, and having the capital needed to hire and retain labor to ensure quality and timely service is achieved.

Shipping is not cheap: Shipping connects the producer to the customer through a complicated web of transactions and handlers. Directly operating your shipping can free up some of the complexities and provide you with a higher degree of oversight and confidence in the chain of custody and end product, however, it can be inefficient and often misleading in how much shipping costs if you are not including the cost of your time to conduct the service, or planning for the depreciation of your vehicle or the cost of reinvestment in a replacement vehicle, in your value equation. Building sufficient cash flow and retained earnings to manage repairs and replacements of capital assets is a challenge, as is ensuring sufficient utilization of the asset to reduce the cost per unit for shipping. As margins for food continually get squeezed, every dollar counts and excess capacity on a truck is truly money wasted.

- 6) What is the cost benefit of owning, leasing, sharing or aggregating for the particular producer or group of producers in question? Do the benefits outweigh the costs? Is it feasible to proceed with implementation? The services and cost structures outlined in this study are general bounds in which a variety of small Vermont based delivery and distribution fleet services operate within. Any particular business would be advised to conduct their own business specific analysis both financial and logistical, for the model they desire implementing. The decision to purchase or lease a truck, run a shared service or host a truck for others to share each comes with its own complexities; legal, financial, and logistical, that should be fully understood before pursuing.

The Foreign Trade Zone

The Foreign Trade Zone (FTZ) program was created by the Federal Government to facilitate trade and increase the global competitiveness of U.S.-based companies. The FTZ is an area within the United States that the Government considers outside the country, or at least, outside of the U.S. Customs territory. Manufacturers can import supplies into the FTZ without going through formal Customs entry procedures enabling them to defer payment of duties on these supplies and pay only on the lowest tariff schedule.⁴ In 2013 the NEK was granted authority to establish FTZ 286, with a service area of Caledonia, Essex and Orleans counties in Vermont, within and adjacent to the Derby Line U.S. Customs and Border Protection port of entry.⁵ While the goal of the FTZ is to stimulate economic development, it favors larger scale manufacturing than typically found in the NEK. Producers would need to have sufficiently large order volumes or sufficiently frequent order placement (such as monthly) for use of the FTZ benefits to be economically viable. There are no manufacturers yet taking advantage of FTZ 286.

- Information about the FTZ and its benefits should be disseminated to industry groups and producer associations so they may disseminate to their members. Target groups would be those whose industries often rely on import and export trade, such as the Vermont Brewers Association and Vermont Maple Producers Association, both of whom have members importing glass and cork supplies, and potentially importing and exporting finished product, for example.
- Trade associations and industry groups should also explore the possibility of coordinating group supply orders for their members to generate sufficient size and scale of orders to facilitate members benefitting from the FTZ.

⁴ <http://www.nvda.net/FTZ.php>

⁵ <http://www.strtrade.com/news-publications-ftzb-vermont-philadelphia-040413.html>

Section 1: Why Freight Service or a Shared-Use Lease Service?

The *Storage and Distribution Report for Local Food in the Northeast Kingdom* focused on identifying gaps in the distribution system that traditional distributors have been unable to fill. It identified “Freight Service” and “shared-use” delivery infrastructures as potential solutions to these gaps. This study investigates these business models to share more information on “Freight Service” and assess whether a stand-alone “shared-use” service may be feasible. The goal is to increase avenues through which NEK producers can access markets.

Identifying demand is the most difficult task in assessing feasibility. For this study, we have developed the break-even costs necessary to provide the delivery services, and have assumed demand based on the nineteen users who indicated an interest/need in delivery in the *Storage and Distribution Report for Local Food in the Northeast Kingdom*. Ultimately, feasibility for a new service or for supporting existing freight service providers will depend on the number of producers who utilize the service. The higher the number of members, the lower the membership fee, and the more sustainable the operation.

As noted previously, many producers remain unaware of the freight service options available. Table 1 provides a list of some of the delivery service options serving the NEK.

Table 1: NEK Food Distribution Partners

Organization	Services	Freight Service Description
Farm Connex (Don Maynard)	Freight Service: BOL, LTL, Refrigerated, Frozen	Cases, Pallets. Hardwick to NEK, Burlington, Montpelier.
Myer’s Produce	Distributor Freight Service: BOL, LTL, Refrigerated	limited cases and pallet options. Hardwick to Boston & NYC
Black River Produce	Distributor Freight Service: BOL, LTL, Refrigerated	Case and pallet BOL options
Upper Valley Produce	Distributor Freight Service: BOL, LTL,	4-5 pallets (~½ truck) minimum for pickup/drop off
Slice of Earth	Freight Service: Could provide BOL, LTL for other producers	Wolcott, VT to PA/Maryland, (53’ trailer loads). I-91 corridor. Backhauling potential
NEK Processing	Freight Service: Could provide BOL, LTL for other producers	Barton/Lyndonville. Friday delivery route within NEK
Peaslees VT Potatoes	Freight Service: Could provide BOL, LTL for other producers	Guildhall, VT. Non-reefer truck. weekly to Brattleboro, Burlington, Littleton, NH

The terminology used in the table:

Distributors: Organizations that purchase product for resale. They will pick up and transport their items.

Freight Service: Organizations that pick-up and delivery products for a fee. Within Freight Service options providers offer:

- Bill of Lading (BOL): The type of shipping for a service, where by the paper slip known as a “Bill of Lading” represents the chain of custody of the item from producer to purchaser. The shipper often charges a set rate per volume or by weight.
- Less-Than-Truckload (LTL): Arrangement whereby the shipper is able to accept less than a full truck load, either by combining multiple orders in the same truck or only shipping partially full trailers.

Shifting Delivery Methods

The *Storage and Distribution Report for Local Food in the Northeast Kingdom* noted that 65% of producers are currently distributing in personal vehicles, 29% in box trucks and 6% in cargo vans. The increasing focus on food safety, requiring a documented chain of custody and product handling history, as well as customer’s desire and confidence in the food system will likely continue to shift to favor mechanically cooled trucks, moving even small producers away from personal vehicles and coolers over time. With changing and increasing food safety requirements, it will be essential for NEK producers to anticipate the cost of adapting their delivery and transportation methods to meet safety requirements, and build these expenses into their business plans.

The final rule on Sanitary Transportation of Human and Animal Food was issued in April 2016 as one of the seven foundational rules proposed within the FDA Food Safety Modernization Act (FSMA). The FSMA model is designed for producers selling, or scaling up to sell, wholesale. The wholesale market in and of itself may expect certain types of business practices that depending on a producer’s current business model, may require additional expenses, such as single use wax boxes, however, the expenses relating to scaling up production for wholesale markets are not explored in detail in this study. In this study we focus on FSMA as it pertains to the transportation of food.

Any food transported for human consumption falls under the jurisdiction of the FSMA rule, with an exception of transportation operations carried out by farms and those of entities with under \$500,000 of gross receipts. While these exemptions apply to many Vermont producers and organizations, there is a clear goal that sound transportation food safety practices are encouraged regardless, namely around: properly refrigerate food, cleaning of vehicles between loads, and methods to properly protect food.

A fact sheet provides a number of clear guidelines for the safe and sanitary transportation of human food⁶. Key considerations include:

- Vehicles and transportation equipment: The design and maintenance of vehicles and transportation equipment to ensure that it does not cause the food that it transports to become unsafe. For example, they must be suitable and adequately cleanable for their intended use and capable of maintaining temperatures necessary for the safe transport of food.
- Transportation operations: The measures taken during transportation to ensure food safety, such as adequate temperature controls, preventing contamination of ready to eat food from touching raw food, protection of food from contamination by non-food items in the same load or previous load, and protection of food from cross-contact, i.e., the unintentional incorporation of a food allergen.
- Training: Training of carrier personnel in sanitary transportation practices and documentation of the training. This training is required when the carrier and shipper agree that the carrier is responsible for sanitary conditions during transport.
- Records: Maintenance of records of written procedures, agreements and training (required of carriers). The required retention time for these records depends upon the type of record and when the covered activity occurred, but does not exceed 12 months.

Frozen Shipping Demand

The *Storage and Distribution Report for Local Food in the Northeast Kingdom* noted Kingdom Creamery's desire for frozen shipping options to New York City. The study also identified a number of other producers looking for frozen shipping options. Few freight shippers, however, offer frozen transport as it presents logistical challenges, is more expensive, and to date demand, while growing, has been insufficient to make a financial case for it.

A local Long-Haul shipper noted that while there is the ability to place a freezer on a truck the reality of doing so would be seasonally dependent and not necessarily affordable for producers. The per case shipping cost will be substantially larger given the space that the freezer requires and the limited volume within the freezer compartment. The result is an overall reduction in the overall amount of product that can be loaded per trip. This reduces the total revenue per trip unless a higher fee per item is charged. This example highlights the tradeoffs between creative shipping uses and the desire to be collaborative, with the practical realities of volume and revenue needed to carry the costs of the truck.

Farm Connex provides "frozen" delivery for Kingdom Creamery and Strafford Organic Ice Cream on a short haul basis from non-frozen equipped delivery vehicles. The company's standard refrigerated vehicles are outfitted with coolers holding the frozen product. If there is enough demand Farm Connex will convert the front of one of their trucks into freezer space. This would require 4-6' of space and a bulkhead with two temperature controls, the frozen section would

⁶ <http://www.fda.gov/downloads/Food/GuidanceRegulation/FSMA/UCM494118.pdf>

be separated from the refrigerated section with foam and would be accessed by the curb side door.

Section 2: General Business Model for Freight Shipping and Shared Use

Configuration of the delivery trucks

While the needs of producers in the NEK vary in the type and scale of shipping, almost all need some degree of mechanical cooling to maintain product in acceptable condition and comply with food safety regulations. This study, therefore, focused on refrigerated vehicles.

A variety of refrigeration options exist on a number of different chassis and box configurations accommodating temperature ranges as low as -18°F.

The most common size being used by 1-2 truck food delivery fleets in Vermont are trucks accommodating between 10 and 20 standard pallets (a 26' box). However, a smaller 6-pallet (16' box) foot print is becoming increasingly available and will be more approachable for inexperienced drivers. All trucks in this study are designed to carry a gross weight of less than 26,000 pounds, are thus classified as Class 6 and lower, and allow for non-CDL drivers.

Capacity of the delivery trucks

The capacity and general loading configuration of a shared delivery truck significantly impact the cost of the delivery routes. Inefficient use of space can reduce the amount of product on the truck and poor loading can lead to damaged goods and a large amount of wasted time at pick-up and drop-off points if cross-docking or multiple pallet moves are required.

The costs of delivery routes and trucking incurred by producers is often expressed as unit costs by the case or by the pallet. These units are used in this study when identifying the costs of operating and leasing a delivery vehicle. When cases are used, this study assumes a general 40 cases per pallet, at up to 50 pounds per case for a pallet maximum weight of 2,000 pounds. This is a standard limit for shipping pallets and can help any trucker manage their loading configuration to stay within weight restrictions of their truck and non-CDL status.

While standard case sizes and weights are easier to manage, the reality is that many producers have a variety of pack sizes and pallet configurations as well as crushable weight limits and other criteria. All these complexities are very important to the success of the delivery operation but have not been accounted for when developing these per unit costs. The trailer dimensions shown in Table 2 suggest an estimated number of pallets per truck. Depending on the exact dimensions, the number of pallets does vary. A straight loaded pallet is 4-feet long, which does not allow excess space at the nose or end of the truck for product spill over or for safely closing the door. Therefore, some 16-foot trailers are actually slightly longer and can hold the full 8 pallets.

Table 2: Straight Loading Pallet and Case Quantity Capacity Assumed

Trailer size	Number of Pallets	Possible Case Quantity
16 ft length	6 - 8	240 - 320
20 -24 ft length	8 - 10	320 - 400
26 ft length	12	480

The actual capacity on delivery trucks is not only determined by the length of the trailer, but also the demands on the loading and unloading of its loads.

Short-haul delivery often requires the trailer maintains empty space to enable the trucker to move through the trailer, and to minimize moving boxes and pallets around and off the truck at intermediate stops. The difficulties of managing the space as well as correctly tracking deliveries for unloading and loading within the same route are not trivial. Reserving space on the truck assists making these activities easier but represents an opportunity cost since that space otherwise might have been filled with other customers' freight. This analysis assumes one pallet space will be reserved for mobility and space operational management on the trailer. The short-haul trips spread the cost of the trip over a reduced volume relative to the size of the truck.

Long-haul delivery often has reduced complexity associated with multiple pickups and drop offs. This simpler route enables the trucker to maximize the revenue of the load and fill the trailer to its capacity. Because stops are fewer and time spent at each stop is small relative to the overall length of the trip, cross-docking and moving pallets around to access the particular one of interest is less significant to the overall time of the trip. Long-haul trips can therefore spread the cost of the trip over a greater volume of product in the trailer.

Ownership Models

To assess the feasibility of delivery options we studied both owned and leased vehicle models.

Owned Vehicle Cost Model

Vehicle Capital Costs

The average cost for a new, refrigerated van, such as a Ford Transit van, ranges from \$30,000 to \$40,000. The cost for a refrigerated 16'-26' box truck can range from \$20,000 to \$100,000 depending on age and condition. Table 3 below provides a purchase price range based on observed sale prices in Vermont and illustrates the capital cost per mile based on an assumed annualized payment schedule of seven years at 4% interest, and an estimated 20,000 miles driven per year, based on the observed Vermont data for 1 to 2-truck fleet operations.

Table 3: Typical Refrigeration Truck Capital Costs

Age	Model Type	Purchase Price Range	Annualized Payment (7-year schedule @ 4% interest)	Capital Cost per Mile @ 20k miles per year
New	Transit Van	\$30,000 – \$40,000	\$4,900 – \$6,500	\$0.25 – \$0.33
New	Box Truck	\$60,000 – \$100,000	\$9,850 – \$16,400	\$0.49 – \$0.82
0 - 5 years	Box Truck	\$30,000 – \$60,000	\$4,900 – \$9,850	\$0.25 – \$0.49
5 - 10 years	Box Truck	\$20,000 – \$30,000	\$3,300 – \$4,900	\$0.17 – \$0.25

The costs do vary based on the size of the vehicle, however, typically not by much. \$10,000 is a common difference between different trailer sizes. Often the truck engine and cab component are the critical concern, with the trailer and length contributing less to the overall cost of the truck.

Owned Vehicle Operating Expenses

Vehicle operating expenses are those expenses tied to the annual costs of maintaining the vehicles suitable for Department of Transportation (DOT) inspections, state inspections, food safety requirements, and relevant registrations, insurance, and fuel costs.

These costs have been broken down into general categories of maintenance, registrations, insurance, and fuel. The values in Table 4 were obtained from limited data provided anonymously by small food service distribution and delivery organizations in Vermont.

Table 4: Operational Costs⁷ Observed in Vermont for Small Diesel Fleets

Cost Items	Average Annual Cost (per truck)	Average Annual Mileage Cost for 20,000 miles
Maintenance & Inspections Costs (annual rolling average)	\$12,000	\$0.46
Fuel	\$7,750	\$0.24
Insurance	\$2,400	\$0.10
Registration(s)	\$900	\$0.05
other licenses (i.e. dairy)	\$200	\$0.01
sub-total	\$17,000	\$0.86

The average operating costs have been developed using short-haul observed rates from Vermont shipping organizations.

⁷ Excluding capital costs

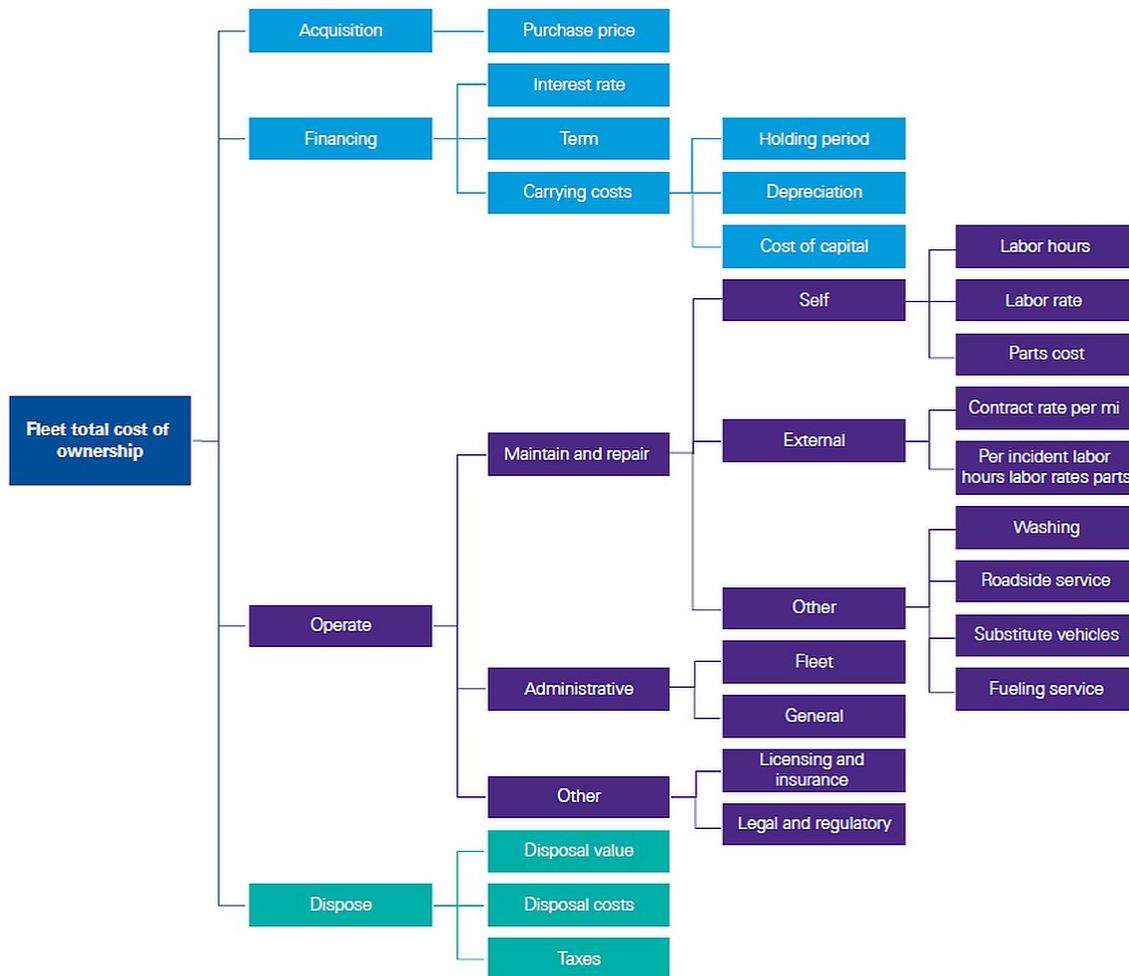
Total Cost of Ownership

This study uses the costs to acquire the capital items (trucks) and estimated operational costs to estimate a total cost of ownership (TCO) for the shipping infrastructure necessary to carry out a delivery service.

An analysis conducted by KPMG in 2016 (*Re-evaluating the Total Cost of Truck Fleet Ownership*, KPMG, 2016) estimated the average cost per mile for class 6/7 trucks was \$0.78. The study noted that fleet annual average mileage was 36,000 and that higher costs are seen for those fleets with fewer trucks (average mileage costs go down with increase in average size of fleet).

The TCO using the observed Vermont data for 1 to 2-truck fleet operations range from \$1.02 - \$1.66 per mile assuming an average annual mileage of 20,000-30,000 miles per truck, with an average of \$1.30. Figure 1 below identifies some of the key items for calculating TCO.

Figure 1: Total Cost of Ownership (KPMG)



Leased Vehicle Cost Model

The expenses associated with a leased vehicle model are similar to the owned vehicle model. There is a lease fee to the owner to offset capital costs for the vehicle. In addition to the lease fee, expenses include insurance, fuel, and a mileage and reefer hour surcharge which covers repairs and maintenance.

Ryder

Ryder offers daily and weekly rentals and multi-year monthly lease agreements for 26' and 16' refrigerated trucks with reefer units that can be programmed to operate as low as -18°F. Trucks can be provisioned at the White River Junction or Burlington Ryder office locations.

These vehicles are Class 6 or lower, with a weight limit of 26,000 pounds. These trucks can be operated with no prior experience and do not require a CDL.

Lease and rental fees include roadside assistance, vehicle replacement, repairs and maintenance. Ryder can also provide insurance (physical damage and liability coverage) for an additional fee. Table 5 demonstrates the rental fee structure for a 16 and 26 foot refrigerated box truck.*

Table 5: Refrigeration Truck Rental Costs

Truck	Daily Rental	Weekly Rental	mileage charge	Reefer Rates (per hr)	Insurance	
					Physical damage (wkly)	Liability (wkly)
16 ft Reefer truck	\$140.95	\$704.75	0.21	1.25	104.95	181.65
26 ft Reefer truck	\$156.95	\$784.75	0.18	1.25	104.95	181.65

Table 6 demonstrates the lease fee structure for a 16- to 26-foot refrigerated box truck. The monthly lease fee includes physical damage and liability insurance.*

Table 6: Refrigeration Truck Lease Costs

Truck	Monthly Lease (includes insurance)	Mileage charge	Reefer Rates (per running hr)
16 ft – 26 ft Reefer truck	\$1,500 – 1,750	\$0.09 - \$0.21	\$0.50 – \$1.25

* All fees quoted are subject to change.

Penske

Penske expressed interest in opening an agent location in the NEK that could be equipped with 3-4 reefer trucks available for lease should sufficient demand support this need. Penske would consider accommodating this service at non-profit rates and could operate the agent location out of an existing business, such as an ACE hardware store or a storage rental unit. Penske has

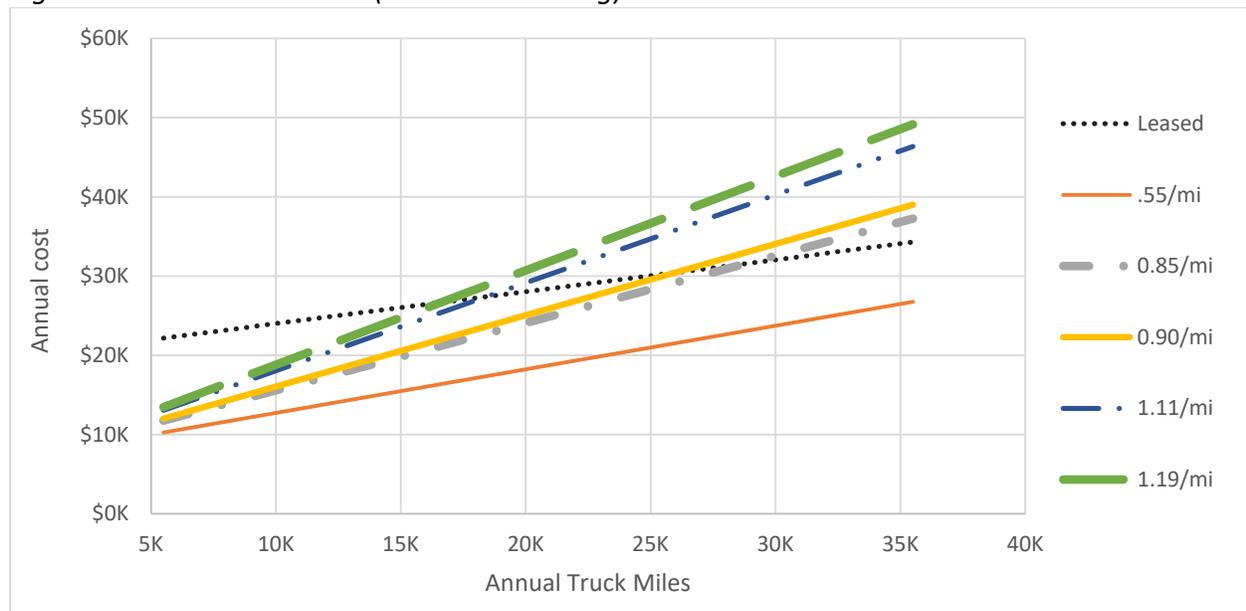
embarked on similar solutions to support the NEK and North Country lumber industry which has also faced limited transportation options.

Comparing Lease vs. Ownership

By comparing the average operational costs of owned trucks versus the cost of operating leased trucks there is evidence that at a certain annual mileage driven, the cost advantage shifts from owning to leasing. At the average operational cost of \$0.86 per mile (see Table 4 for the operations excluding labor and capital) and 26,000 travel miles per year, the cost advantage appears to shift to a leased vehicle model. The comparison of different operational costs versus leasing is shown in Figure 2. The operational costs shown are for fuel, maintenance, insurance, and licenses and account for the average capital costs per year of approximately \$7500.

This analysis is simplistic because it is likely that as mileage increases, operational costs per mile decrease. The marginal increase in mileage is not linear as to its impact on operational costs. The scale and scope of this study precluded a more thorough review of the actual mileage / operational cost curve. However, the analysis shown in Figure 2 does suggest that anyone using a delivery vehicle at a rate of 20,000 miles per year or more conduct a cost benefit analysis of leasing vs owning as it is possible that a leased arrangement could save their organization money.

Figure 2: Annual Fleet Costs (Leased vs Owning)



The analysis shown here in Figure 2 accounts for the fact that many of the local trucking organizations carry debt or should be depreciating their asset and these are fixed annual costs. The operating costs on the Y-Axis show the variable operational costs per mile and then add in the fixed annual capital cost for the asset.

Additional considerations:

- Flexibility: ownership allows the user to be flexible with the actual use of the truck. The use doesn't have to operate within constraints imposed by the lease.
- Capital purchase cost: Used refrigeration trucks may cost less to finance, but it is important to track annual operational expenses and maintenance. As these costs increase with vehicle age, there comes a point where an older vehicle costs more to maintain than other options.
- Maintenance costs: Maintaining refrigeration trucks can be costly and often comes in larger fee increments than traditional truck maintenance due to the refrigeration components involved. Cash flow constrained organizations may find it prudent to lease with a set monthly payment limiting variable cost risk regarding unanticipated repairs.
- Maintenance access: Maintaining refrigeration trucks requires skilled and experienced service technicians. Most fleet owners we spoke with expressed concern in their ability to find and maintain access to a reliable and capable mechanic. With a leased vehicle maintenance and repairs, and access to well-maintained vehicles and qualified technicians are guaranteed by the leasing entity.
- System redundancy: Breakdowns happen. In a leased scenario the leasing company provides roadside assistance to ensure your products get to their destination. In an ownership model the owner must consider how to handle breakdowns- will the cost of a relief vehicle be built into the business plan? How will breakdowns impact customer service and reliability?

Sustainability of the Business Models: Overlooked Expenses

Whether leasing or owning the vehicle, operating it for personal use or as a shared service, there are overhead and operating expenses that have yet to be captured in either model. These include overhead expenses such as staff, utilities, rent, rubbish removal, business registration, telephone and internet service, marketing expenses, professional services, etc.; operating expenses such as labor, and, in an owned vehicle business model, depreciation.

Labor expenses should include the hourly or base rate plus payroll taxes and workers' compensation insurance associated with each employee.

Driver labor and depreciation should be included in the variable operating expenses, overhead would fall under fixed costs. A business should aim for operating expenses totaling no more than 65% of gross sales and overhead expenses totaling no more than 35% of total gross sales.

Section 3: Comparing Per Unit Shipping Costs Employing Multiple Shared Use Vehicle Business Models

This section of the study extrapolates how TCO or total cost of leasing translates into a per unit shipping cost per pallet or case based on one of three business models at a variety of mileage distances and an assumed number of trips per week.

The following four shipping options are explored in this study:

- 1) Refrigerated Short-Haul Routes
- 2) Frozen Short-Haul Routes
- 3) Refrigerated Long-Haul Routes
- 4) Frozen Long-Haul Routes

Through the analysis of the needs of the producers in the NEK there is sufficient frozen demand to warrant modeling out the cost of shipping services for both frozen (<32°F) and refrigerated product (32-40°F).

The distances that NEK producers are shipping include Short-Haul to locations within the NEK, Burlington, and Montpelier, as well as to points of sale much further away, including Portland, ME, Pittsfield, MA, Boston, MA, and New York City, NY. Some producers continue to push further along the eastern seaboard into Maryland, Pennsylvania, and beyond. Anything beyond the northern Vermont context is considered Long-Haul for the purposes of this study.

Three different models are explored, each with capability to do refrigerated and frozen as well as short- and long-haul. The models include:

- **Model 1:** No core user. A leased truck is available every day of the week. Assumption is it will be accessed for a minimum of three trips per week by one or more users. The TCO of ownership or monthly lease fee is split into a three day per week daily rate. User pays per trip mileage and reefer per hour charges.
- **Model 2:** 1 core user. An owned truck is offered for rent to other users when available on a per mileage fee basis.
- **Model 3:** Aggregator. An aggregator or the core group of users coordinates loads from multiple producers to optimize efficiency per trip.

Each of these three models present different cost structures and may be suited to specific types of shipping and certain volumes of product shipped.

Model 1: Leased Vehicle

- user pays mileage and reefer hourly charge to cover wear and tear
- user pays fuel (~0.23 / mile)
- user pays a daily charge of capital costs, insurance, registration

This model explores the scenario of an organization entering a long-term lease of a mechanically cooled delivery truck. Leasing companies typically have a monthly charge for the vehicle, mileage charges, and hourly charges for the use of the refrigeration units.

The cost estimates in Table 7 for this scenario assume

1. the truck is being sub-let (rented out to individual users);
2. the truck is sub-let for a minimum of three trips per week;
3. the monthly lease fee, including insurance, is \$1,755; and
4. each trip is loaded to maximum capacity.

Table 7: Usage charge and mileage charge estimated costs

Miles Traveled	Daily Rental Charge (assuming truck is used three truck trips per week)	Mileage, Fuel, Reefer Charges ⁸	Labor Costs (@ \$24 ⁹ / hr)	16 ft Reefer Pallet and Case Price (assuming full truck)
50	\$127	\$19	\$80	Total Truck Cost: \$226 \$32 / pallet (assume 7 pallets for short-haul) \$0.41 per case
100	\$127	\$37	\$120	Total Truck Cost: \$284 \$36 / pallet (8 pallets for long-haul) \$0.89 per case
200	\$127	\$74.5	\$120	Total Truck Cost: \$322 \$40 / pallet (8 pallets for long-haul) \$1.01 per case
500	\$127	\$186	\$240	Total Truck Cost: \$553 \$69 / pallet (8 pallets for long-haul) \$1.73 per case

⁸ Assumes \$0.095/mi, \$0.23/mil fuel, \$0.95/reefer hr., avg. speeds of 15 miles per hour average in short haul and up to 50 miles per hour average in long haul.

⁹ \$20 gross per hour employee wage. \$4.00 per hour additional associated with payroll taxes and insurance. 15 miles per hour average in short haul and up to 50 miles per hour average in long haul.

Model 1 provides a shipping capacity of 24 pallets per week, or nearly 1,000 cases per week.

Pros

- A leased truck will ensure the vehicle is always well-maintained and travel ready.
- A leased truck will provide roadside assistance in the event of a breakdown.
- A leased truck will provide blanket insurance covering all potential users.
- More dependable truck availability, the service's core competency is providing access to delivery vehicles, this is not a secondary service offered by someone when their vehicle is not in use.
- Leasing provides scalability, can add or reduce trucks as user base warrants without having to carry the capital costs of the vehicle(s) and without having to wait for capital to invest in new assets.

Cons

- Daily rate is highly dependent on the number of trips being made per week. Worst case scenario, the daily rate would be \$1,700/day if only one trip is made per month.
- Per pallet and per case shipping costs assume maximum loads. Without professional shippers to assist users in packing and loading strategies, and especially with small producers being likely users of the rental service, using it for single business delivery need, it will be unlikely for loads to achieve maximum capacity.
- This model requires a common manager and would need to be accounted for in the cost of operating the shared-use truck. Software such as those used for Zip Car and other shared assets could be employed to allow users to pre-book and manage timing between the users.

An additional way to look at the leased use truck fee structure is to consider a membership option. The monthly lease cost, \$1,755, can be carried by assessing a fixed monthly fee to members in a co-op or co-shipping arrangement. The variable mileage and hour based fees to operate the truck would be borne by the user of the particular truck. If 10 members were to carry the lease, each would have a \$175 monthly fixed charge and then the operational costs of mileage, reefer hours, and fuel (third and fourth columns in Table).

Model 2: Owned Vehicle

- user pays a mileage charge to use the truck, offsets owners/core user's truck carrying costs
- user pays for fuel (~0.23 / mile)
- user must pay/provide insurance

This model is a generic model based on the average observed Total Costs of Ownership (TCO) identified earlier for small Vermont based fleets. However, in this model it is assumed that daily users would be responsible for fuel and carry their own insurance in addition to the primary insurance. This model may be most appropriate for when an owner of a truck(s) is able to share the truck with other nearby users by charging a fixed mileage based cost. Sharing trucks legally would require previously agreed arrangements around insurance and DOT compliance around primary registration and contracted users.

The cost estimates in Table 8 for this scenario assume the truck is filled to capacity.

Table 8: Mileage charge estimated costs

Miles Traveled	Observed average operating and capital costs per mile (@1.00) ¹⁰	Higher than Observed average operating and capital costs per mile (@1.25)	User Costs: Fuel and Labor (.23/mi & (@ \$24/ hr) ¹¹	16 ft Reefer Pallet and Case Price (assuming full truck)
50	\$50	\$63	\$80	Total Truck Cost: \$ 130 - 143 \$19-20 / pallet (assume 7 pallets for short-haul) \$0.46-0.51 per case
100	\$100	\$125	\$120	Total Truck cost: \$220-245 \$31-35 / pallet (8 pallets for long-haul) \$0.79-0.88 per case
200	\$200	\$250	\$120	Total Truck Cost: \$320-370 \$46-53 / pallet (8 pallets for long-haul) \$1.14-1.32 per case

The example model is based on an owner who has identified their cost of operations of the truck. The table above provides an average and above average range based on observed mileage costs here in Vermont for small, food delivery operations. It is anticipated that as overall mileage increases the marginal cost per mile should decrease. This is in-line with

¹⁰ Mileage charges include: capital, maintenance, base insurance, registration, and other licenses. This is the observed average in Vermont. The higher \$1.25 provides another value to benchmark around.

¹¹ \$20 gross per hour employee wage. \$4.00 per hour additional associated with payroll taxes and insurance. 15 mile per hour average in short haul; 50 mile per hour average in long haul.

national data on truck fleet management. Therefore, this model is simplistic in that the mileage cost does not vary with the per trip mileage identified in the first column.

Pros

- Leverages existing infrastructure and assets in the region
- Maximizes Return on Assets for vehicle owners or lease holders
- Provides side income for vehicle owners or lease holders to offset truck carrying costs when not in use
- Reduces fixed costs for infrequent shippers

Cons

- Truck availability revolves around core user and may be sporadic
- Condition of the vehicle is not guaranteed
- Roadside assistance- What happens in the event of a break-down?- is not guaranteed
- Liability and redundancy of the system- what happens in the event of an accident or breakdown by a non-core user that takes the truck out of commission for a long period of time for the core user?

Per pallet and per case shipping costs assume maximum loads. Without professional shippers to assist users in packing and loading strategies, and especially with small producers being likely users of the truck, using it for single business delivery need, it will be unlikely for loads to achieve maximum capacity.

Model 3: Aggregator

- An aggregator, be it a third party or the group of producers, coordinates freight shipping service
- Per unit (pallet or case) fees cover the costs of service (TCO + labor, overhead)
- Trips are designed to optimize volume per load to geographic destination points

This model is an exploration of the costs and complexities involved in running a freight shipping service. In Models 1 and 2 we focused on how a single user could access a refrigerated truck for individual delivery needs without bearing the carrying costs of a truck individually. While this provides increased accessibility, it does not necessarily address “efficiency” given most users will be traveling at Less Than Load capacity. In this third analysis, we are exploring how an aggregator fits into the picture. An aggregator specializing in delivery can further optimize costs and efficiency by grouping products to be delivered based on their destination. As such, the aggregator’s goal is to make as full to capacity a trip as possible. As noted earlier in this report, it takes skill and expertise to understand how to best load a truck, especially in short haul delivery scenarios where, with multiple producers and multiple drops, any excess time spent un-loading and re-loading to access the right product for delivery is costly.

An aggregator can be a third party service, or it could be the group of producers seeking to minimize their cost per unit by optimizing load capacity per trip. Examples of aggregators include Farm Connex, Fed-Ex, UPS, USPS, Green Mountain Messenger. Examples of producers who have or would consider being an aggregator include Butterworks Farm, NEK Processing, and Peaslee’s Vermont Potatoes for example. Several distributors could be aggregators as they offer freight shipping as a side business when they have excess capacity on their trucks. These aggregators include Myers Produce, Black River Produce, and Upper Valley Produce.

In Model 3 a number of scenarios affect how services can be delivered:

- Warehouse vs. Point of Origin based service. Warehouse: Individual producers ship and deliver their own product to a central location whereby the loads can be aggregated and consolidated by drop-off point. Point of Origin shipping: requires a vehicle to make the rounds to a number of producers, thereby increasing net mileage and time necessary in the large truck to fill up a load suitable for longer travel. Small LTL pickups often create complexity with loading configurations and efficient use on the truck.
- Organization. The service could be provided by existing LTL service providers such as Farm Connex, a producer with a truck willing to share space, or a group of producers using either Model 1 or 2 to coordinate the aggregation and delivery of their loads. Elements of coordination such as driver duties, liability, food safety, product condition, customer service, accountability, etc. will need to be agreed upon.
- Short-Haul vs. Long-Haul. The survey of NEK producers has identified both northern Vermont drop points (Short-Haul) and Long-Haul locations such as Western Mass, Boston, New York, and beyond as markets for their products.
- Refrigerated vs. Frozen. NEK producers have identified a need for additional frozen shipping capacity to access markets out of state, particularly in the ice-cream, gelato, and meat industries.

Model 3A: Short-Haul

The short-haul route would be comprised of a mix of both pickups and drop-offs. This type of design is most often done one of three ways:

- A) Pickups one day, storage, and drop-offs the next day;
 - B) Drop-offs on the way out, pickups on the way in (this would require a warehouse. It is unlikely to be able to do a full pickup then a full drop);
 - C) Pickups and drop-offs throughout a route.
- A) This route could be the longest short-haul route, allowing for a full loop for only one type of activity (either pickup or drop-off). Keeping only one activity type minimizes time at each stop increasing the possible distance. This type of route could do an average of 20-30 miles per hour in the northern Vermont area – up to 240 miles per 8-hour shift (a typical workday). The volume and capacity of the truck is maximized in this scenario because both pickups and drop-offs can be organized on the truck for sorting later in a warehouse. There is no issue of having to access pallets or product that is located behind other product in the truck. By maximizing the capacity of the truck the average cost per item will be the least of the three scenarios.
- B) This route would likely be shorter than A. It benefits from only one type of activity for each leg of the trip, increasing efficiency. Because of the time and mileage constraint, it means only half the total distance traveled is to be used either for drop-offs or pickups. This pattern of one activity at a time does increase the efficiency per stop and can also likely achieve 20-30 miles per hour in the northern Vermont area – up to 240 miles per 8-hour shift.
- C) This route option is the least efficient from a time and mileage standpoint but often a necessity for truck days and delivery needs both from a producer and a customer point of view. The needs in the refrigerated, fresh produce and dairy industries often require very quick turnaround time from production to consumption, thereby buyers are looking for fast delivery methods. The reality of traveling one route with both pickups and drop-offs makes organization of the truck a challenge, especially if one drop-off requires inputs from a pickup on the same route. The organization of the truck is one of the key limitations on this method reducing both the capacity of the truck and slowing the overall speed of the route. The average speed through the course of these routes has been observed around 15 miles per hour– up to 120 miles per 8-hour shift.

Warehousing: Short-haul routes benefit significantly from access to a warehouse. A central location where goods can be stored temporarily, sorted and re-organized, and can be loaded onto the truck in an efficient manner can be instrumental in any delivery service. The efficiencies of loading and having space to organize a truck before or after are critical to any service and should be considered if any short-haul routes are considered.

Refrigerated vs. Frozen: Frozen items typically have a more flexible delivery schedule and could be organized to occur less frequently than refrigerated goods (32-40°F) delivery routes. Frozen is important as the *Storage and Distribution Report for Local Food in the Northeast Kingdom* noted that 50% of the 19 producers seeking delivery sought frozen delivery.

Service Design

Table indicates that on a simple route connecting the producers and existing identified customer base, a short-haul route would be approximately 300 miles. However, at an average delivery rate of 15 miles per hour based on observed data from Vermont fleet owners, it is likely impossible to complete the entire northern Vermont in one day. A segment of the route would have to be identified. Depending on the method of delivery, outlined above, the travel distances, route, and question of central warehousing all come into play.

The following key questions can help any potential shipper quickly identify which options might be the most appropriate for them:

- Do you have access to a warehouse? If No, Option C is your best choice
- Is your route more than 120 miles? If Yes, then Options A & B provide a greater range in travel options.
- Are the customers and producers in the same route? If No, Option A allows very different routes by the separation of pick-up and drop-op.

In summary the short-haul options breakdown generally along these lines:

Option A

- Warehousing
- Longer route,
- pickups and drop not along common route

Option B

- Warehousing
- medium to short-route
- some flexibility between pickups and drops along route

Option C

- can operate without a warehouse
- shortest route
- complex routing between pickups and customers on same route

Model 3B: Long-Haul

The Long-Haul model includes a round of pickups within the NEK then a longer leg of the journey to a destination outside of Vermont.

Any Long-Haul service would be designed to maximize the amount of product on the truck to reduce the average cost of delivery per case or pallet. This could occur en-route by efficient loading at each stop or at a central warehouse prior to the Long-Haul departure.

The Long-Haul portion of the trip could be comprised of pickups within the NEK, identified in Table , as approximately 100 miles for refrigeration and 50 miles for frozen items. Table10 shows the estimated distances for the Long-Haul portion of the trip, as far away as New York City. Estimating costs for shipping Long-Haul would be comprised of a higher cost per mile for the local pickup leg due to slower travel speeds, the time at each pickup, and the product volume in the truck over that pickup distance. The Long-Haul cost would then be assuming a fully loaded vehicle over the longer distance.

Table 9: Routing Distances for Long-Haul Pickup and Short-Haul Routes

	<i>Pickup Mileage (1-way)</i>	<i>Labor Costs</i>	Cost Option A <i>Cost of Leased Truck Use (assumed 3 days per week use)</i>	Cost Option B <i>Trucking Operational Costs (@ \$1.3 per mile)</i>	<i>Truck Costs</i>
Refrigerated	100	\$96	\$164	\$130	\$226 - \$260
Frozen	50	\$48	\$146	\$65	\$113 - \$194

Table 10: Long-Haul Distance and Time Estimated Truck Costs

Origin	Destination	Round Trip Mileage	Labor Costs ¹²	Cost Option A Cost of Leased Truck Use (assumed 3 days per week use)	Cost Option B Trucking Operational Costs (@ \$1.3 per mile)	Truck Costs
St. Johnsbury	Portland, ME	300	120	239	390	\$360 - \$510
	Boston, MA	344	138	257	455	\$400 - \$600
	Pittsfield, MA	382	153	268	494	\$420 - \$645
	Hartford, CT	412	165	280	533	\$444 - \$700
	New York City	642	257	365	832	\$620 - \$1,100
	Philadelphia	830	572	436	1079	\$1,000 - \$1,650
	Washington, DC	1086	674	533	1417	\$1,210 - \$2,100

The total costs identified for the Long-Haul shipping needs to consider the costs to pick up the items (Table 9) as well as the long-distance portion of the trip beyond Hardwick or St. Johnsbury (Table 10). The labor costs on the Long-Haul portion of the trip are based on the Federal Department of Transportation Law for property carrying vehicles in excess of 10,000 pounds requires a 10-hour break for every 11 hours of driving. Short-Haul transportation logistics within this study are based around an 8-hr shift, which is more typical for a daily workload.

Service Design

The distances associated with the Long-Haul travel are not insignificant and can lead to substantial shipping costs. The trailer should be utilized to the fullest extent per trip to reduce the per unit shipping costs. Loading of the products should be done in a manner to minimize time necessary at each location, maximizing the time on the road.

Backhauling becomes a significant opportunity to reduce the shipping costs or obtain revenue on the truck as it returns from the Long-Haul trip. In the case of the NEK, the backhaul trip provides an opportunity to bring products from NYC and beyond back to the NEK. Future efforts by NVDA and others should explore opportunities to connect different industries to maximize the use of excess shipping capacity on these Long-Haul routes.

Product value on the truck

Another method to identify how the truck costs can be conveyed to possible users is how the costs compare to the margin of the enterprise and the value of the products that need to be on the truck to justify the delivery.

¹² Driving time estimated as 60mph moving average. Up to an 11-hr shift then a 10-hr required break.

Farms and food producers have a variety of margins as do any delivery company. Table 11 covers a variety of margins from 2% to 20%, converting the total cost of the delivery (operating costs and labor) into the total value of product that should be on the truck. For example, for a roundtrip route between Newport and Hardwick there should be just over \$2,000 of product on the truck for the shipping expense to not exceed a 10% margin of the total value of product onboard.

This method is especially helpful for evaluating the amount of shipping demand that is necessary if a 3rd party shipper manages the shared use of a delivery truck.

Table 11: Product Value on the delivery truck

		Round Trip Mileage	Trucking Operational Costs (@ \$1.3 per mile)	Labor Costs	Amt. of Product Value on The Truck (based on margin necessary for shipping)					
					2%	5%	7%	10%	15%	20%
Long Haul										
Hardwick	Boston	420	546	168	\$35,700	\$14,280	\$10,200	\$7,140	\$4,760	\$3,570
Hardwick	New York City	692	900	517	\$70,820	\$28,328	\$20,234	\$14,164	\$9,443	\$7,082
Hardwick	Portland, ME	360	468	144	\$30,600	\$12,240	\$8,743	\$6,120	\$4,080	\$3,060
Hardwick	Philadelphia	880	1144	592	\$86,800	\$34,720	\$24,800	\$17,360	\$11,573	\$8,680
Hardwick	Hartford, CT	480	624	192	\$40,800	\$16,320	\$11,657	\$8,160	\$5,440	\$4,080
Hardwick	Washington, DC	1140	1482	696	\$108,900	\$43,560	\$31,114	\$21,780	\$14,520	\$10,890
Short-Haul										
Newport	Hardwick	70	91	112	\$10,150	\$4,060	\$2,900	\$2,030	\$1,353	\$1,015
Hardwick	Montpelier	56	73	90	\$8,120	\$3,248	\$2,320	\$1,624	\$1,083	\$812
Montpelier	Burlington	80	104	128	\$11,600	\$4,640	\$3,314	\$2,320	\$1,547	\$1,160
Newport, Morrisville, Craftsbury, Hardwick, St J		184	240	294	\$26,680	\$10,672	\$7,623	\$5,336	\$3,557	\$2,668

Section 4: Mapping Regional Demand

The producers and distributors in the Northeast Kingdom, and greater Vermont and New Hampshire region identified in the *Storage and Distribution Report for Local Food in the Northeast Kingdom* interested in collaboration were mapped to identify locations of interest. Figure 3 illustrates those locations.

The *Storage and Distribution Report for Local Food in the Northeast Kingdom* found that up to 44% of producers were interested in delivery support. Almost three quarters of the producers responding -- 73% -- are interested in collaboration. Of the producers interested in collaborating, 62% percent were seeking delivery, while 48% had delivery capacity to offer. Figure 4 illustrates the stakeholders looking to provide or obtain delivery services.

Of the producers delivering or desiring delivery, 26% require shelf stable transportation, 74% refrigerated transportation, and 53% frozen transportation. 32% are meat and fish producers, 21% are vegetable producers, 21% are dairy, 11% are maple producers, 11% are value added producers, and 5% are fruit growers. Figure 5 illustrates the type of transportation by movement type, and Figure 6 illustrates the type of transportation by product type.

Producers have interest in moving goods within northern New England and throughout the northeast. Of these producers 31% seek delivery to markets outside of VT, 38% within the NEK, 38% percent along the Montpelier to Burlington corridor, and 23% percent into NH. Figure 7 illustrates the larger regional movements, and Figure 8 illustrates the movements within northern Vermont.

Figure 3: Locations of Producers and Storage/Distribution Facilities

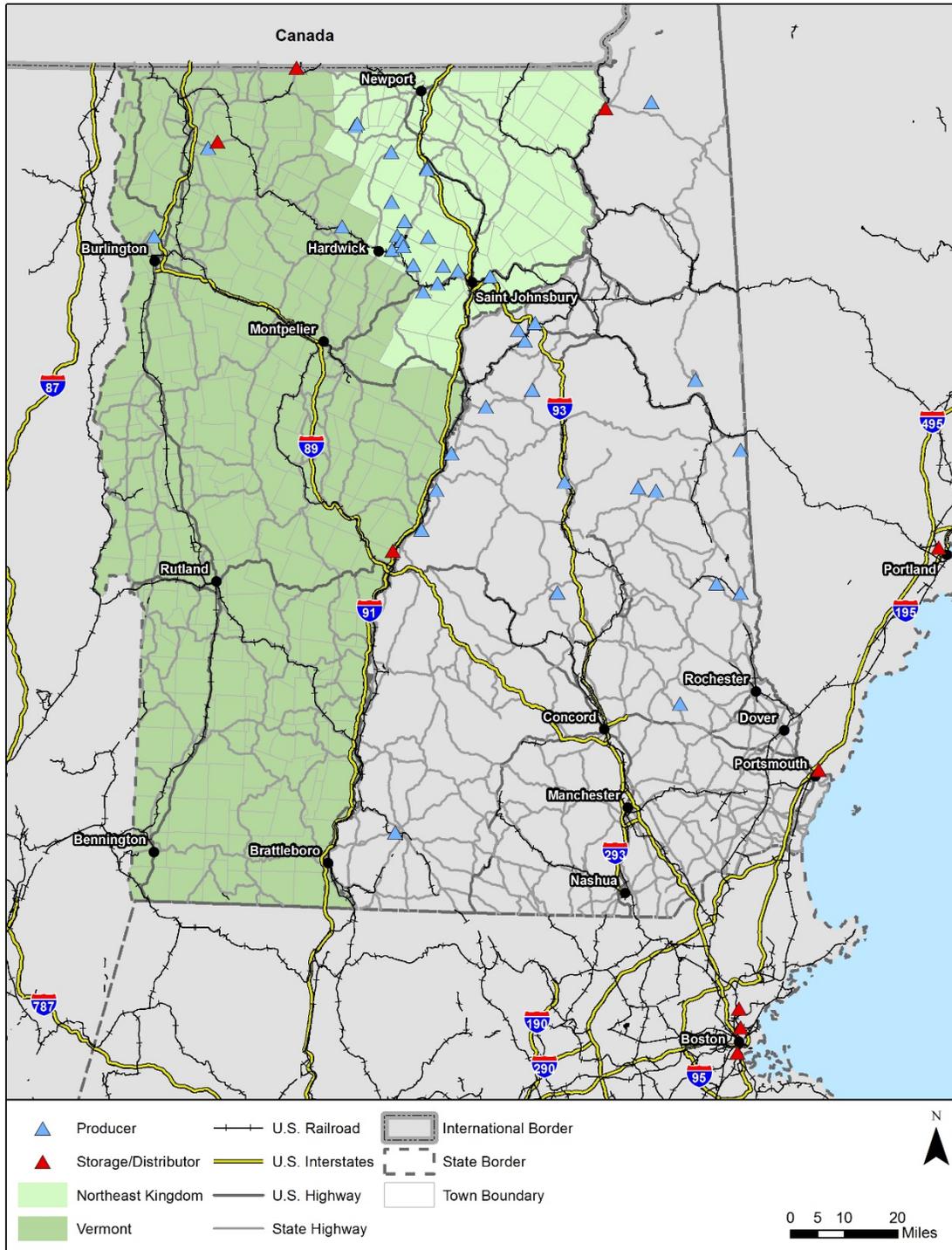


Figure 4: Stakeholders Interested in Participating in Shared Distribution and their Role

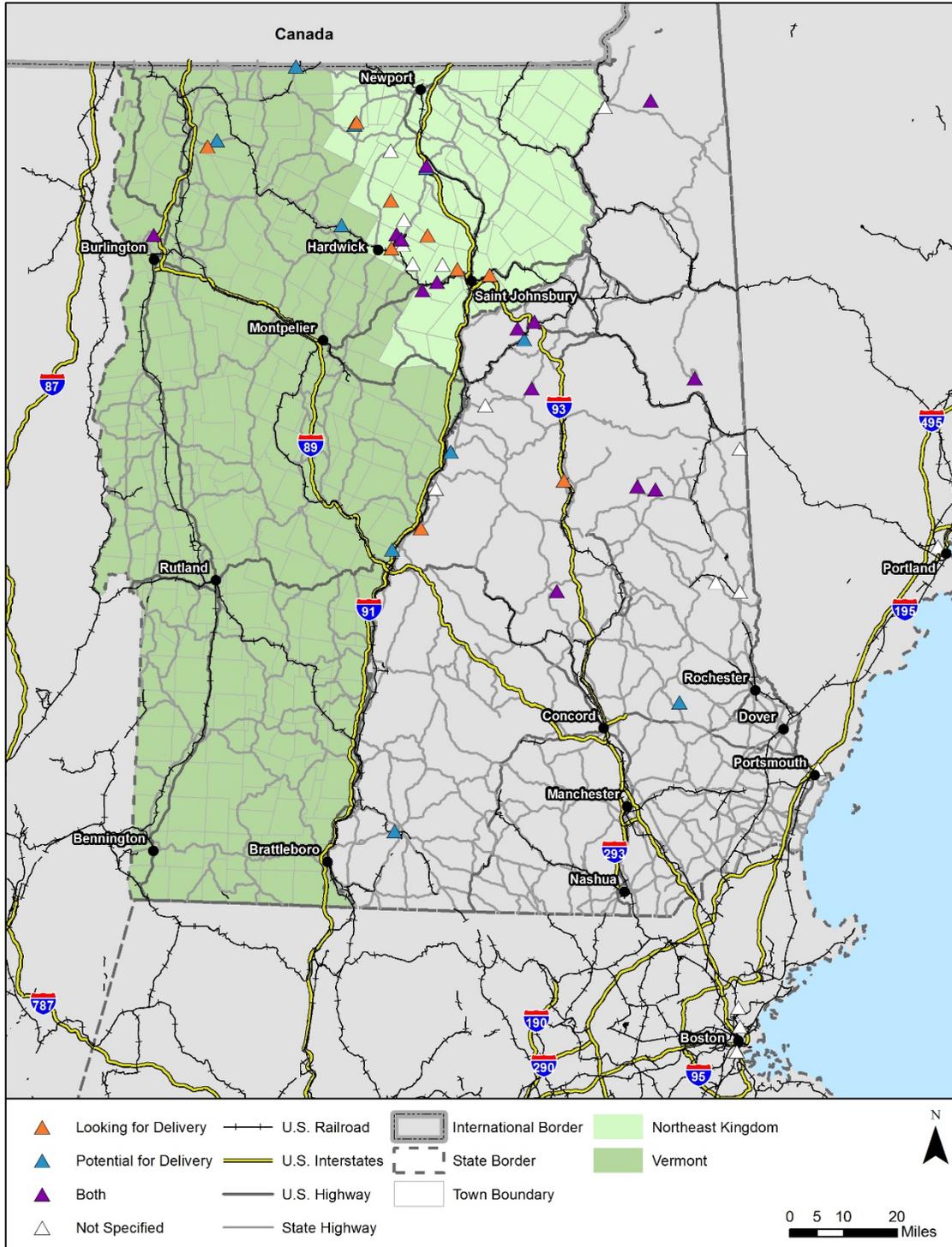


Figure 5: Producers by Movement Type (Shelf-stable, refrigerated, or frozen)

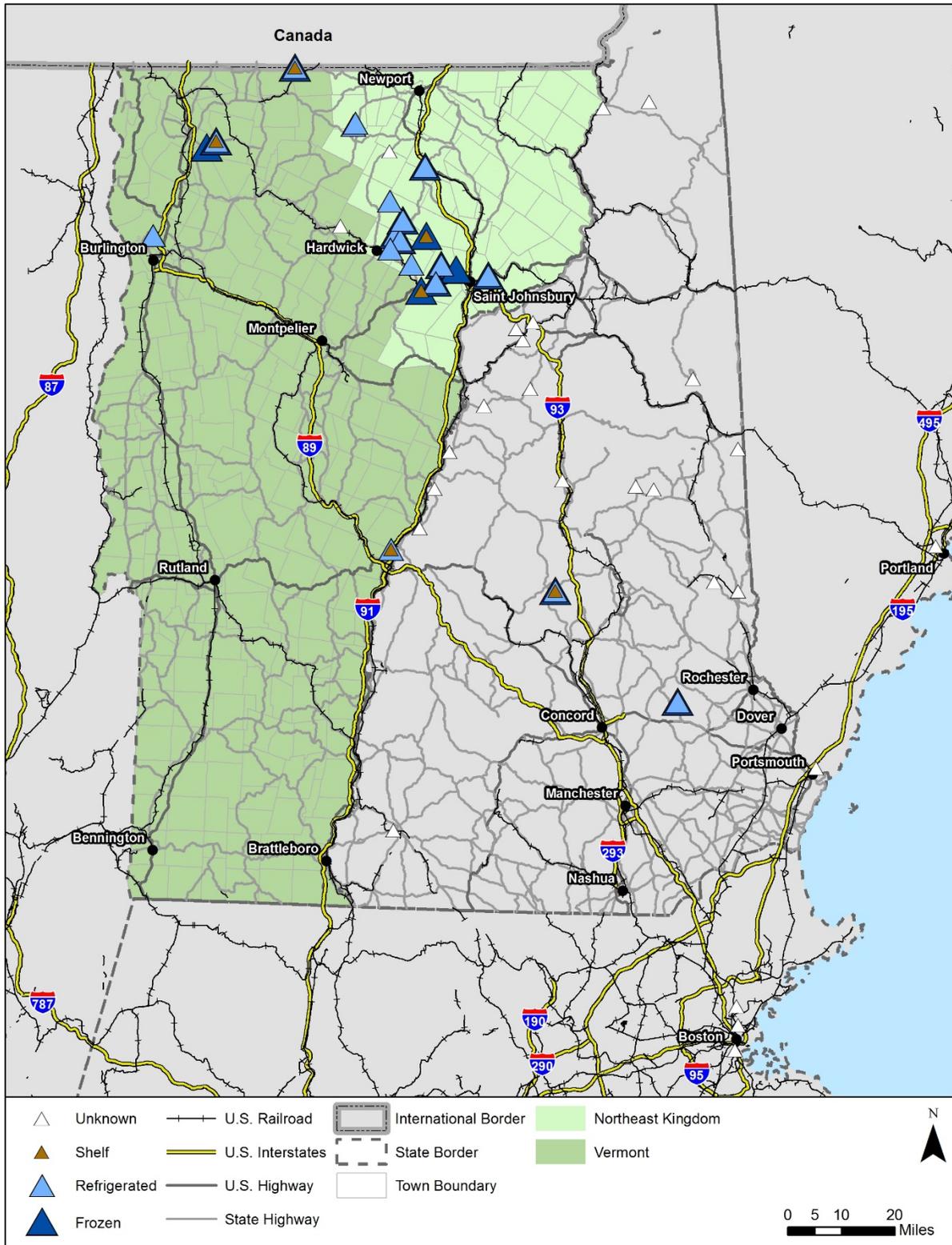


Figure 6: Type of Goods Moved by Producers

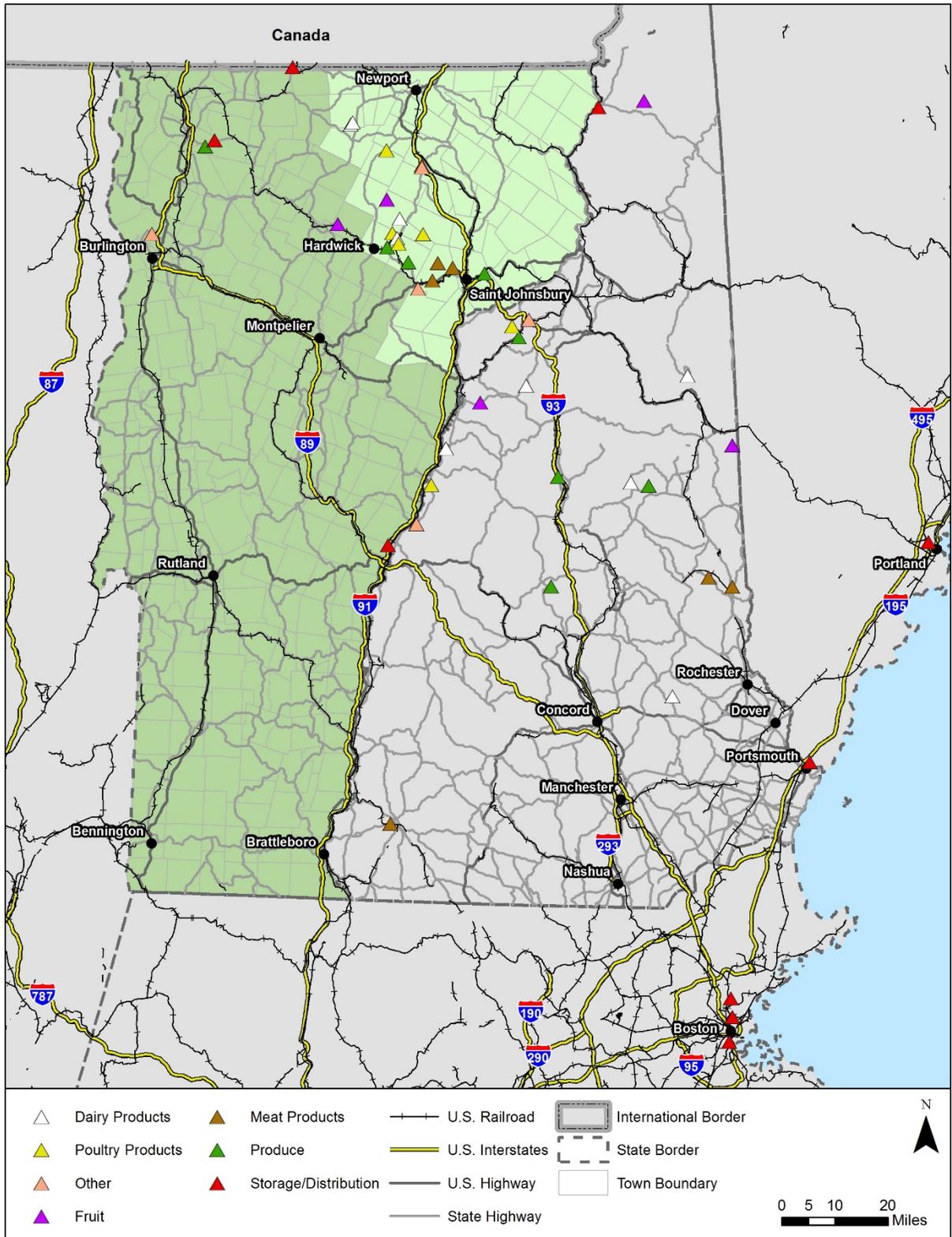


Figure 7: Desired Regional Movement of Goods

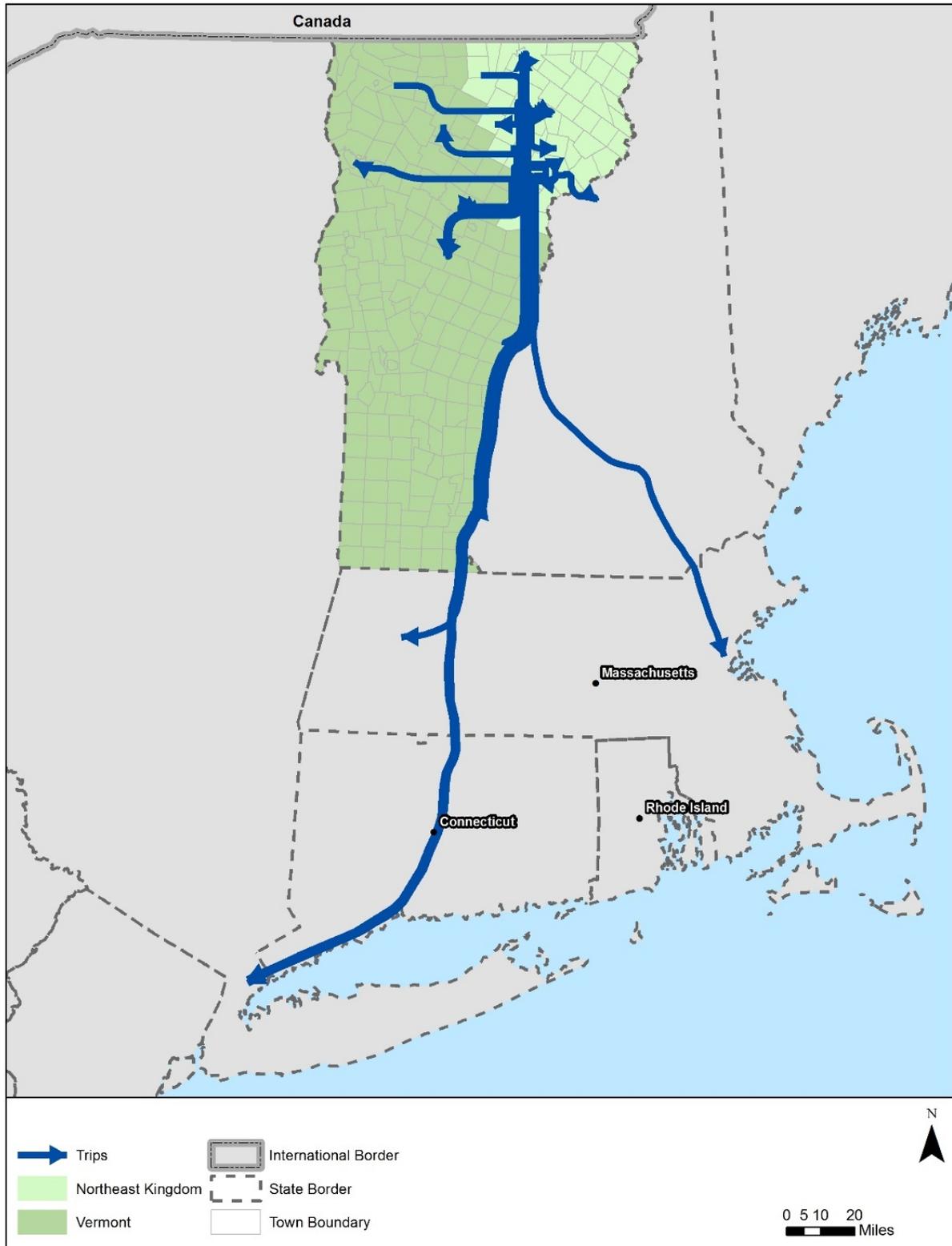
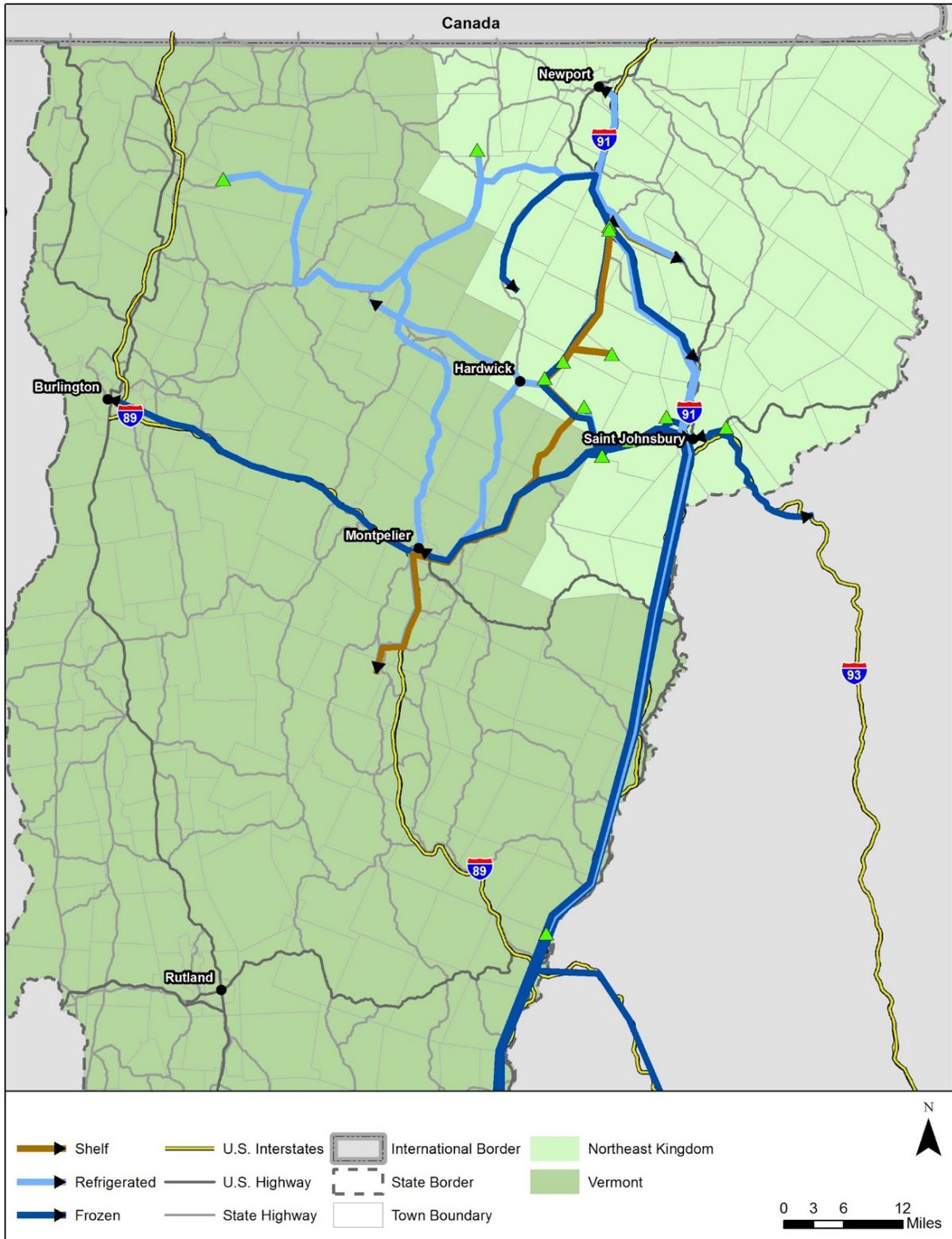


Figure 8: Desired Movement of Goods in Northern Vermont



Section 5: Mapping Potential Delivery Routes

After examining the *Storage and Distribution Report for Local Food in the Northeast Kingdom*, the associated survey data, and the mapped producers and their desired delivery routes, producers were assigned to any of four categories:

- 1) Refrigerated Short-Haul Routes
- 2) Frozen Short-Haul Routes
- 3) Refrigerated Long-Haul Routes
- 4) Frozen Long-Haul Routes

Producers may be interested in only 1 of these types of delivery routes, or may be interested in more than 1. Figure 9 through Figure 12 illustrate preliminary routing developed to match all identified interested producers with their destinations by movement type (refrigerated or frozen).

Table 12 demonstrates the travel distance for short and long haul routes. For the short-haul routes, the entire route is shown. For the long-haul routes, only the pick-up portion is shown.

Table 12: Routing Distances for Long-Haul Pickup and Short-Haul Routes

Travel distances (miles)		
	Short-Haul Routes	Long-Haul Pickup Route
Refrigerated	296	100
Frozen	300	50

Travel to, from, and between, long haul destinations, can be organized in many ways. To support the development of implementable routes, Table 13 illustrates the travel distances between key origin and destination cities.

Table 13: Distance Matrix Between Long Haul Origins and Destinations

	St. Johnsbury, VT	Hartford, VT	Putney, VT	Pittsfield, MA	Boston, MA	New York City
St. Johnsbury, VT	0					
Hartford, VT	60	0				
Putney, VT	113	56	0			
Pittsfield, MA	191	134	71	0		
Boston, MA	172	131	125	163	0	
New York City	321	264	209	259	215	0

Figure 9: Refrigerated Short-Haul Truck Route

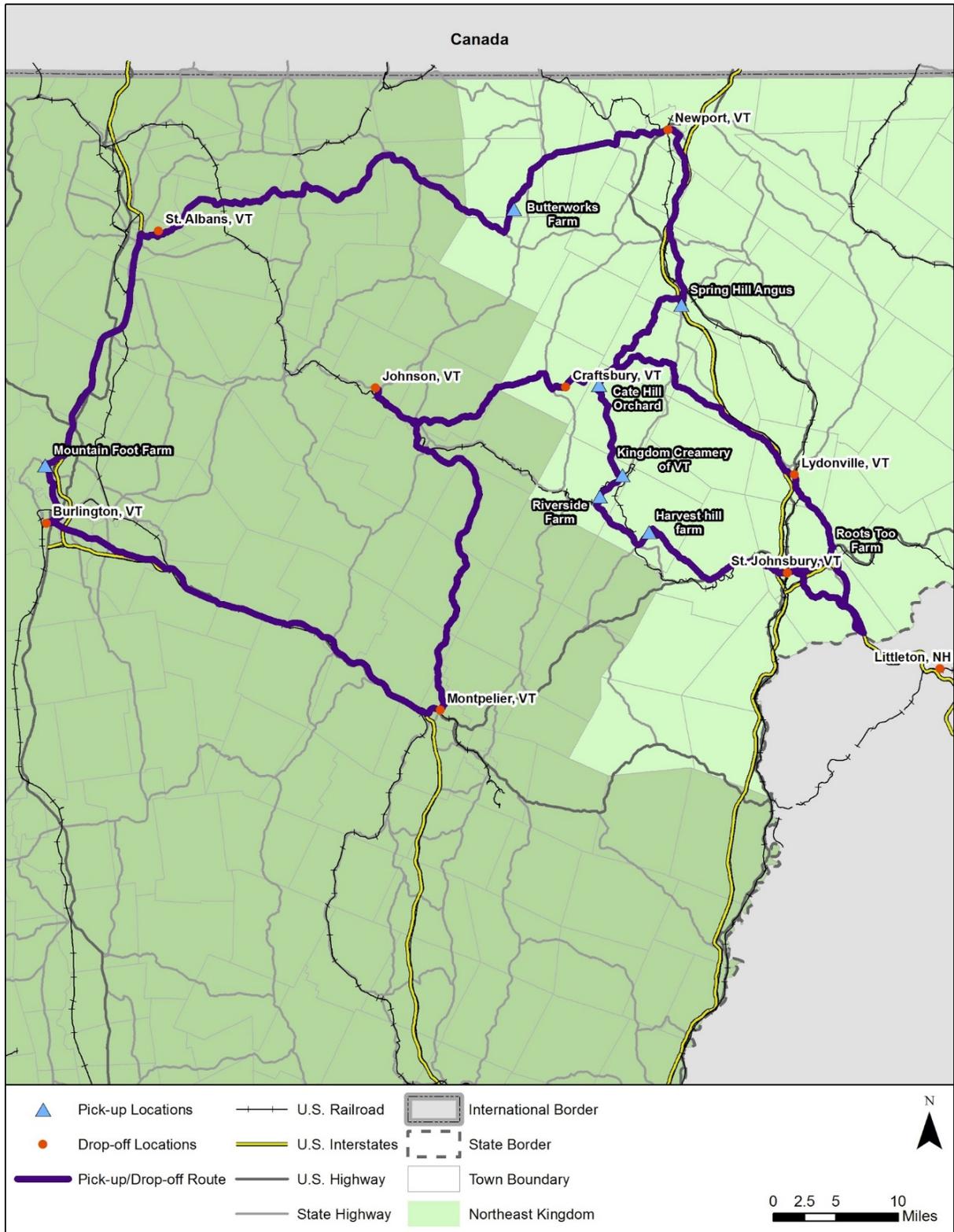


Figure 10: Frozen Short-Haul Truck Route

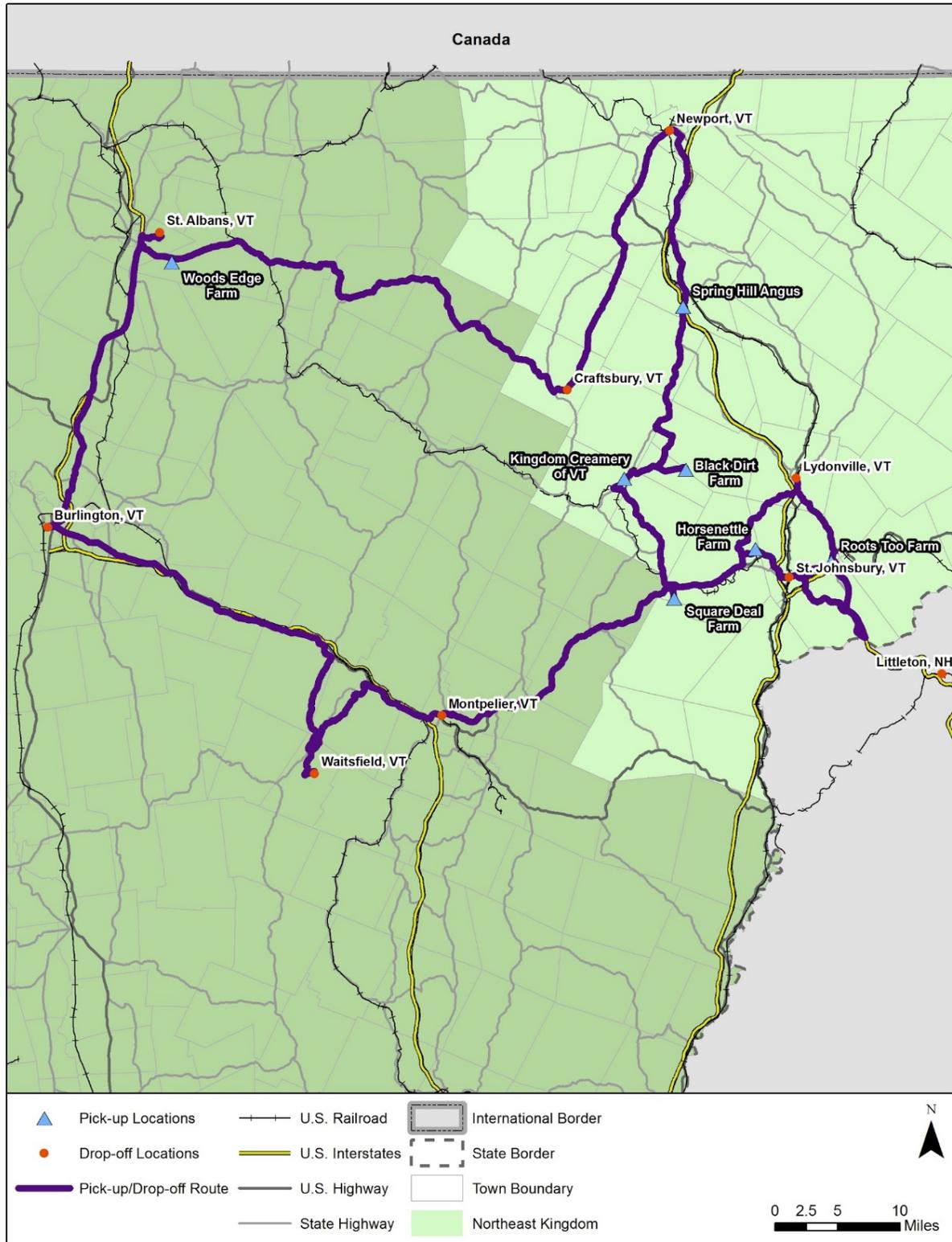


Figure 11: Refrigerated Long Haul Pick-Up Route

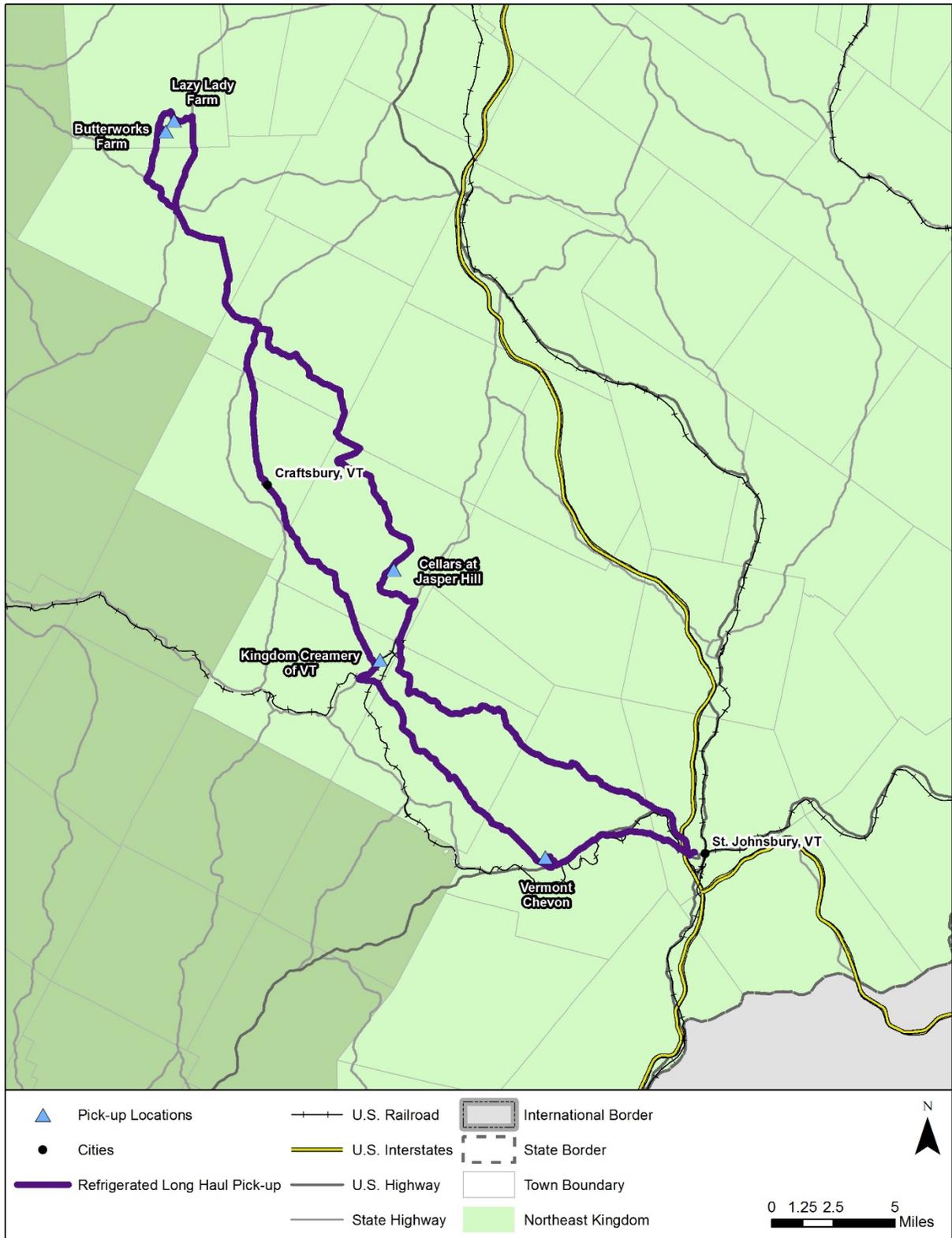
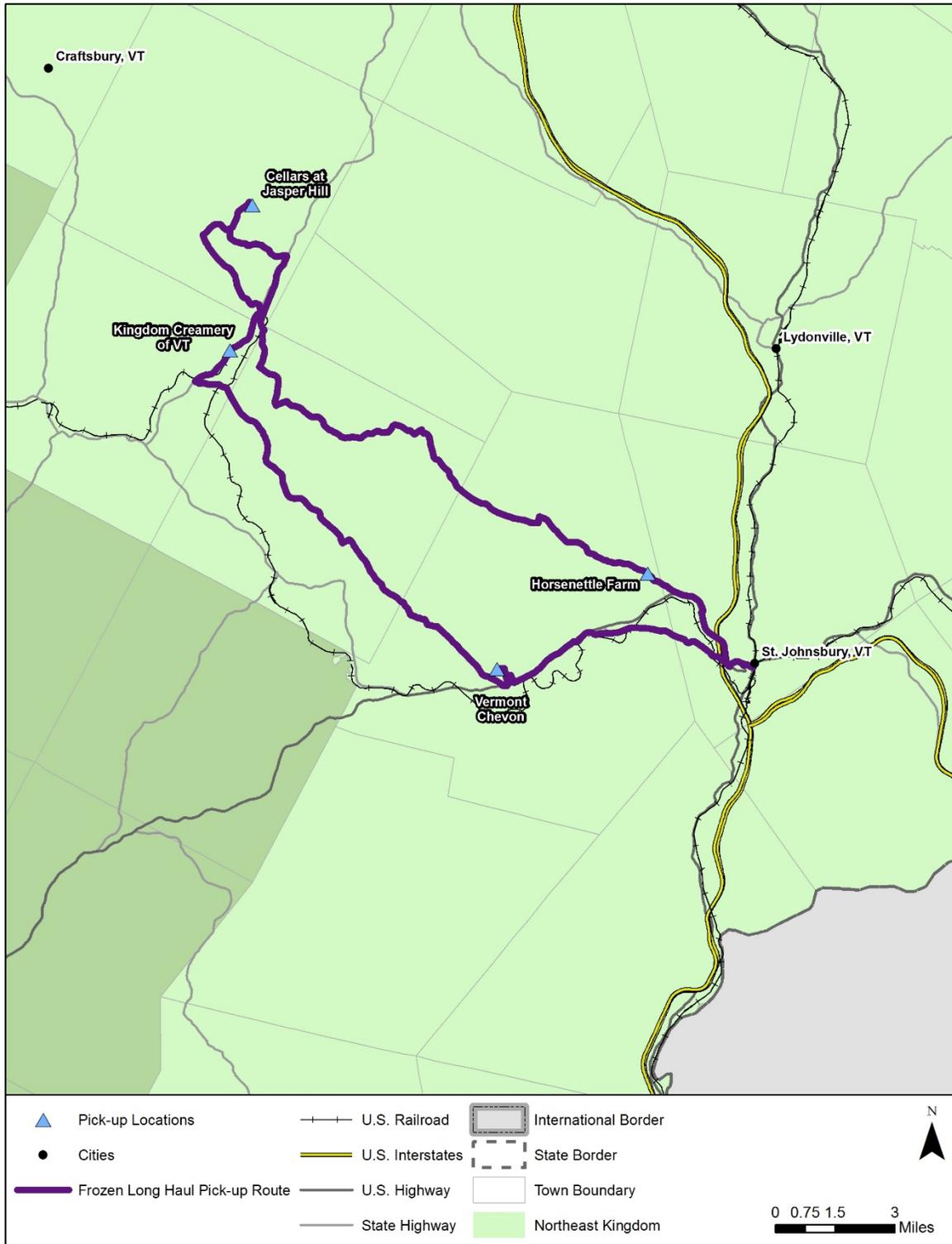


Figure 12: Frozen Long-Haul Pickup Route



Section 6: Benefits of the NEK Foreign Trade Zone 286 for Agricultural Producers

The Foreign Trade Zone (FTZ) program was created by the Federal Government in the 1930's to facilitate trade and increase the global competitiveness of U.S.-based companies. A Foreign Trade Zone (FTZ) is an area within the United States that the Government considers outside the country, or at least, outside of the U.S. Customs territory. Manufacturers can import supplies into the FTZ without going through formal Customs entry procedures enabling them to defer payment of duties on these supplies and pay only on the lowest tariff schedule. If the finished products are assembled in the US and exported back out of the country, the manufacturer would pay no duty at all.¹³

In 2013 the NEK was granted authority to establish FTZ 286, with a service area of Caledonia, Essex and Orleans counties in Vermont, within and adjacent to the Derby Line U.S. Customs and Border Protection port of entry.¹⁴ While the goal of the FTZ is to stimulate economic development, it favors larger scale manufacturing than typically found in the NEK because capital and operating expense, and logistical planning, are required to benefit from the FTZ. The location where imported inventory is stored needs to be designated and separated from non-imported inventory. The site requires on-site security and inventory control measures. A customs officer must be able to access the site and inspect the goods. Therefore, producers would need to have sufficiently large order volumes or sufficiently frequent order placement (such as monthly) for use of the FTZ benefits to be economically viable. According to David Snedeker, Executive Director, NVDA, there are no manufacturers yet taking advantage of FTZ 286.

Producers that may be more likely to benefit from the FTZ would be those whose industries often rely on import and export trade, such as beverage manufacturers and maple producers who may be importing glass and cork supplies, and potentially importing and exporting finished product, for example.

Key Benefits of Using an FTZ

1. Imports may be admitted and held without paying U.S. Customs duties.
2. Users can pay the duty rate on component material or merchandise produced from component material, whichever is lower.
3. Customs duties are never paid on merchandise exported.
4. Duties are reduced or eliminated on materials subject to defect, damage, obsolescence, waste or scrap.
5. Merchandise may be exported or returned to an FTZ without duty payment.
6. Spare parts may be stored, returned, or destroyed without duty payment.
7. Delays in Customs clearances and duty drawback are eliminated.

¹³ <http://www.nvda.net/FTZ.php>

¹⁴ <http://www.strtrade.com/news-publications-ftzb-vermont-philadelphia-040413.html>

8. Duties are not owed on labor, overhead, or profit attributed to FTZ production operations.
9. Quality control inspections can identify sub-standard goods to be destroyed or returned without duty payment.
10. No duty is owed on in-bound, zone-to-zone transfer of FTZ merchandise.

Information about the FTZ and its benefits should be disseminated to industry groups and producer associations so they may share it with their members. Target groups would be those whose industries often rely on import and export trade, such as the Vermont Brewers Association and Vermont Maple Producers Association, both of whom have members importing glass and cork supplies, and potentially importing and exporting finished product, for example.

Trade associations and industry groups should also explore the possibility of coordinating group supply orders for their members to generate sufficient size and scale of orders to facilitate members benefitting from the FTZ. David encouraged producers to conduct a cost benefit analysis using the “cost savings calculator” found on the NVDA website FTZ page, <http://www.nvda.net/FTZ.php> and contact an FTZ consultant, such as Deb Shannon of FTZ Services, LLC for more information.

Deb Shannon
FTZ Services, LLC
16 Rotterdam Drive
Glenmont, NY 12077
ph:(518) 469-6568
debshannon@outlook.com
<http://www.ftzservicesllc.com/home>

Section 7: Conclusions and Next Steps

The market assessment of storage and distribution needs identified in the *Storage and Distribution Report for Local Food in the Northeast Kingdom* outlined key stakeholders that have expressed concern that existing storage and distribution methods have not been able to align with their existing business operations. While this is likely to have occurred for a variety of reasons, it is clear that the diversity of businesses and the size of many of the producers represent challenges for both existing shipping companies and the producers themselves.

The analysis conducted within this follow-up study reviews some of the likely hard costs that those looking to ship for themselves or others will face as they acquire the assets necessary; namely trucks to buy and maintain, rent or lease, and the operating expenses associated with these assets: insurance, registration and licenses, maintenance and repairs, and fuel. These costs outline the basic costs of running and maintaining the trucks themselves but do not include the myriad of costs associated with running a shipping service business, such as labor and overhead.

- The average Total Cost of Ownership¹⁵ of a refrigerated box truck using observed Vermont data for 1 to 2-truck fleet operations ranges from \$1.02 - \$1.66 per mile at an average annual usage of 20,000-30,000 miles per truck.
- Leasing trucks is an option that should be considered when miles per truck are above 15,000 or if Total Cost of Ownership is above the average \$1.30 per mile.
- Key concerns to establishing a shared-use delivery vehicle service include liability coverage, driver requirements, food safety requirements, repairs and maintenance, roadside assistance, coordinating vehicle access, and cost.

The three models explored in this study include the following scenarios:

Model 1: Leased Vehicle

- user pays mileage and reefer hourly charge to cover wear and tear
- user pays fuel (~0.23 / mile)
- user pays a daily charge of capital costs, insurance, registration
- shared lease models
- reviewing lease vs ownership costs

Model 2: Owned Vehicle

- user pays a mileage charge to use the truck, offsets owners/core user's truck carrying costs
- user pays for fuel (~0.23 / mile)
- user must pay/provide insurance to supplement primary insurance

Model 3: Aggregator

- An aggregator, be it a for-profit third party or the group of producers, coordinates freight shipping service
- Per unit (pallet or case) fees cover the costs of service (TCO + labor, overhead)
- Trips are designed to optimize volume per load to geographic destination points
- Short-Haul and Long-Haul trucking options are investigated

A feasibility analysis should be considered if a producer or organization is looking to add a shipping enterprise to their operation:

- 1) What existing options are there for shipping? Within the NEK there are at least four professional freight service providers serving food producers, with additional options being explored by individual producers. It is strongly recommended that producers determine if existing operators can provide the services needed to avoid the complexity and expense of buying, maintaining, and operating transportation assets. The existing rates for these services range anywhere between a flat fee or percent margin on the value of product being shipped. Flat fees range from \$2 - \$10 per case, \$100 - \$200 per

¹⁵ TCO: operating and capital costs, not including labor, overhead or depreciation.

pallet, and percent margins range up to 20% for BOL shipping throughout the New England region. Within the NEK region, three of the four freight service providers already have local customers and delivery routes within northern Vermont and the NEK. Existing frozen shipping options are extremely limited. This gap in the marketplace has been identified and none of the existing service providers have purpose built frozen capacity transportation and storage at this time sufficient to handle any meaningful volume. Farm Connex is willing to expand their service to include dedicated frozen transportation should demand warrant the expansion.

2) Where is the demand?

- a. Short-Haul: Frozen short-haul is in demand from seven of the NEK producers.¹⁶ Destinations are throughout Northern Vermont and New Hampshire. Refrigeration short-haul demand is also strong with eight producers looking for this service.
- b. Long-Haul: Five producers are interested in shipping Long-Haul to points south in Southern Vermont and beyond. Of these five producers, two seek delivery for meat, one for ice cream, and three for dairy products such as cheese and yogurt.¹⁷

While these producers identified a desire to reach these locations, it is not clear from the data currently available if these producers would add new customers or if they would increase production if transportation becomes accessible. Further analysis and survey data is necessary to understand the projected quantity and frequency of product movement, in addition to the value of goods being transported, to develop a business plan for one or more producers or models to assess if a specific transportation option would be feasible.

3) Who might be teaming partners? Costs and time for developing plans, purchasing assets, and creating a successful venture requires the support of stakeholders, business partners, and customers. The teaming arrangements and partnership should identify if any of the region's organizations or businesses would be willing and interested in overseeing and coordinating a shared use delivery vehicle service.

4) How is food safety impacting the local food system?

Food safety rules mandate that producers and handlers comply with regulations through the chain of custody and that appropriate conditions are maintained. As awareness of food safety and associated liability concerns on the behalf of customers (wholesale and direct), it is likely that a greater emphasis will be placed on refrigerated and fully-enclosed transport. While many NEK producers will be exempt from FSMA, for producers selling to, or wishing to scale up to, wholesale, adhering to food safety regulations imposed by FSMA or by customer expectations may require a shift in their

¹⁶ *Storage and Distribution Report for Local Food in the Northeast Kingdom, 2016, NVDA.*

¹⁷ *Storage and Distribution Report for Local Food in the Northeast Kingdom, 2016, NVDA.*

current business model and cost structure. Any changes that impact cost or logistics are critical to the sustainability of the business and we encourage every business to analyze and plan for these impacts on an individual basis.

- 5) How will the asset be used? As a depreciable asset a truck's most cost effective use would be to maximize its utilization, lowering its per hourly, per mileage, and per unit shipping costs. As the *Storage and Distribution Report for Local Food in the Northeast Kingdom* noted, some producers are willing to incur a significant cost to purchase an asset if it gives them the added confidence to ensure that sales and deliveries take place. While the actual shipping or trucking costs may not cover themselves, the business is willing to absorb these costs to protect the company's revenue generating activities. Reliability of service is an important consideration for any shipping operation or producer. Once a customer relies on a set schedule or available option it becomes one of the most heavily valued traits of the relationship with their supplier, especially in the perishable food industry. Therefore, for any sustainable transportation model, it is paramount to consider how to build redundancy into the system, including having vehicles on-call for roadside assistance, having a plan for reinvesting in new vehicles as the existing fleet ages, and having the capital needed to hire and retain labor to ensure quality and timely service is achieved.

Shipping is not cheap: Shipping connects the producer to the customer through a complicated web of transactions and handlers. Directly operating your shipping can free up some of the complexities and provide you with a higher degree of oversight and confidence in the chain of custody and end product, however, it can be inefficient and often misleading in how much shipping costs if you are not including the cost of your time to conduct the service, or planning for the depreciation of your vehicle or the cost of reinvestment in a replacement vehicle, in your value equation. Building sufficient cash flow and retained earnings to manage repairs and replacements of capital assets is a challenge, as is ensuring sufficient utilization of the asset to reduce the cost per unit for shipping. As margins for food continually get squeezed, every dollar counts and excess capacity on a truck is truly money wasted.

- 6) What is the cost benefit of owning, leasing, sharing or aggregating for the particular producer or group of producers in question? Do the benefits outweigh the costs? Is it feasible to proceed with implementation? The services and cost structures outlined in this study are general bounds in which a variety of small Vermont based delivery and distribution fleet services operate within. Any particular business would be advised to conduct their own business specific analysis both financial and logistical, for the model they desire implementing. The decision to purchase or lease a truck, run a shared service or host a truck for others to share each comes with its own complexities; legal, financial, and logistical, that should be fully understood before pursuing.

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Individuals Consulted

Matt

Commercial Leasing

Penske Truck Rental

(888) 234-4201

<http://www.pensketruckrental.com/>

Joe Keegan

Branch Rental Manager, Vermont/Upstate NY

Commercial Leasing

Ryder

(609) 707-4616

Joseph_Keegan@ryder.com

<http://www.ryder.com/solutions/truck-rental>

Alex McCullough

Food Connects, Food Hub Manager

Windham Farm & Food + Monadnock Menus

(802) 451-0555

alex@foodconnects.org

www.foodconnects.org / www.windhamfarmandfood.org / www.monadnockmenus.org

Annie Myers

Owner

Myers Produce

(917) 733-9949

myersproducevt@gmail.com

www.myersproduce.com

Shirley Richardson

Founder/Partner, Director Marketing & Sales

Vermont Chevron, L3C

(802) 535-4110

shirley@vermontchevon.com

www.vermontchevon.com

Britt
Mail Order
Cellars at Jasper Hill
(802) 533-2566

David Snedeker
Executive Director
Northeastern Vermont Development Association
(802) 748-8303
dsnedeker@nvda.net

Kristy Scott
Co-owner
Farm Connex, LLC
(802) 533-2339
vtfarmconnex@gmail.com

Internet Sites Consulted

<http://www.carsharevt.org/business-rates/>
<http://www.zipcar.com/business/check-rates/boston>
<http://www.ftzservicesllc.com/home>
<http://www.fda.gov/downloads/Food/GuidanceRegulation/FSMA/UCM494118.pdf>