New England Root Beer Distributors

Background

New England Root Beer Distributors (NERD) was founded in the late 1800's in East Kingston New Hampshire. Always family owned, NERD has grown tremendously from its humble origins selling root beer from a horse-drawn carriage to now serving the better part of the North Eastern United States root beer market.

NERD differentiates its root beer from competitors with a proprietary recipe passed down from generation to generation to produce a unique and refreshing flavor. The recipe is stored in a vault in the corporate headquarters in Nashua NH. Only three people have access to the exact recipe. NERD's management places a high value on keeping the recipe secret and protecting it from copycats or generic manufacturers.

During the great Root Beer recession of the 1980's, NERD faced severe challenges as the market collapsed. Up to this point, NERD operated small brewing and bottling plants located in the major cities it served. These plants were small, used antiquated methods and equipment, and had little ability to increase in scale or size.

The management of NERD at the time decided to consolidate operations in a modern new facility. After significant negotiations, they selected Scranton Pennsylvania as the site of the new plant. This was a controversial decision as NERD root beer had always been manufactured in New England. However, the higher labor costs in New England drove them to re-locate the manufacturing operations. The new plant, located several hundred miles away from the New England market, was part of a larger initiative within NERD to expand its sales. NERD's market share for the regions outside of New England have grown significantly over the last 20 years. The Scranton plant is considered a major success not only in terms of opening new markets, but also in its lower operating costs, higher and more consistent quality, and ability to scale with growing demand.

Over the last few years, however, the distribution system within New England itself has come under scrutiny. The current distribution centers (DCs) have been haphazardly selected over time through mergers and acquisitions of other smaller root beer breweries. There is no apparent logic to the current network and the current management thinks they have too many DCs. Additionally, a small bottler in Vermont (located in Bellows Falls) approached NERD to provide additional manufacturing capabilities. Some of the management within NERD is happy to see this, as it is a "return to their roots" of bottling in New England once again. Others view it as costly and a duplication of facilities.

You have been hired to to provide some analytical support to help the NERD management re-design its distribution network within New England. Specifically, you have been asked to answer the following questions:

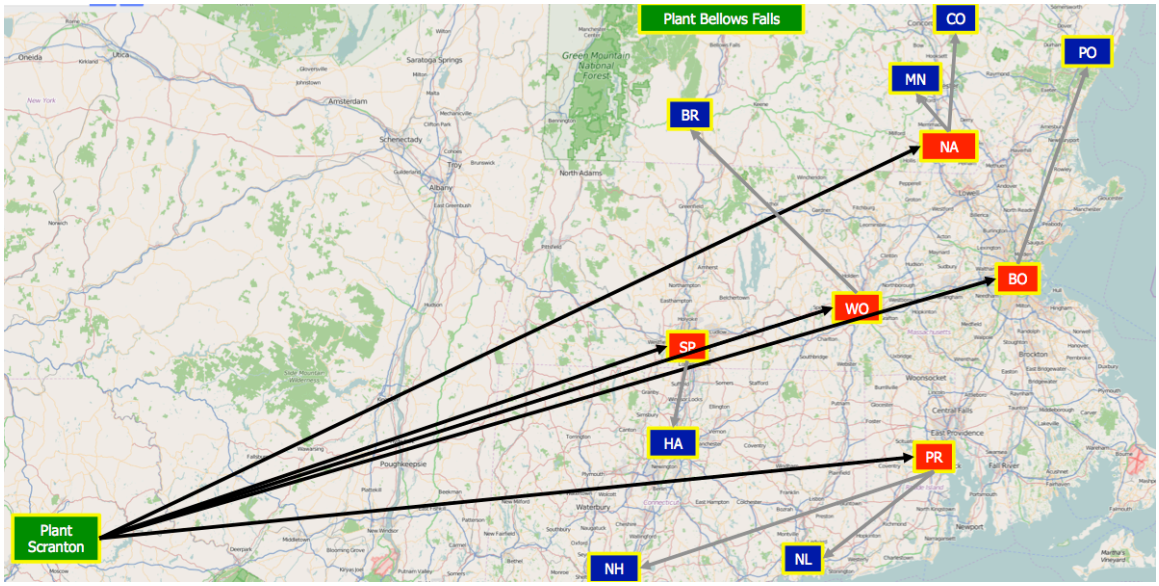
1) Does NERD have the right number of DCs in New England now? Should they be reduced?
2) Should NERD source from the Bellows Falls, Vermont plant (BFP)?
3) Does the current DC configuration provide sufficient level of service?
4) Can the current configuration handle increases in demand?

You have decided to create a network design model to help analyze the situation.

Supply Chain Details

NERD currently operates one plant in Scranton Pennsylvania (SCP) that brews and bottles root beer in large barrels. The plant distributes these barrels to five DCs located in Massachusetts, Rhode Island, and New Hampshire using a national truckload carrier. The barrels of root beer are stored at these five DCs and are then distributed by a local courier to 12 smaller regional DCs (RDCs) that in turn distribute to local restaurants and retailers. Each city market is dedicated to a single RDC.

The current network is shown in the figure below. The red locations are the current DCs which also serve as a RDC for that location. The other cities have their own RDCs. The current plant in Scranton, PA is located in the lower left corner of the map while the potential new plant in Bellows Falls, VT is located at the top of the map.



Data:

The tables below list the related data that you have currently collected.

Distance DC to RDC

Distances (in miles) between the five DCs and the twelve RDCs are in the table below. The distance includes the expected delivery distances from that RDC to its local customers. That is why the distance from Boston to Boston, for example, is 8 miles and not 0.

d_{ij}	BO	BR	CO	HA	MN	NA	NH	NL	PO	PR	SP	WO
BO	8	93	69	98	55	37	128	95	62	42	82	34
NA	37	65	33	103	20	12	137	113	48	72	79	41
PR	42	106	105	73	92	72	94	57	104	17	68	38
SP	82	59	101	27	93	79	63	57	127	68	12	47
WO	34	68	72	66	60	41	98	71	85	38	47	18

Outbound Transportation Costs from DC to RDC

Costs per barrel moving product from a DC to the RDC using the $0.55 per barrel/mile of local courier.

$/bl	BO	BR	CO	HA	MN	NA	NH	NL	PO	PR	SP	WO
BO	$4.40	$51.15	$37.95	$53.90	$30.25	$20.35	$70.40	$52.25	$34.10	$23.10	$45.10	$18.70
NA	$20.35	$35.75	$18.15	$56.65	$11.00	$6.60	$75.35	$62.15	$26.40	$39.60	$43.45	$22.55
PR	$23.10	$58.30	$57.75	$40.15	$50.60	$39.60	$51.70	$31.35	$57.20	$9.35	$37.40	$20.90
SP	$45.10	$32.45	$55.55	$14.85	$51.15	$43.45	$34.65	$31.35	$69.85	$37.40	$6.60	$25.85
WO	$18.70	$37.40	$39.60	$36.30	$33.00	$22.55	$53.90	$39.05	$46.75	$20.90	$25.85	$9.90

Inbound Transportation Costs from Plant to DC

Costs per barrel moving product from plant to DC.

$/barrel	BFP	SCP
BO	$3.40	$4.80
NA	$3.00	$5.25
PR	$4.40	$5.12
SP	$3.04	$4.00
WO	$3.36	$4.20

Variable costs at Plants

Costs per barrel for loading and procuring from each plant.

Plants	Var Cost ($/bl)
BF Plant	$2.00
SC Plant	$0.75

Fixed and Variables costs for DCs

Fixed cost of handling barrels at DCs.

Distribution Center	Var Cost ($/bl)	Fixed Cost ($/week)	Capacity (bl/week)
Boston - BO	$1.50	$11,000	1000
Nashua - NA	$0.95	$5,000	500
Providence - PR	$1.05	$9,000	1000
Springfield - SP	$1.10	$8,000	500
Worcester - WO	$1.12	$7,000	1000