

Vehicle Routing at a Regional Discount Company

- Data Analytics 2 -

Group 3

// Eunjeong Heo

// Kwong Wa Lam

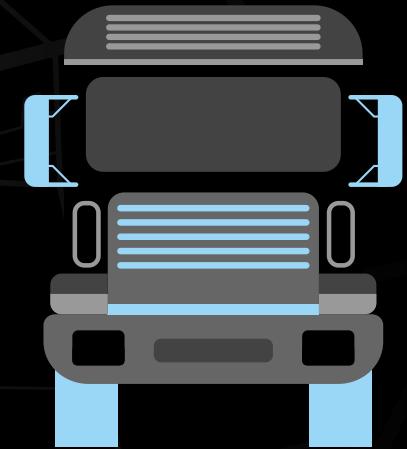
// Korbin Sorensen

// Tina Tangkittiwit

// Ryan Liu

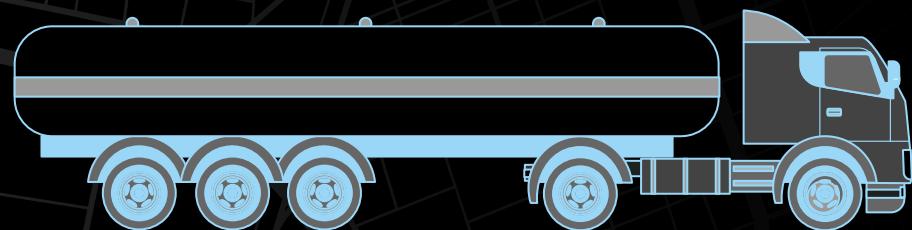
// Tianhong Zhang

// Florian Houget



■ Topics

- 1) Team Intro
- 2) Case Intro
- 3) First Cost Reduction Strategy
- 4) Second Cost Reduction Strategy
- 5) Final Recommendation



The Team

01.



EunJeong Heo

Track: SC Analytics MSB
From: South Korea

02.



Kwong Wa Lam

Track: SC & Logistics MBA
From: Hong Kong, China

03.



Korbin Sorensen

Track: SC Analytics MSB
From: Washington State

04.



Tina Tangkittiwit

Track: SC Analytics MSB
From: Thailand

05.



Ryan Liu

Track: SC Analytics MSB
From: Taiwan

06.



Tianhong Zhang

Track: SC Analytics MSB
From: China

07.



Florian Houquet

Track: SC & Logistics MBA
From: France

CASE INTRO

(Tianhong)





Case Intro



SYNOPSIS

This case focuses on the vehicle routing decision for a regional discount store chain based in Oregon. The company has one distribution center in Albany, OR that delivers shipments each day to 15 stores in Oregon and southwest Washington.

The distribution center in Albany, OR receives full truck-load shipments from all suppliers and builds mixed pallets of products to fulfill orders from the individual stores. Although the orders vary each day, the overall volume of each order remains relatively constant.



GOALS

Your team must investigate possible cost reduction measures in order to maximize the **weekly** profit.

Routes Calculation

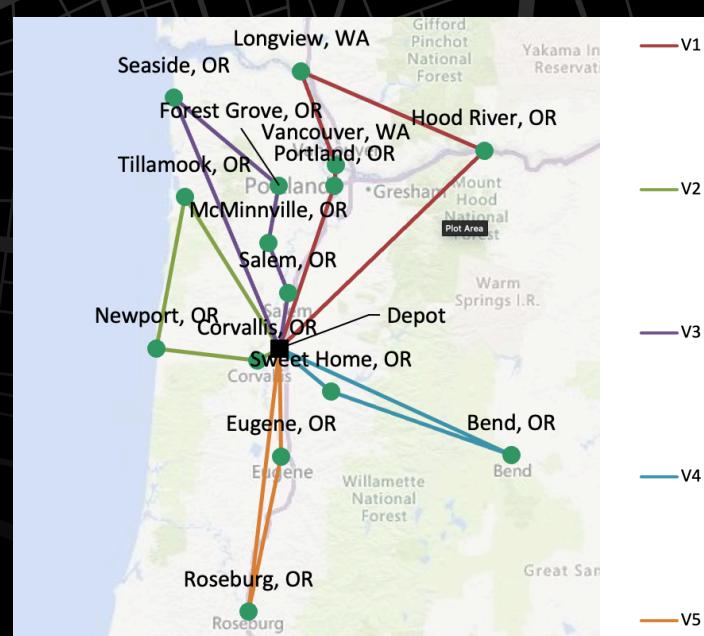
LOCATIONS

Location ID	Name	Address	Service time	Delivery amount	Profit
0	Depot	Albany, OR	0:00	0	0
1	Corvallis, OR	Corvallis, OR	1:00	8	400
2	Salem, OR	Salem, OR	1:00	9	450
3	Portland, OR	Portland, OR	1:00	10	500
4	Bend, OR	Bend, OR	1:00	9	450
5	Newport, OR	Newport, OR	1:00	5	250
6	McMinnville, OR	McMinnville, OR	1:00	6	300
7	Tillamook, OR	Tillamook, OR	1:00	4	200
8	Forest Grove, OR	Forest Grove, OR	1:00	9	450
9	Hood River, OR	Hood River, OR	1:00	3	150
10	Eugene, OR	Eugene, OR	1:00	10	500
11	Roseburg, OR	Roseburg, OR	1:00	6	300
12	Seaside, OR	Seaside, OR	1:00	5	250
13	Sweet Home, OR	Sweet Home, OR	1:00	5	250
14	Longview, WA	Longview, WA	1:00	6	300
15	Vancouver, WA	Vancouver, WA	1:00	7	350

VRP SOLVER



BEST ROUTES



Daily Profit

Total net profit: **3435.03**

Warning: Last solution returned by the solver does not satisfy all constraints.

Vehicle:	V1	Stops:		5 Net profit:		897.28			
Stop count	Location Name	Distance travelled	Driving time	Arrival time	Departure time	Working time	Profit collected	Load	
0	Depot	0.00	0:00		23:00	0:00	0	26	
1	Portland, OR	69.81	1:10	00:10	01:10	2:10	500	16	
2	Vancouver, WA	79.42	1:25	01:25	02:25	3:25	850	9	
3	Longview, WA	120.14	2:05	03:05	04:05	5:05	1150	3	
4	Hood River, OR	222.64	3:41	05:41	06:41	7:41	1300	0	
5	Depot	353.40	5:44	08:44		9:44	1300	0	

Vehicle:	V2	Stops:		4 Net profit:		554.66			
Stop count	Location Name	Distance travelled	Driving time	Arrival time	Departure time	Working time	Profit collected	Load	
0	Depot	0.00	0:00	23:00	0:00	0	17		
1	Corvallis, OR	11.55	0:20	23:20	00:20	1:20	400	9	
2	Newport, OR	60.42	1:24	01:24	02:24	3:24	650	4	
3	Tillamook, OR	129.16	3:04	04:04	05:04	6:04	850	0	
4	Depot	219.17	5:04	07:04		8:04	850	0	

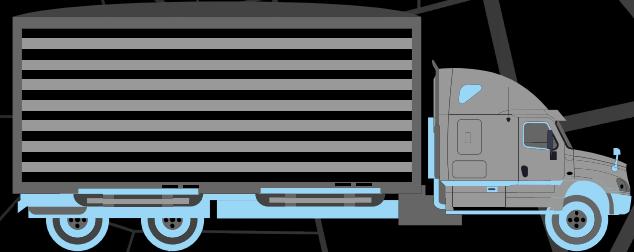
Vehicle:	V3	Stops:		5 Net profit:		1105.70			
Stop count	Location Name	Distance travelled	Driving time	Arrival time	Departure time	Working time	Profit collected	Load	
0	Depot	0.00	0:00	23:00	0:00	0	29		
1	Salem, OR	25.75	0:32	23:32	00:32	1:32	450	20	
2	McMinnville, OR	52.09	1:11	01:11	02:11	3:11	750	14	
3	Forest Grove, OR	76.90	1:51	02:51	03:51	4:51	1200	5	
4	Seaside, OR	139.57	3:11	05:11	06:11	7:11	1450	0	
5	Depot	280.37	5:39	08:39		9:39	1450	0	

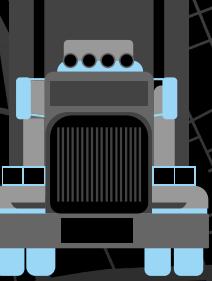
Vehicle:	V4	Stops:		3 Net profit:		381.38			
Stop count	Location Name	Distance travelled	Driving time	Arrival time	Departure time	Working time	Profit collected	Load	
0	Depot	0.00	0:00	23:00	0:00	0	14		
1	Sweet Home, OR	30.07	0:45	23:45	00:45	1:45	250	9	
2	Bend, OR	123.81	2:40	02:40	03:40	4:40	700	0	
3	Depot	248.28	5:22	06:22		7:22	700	0	

Vehicle:	V5	Stops:		3 Net profit:		496.01			
Stop count	Location Name	Distance travelled	Driving time	Arrival time	Departure time	Working time	Profit collected	Load	
0	Depot	0.00	0:00	23:00	0:00	0	16		
1	Eugene, OR	44.37	0:45	23:45	00:45	1:45	500	6	
2	Roseburg, OR	117.42	1:51	01:51	02:51	3:51	800	0	
3	Depot	229.99	3:33	04:33		5:33	800	0	

I First Cost Reduction

(Korbin/Kwong)





First Cost Reduction Proposal



SUMMARY - Model 1

One great cost reduction strategy is to lower the number of trucks & have the trucks run all day to fulfill all the deliveries. When we have 2 trucks run all day with a mid-day stop at the depot we get total daily profit of \$3880.



Pros

- Daily profit will be up \$445 a day or 13% profit increased.
- 2 trucks only make for a great utilization of the truck's capacity which is a good thing for a business.



Cons

- High-risk for 1 truck to be out-of-service regularly throughout the year.
→ Keeping a backup truck available.

Routes Calculation



VEHICLES UPGRADE

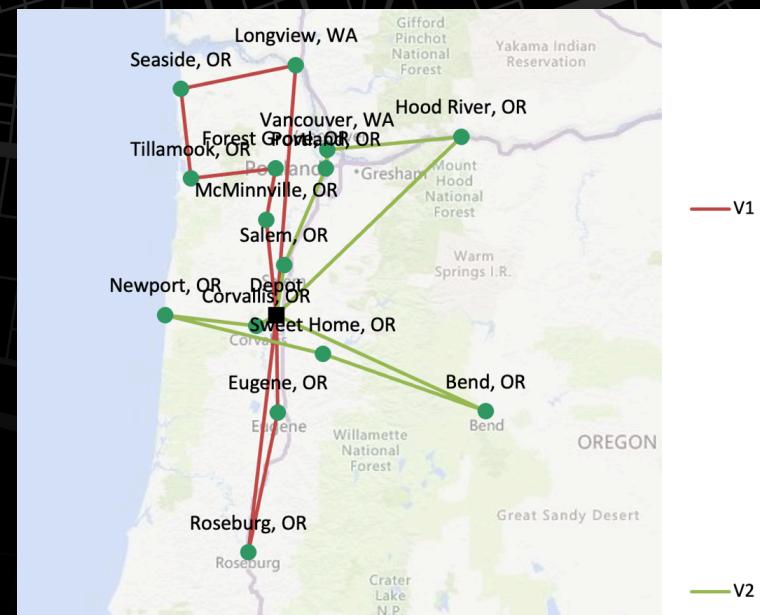
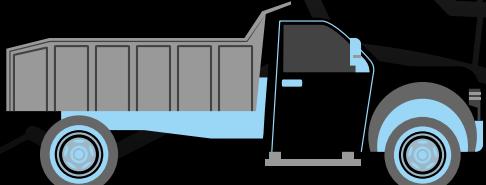
Starting depot	Vehicle type	Capacity	Fixed cost per trip	Cost per unit distance	Duration multiplier	Distance limit	Work start time	Driving time limit	Working time limit	Return depot	Number of vehicles
Depot	T1	30	120.00	0.80	1.00	800.00	23:00	11:00	11:00	Depot	5

Starting depot	Vehicle type	Capacity	Fixed cost per trip	Cost per unit distance	Duration multiplier	Distance limit	Work start time	Driving time limit	Working time limit	Return depot	Number of vehicles
Depot	T1	30	120.00	0.80	1.00	800.00	23:00	22:00	22:00	Depot	2

VRP SOLVER



BEST ROUTES



Daily Profit

Total net profit:

Warning: Last solution returned by the solver does not satisfy all constraints.

Vehicle:	V1	Stops:	9 Net profit:		1711.57			
Stop count	Location Name	Distance travelled	Driving time	Arrival time	Departure time	Working time	Profit collected	Load
0	Depot	0.00	0:00		23:00	0:00	0	30
1	McMinnville, OR	45.63	1:02	00:02	01:02	2:02	300	24
2	Forest Grove, OR	70.45	1:42	01:42	02:42	3:42	750	15
3	Tillamook, OR	122.26	2:48	03:48	04:48	5:48	950	11
4	Seaside, OR	170.94	4:00	06:00	07:00	8:00	1200	6
5	Longview, WA	237.29	5:33	08:33	09:33	10:33	1500	0
6	Depot	355.55	7:27	11:27	12:27	13:27	1500	16
7	Eugene, OR	399.92	8:12	13:12	14:12	15:12	2000	6
8	Roseburg, OR	472.98	9:18	15:18	16:18	17:18	2300	0
9	Depot	585.54	11:00	18:00		19:00	2300	0
10			Vehicle:	V2	Stops:		10 Net profit:	

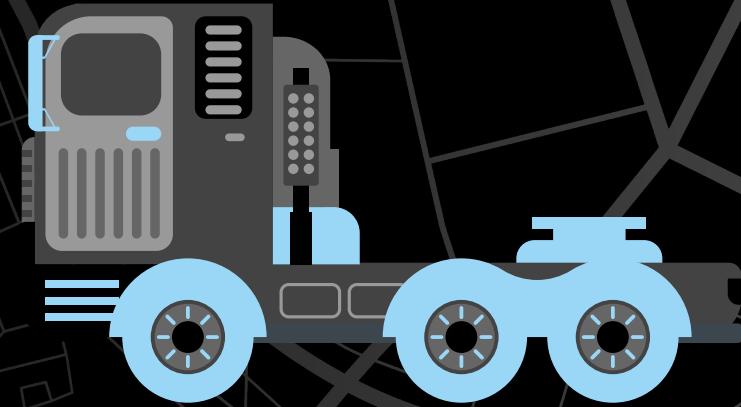
■ Other Financial Savings

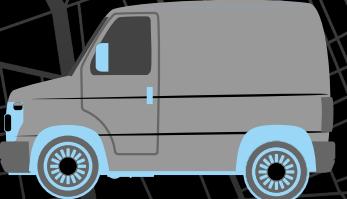
Yearly Savings					
Description	Unit Saving	Qty	Total Savings	Source	
Daily Profit	\$ 445.00	355 D	\$ 157,975.00	-	
Truck Insurance	\$ 6,500.00	2	\$ 13,000.00	https://askthetrucker.com/what-it-really-costs-to-own-a-commercial-truck/#:~:text=On%20average%2C%20a%20brand%2Dnew,combinations%20will%20certainly%20cost%20more.	
Truck Repair	\$ 15,000.00	2	\$ 30,000.00	https://askthetrucker.com/what-it-really-costs-to-own-a-commercial-truck/#:~:text=On%20average%2C%20a%20brand%2Dnew,combinations%20will%20certainly%20cost%20more.	
Drivers Reduction	\$ 61,625.00	1	\$ 61,625.00	1 truck will have 2 drivers splitting the day's deliveries. https://www.indeed.com/career/truck-driver/salaries	
TOTAL			\$ 262,600.00		

One Time Savings					
Description	Unit Saving	Qty	Total Savings	Source	
Sell 3 trailers (~2008)	\$ 7,900.00	3	\$ 23,700.00	https://www.google.com/shopping/product/1?q=2010+53-foot+trailer+for+sale&prds=epd:3627066896752318242,eto:3627066896752318242_0,pid:3627066896752318242,prmr:1&sa=X&ved=0ahUKEwiC7qeWiYfvAhXC6Z4KHVDNCywQ9pwGCAU	
Sell 2 trucks (~2015)	\$ 50,000.00	2	\$ 100,000.00	https://ryder.com/used-trucks/inventory/north-dakota/fargo/truck/box-trucks/2015/freightliner/m2-106/350152/	
TOTAL			\$ 123,700.00		

Second Cost Reduction

(Tina/Eunjeong)





16 % of
Profit
Growth



SUMMARY - Model 2

Lower the number of trucks and open another warehouse closer to the Portland area as well as to reduce our customers service time from 1 hour to 45 minutes. When opening a new warehouse in McMinnville, the daily profit of such model grows to \$3966.64.

Second Cost Reduction Proposal



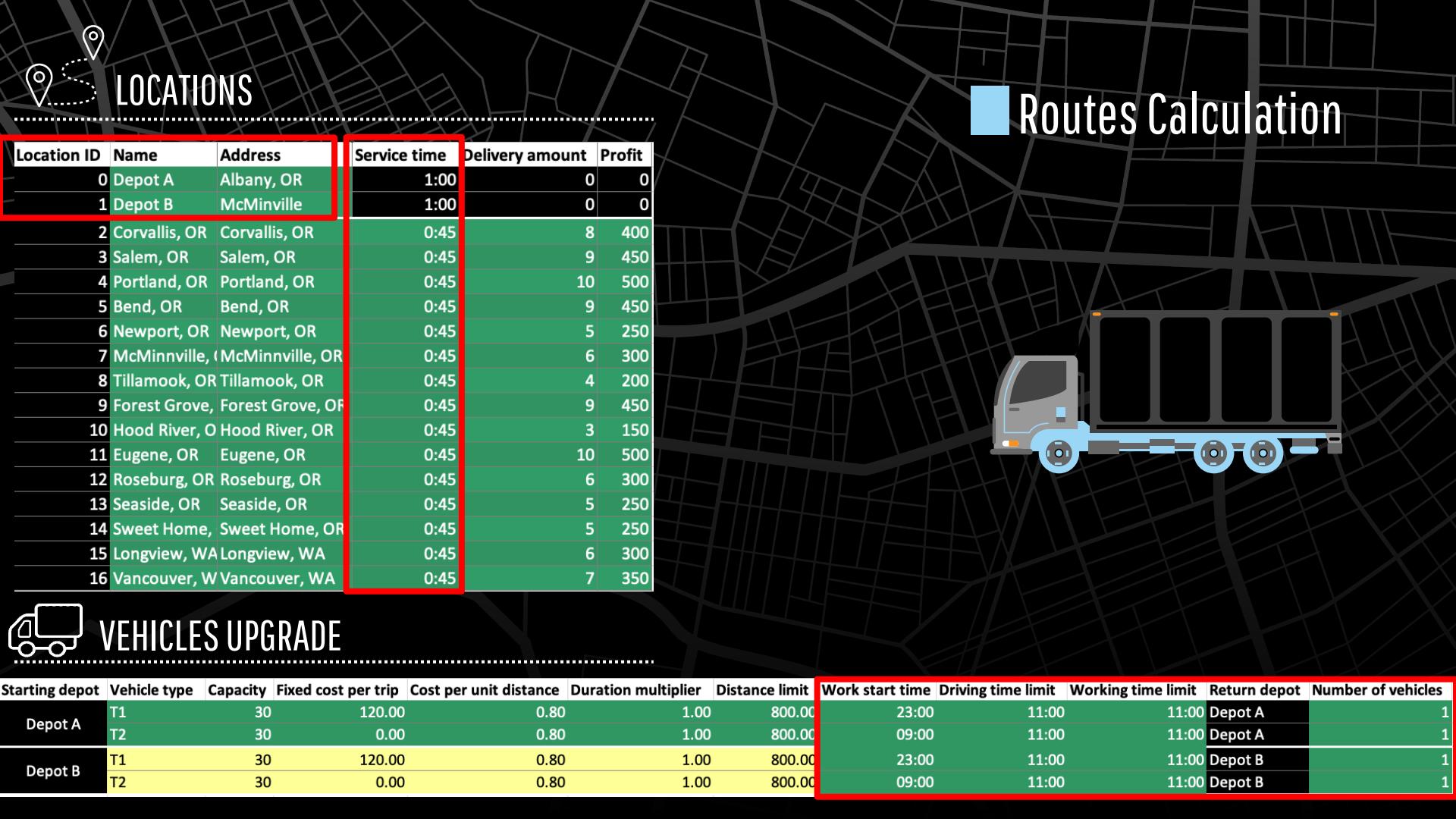
Pros

- 2 trucks = great utilization of the truck's capacity.
- 2 warehouses = more responsive value chain to customers.
- Warehouse expansion = revenue growth
- Efficient and flexible labor scheduling of employees.

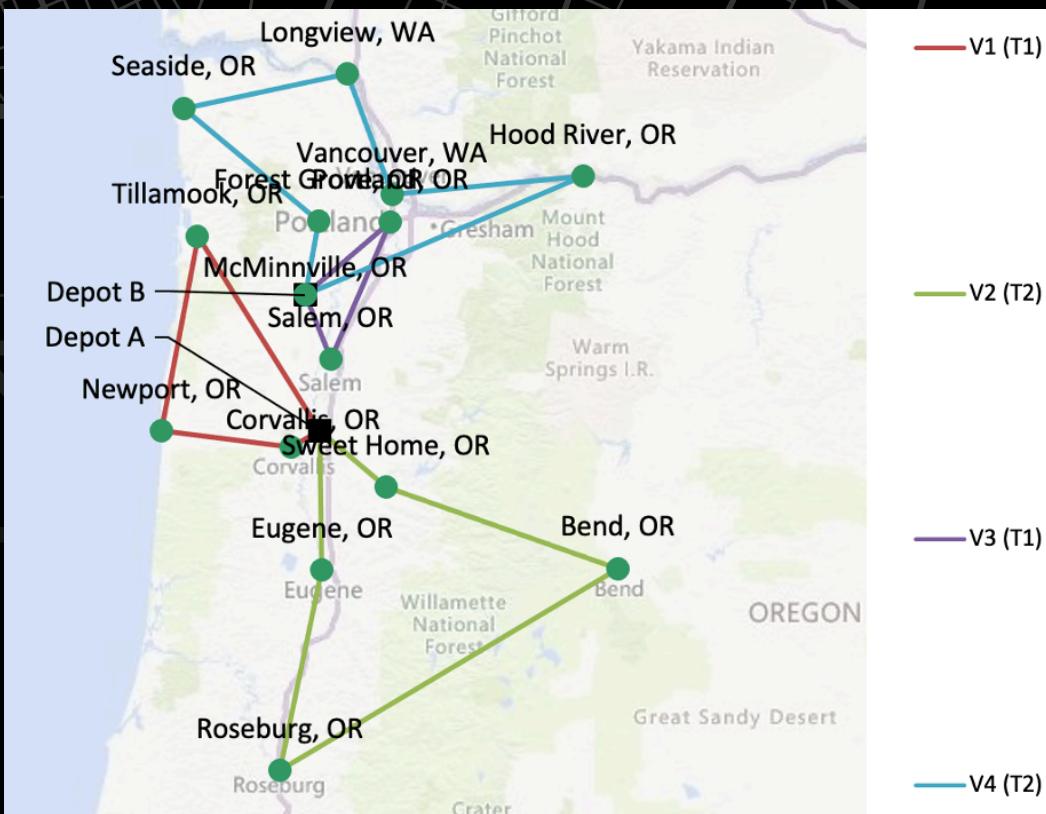


Cons

- High-risk for 1 truck to be out-of-service
 - ➡ Keeping a backup truck
- 2 warehouses will dilute the inventory to serve the customers
 - ➡ Investing in an Inventory Management System
- Faster service time will require more efficiency in our processes
 - ➡ Leverage our new IT system to be more digital (advanced shipment notice, barcode, RFID)



Routes Calculation



Daily Profit

Total net profit: **3966.64**

Vehicle:	V1 (T1)	Stops:		4 Net profit:	554.66				
Stop count	Location Name	Distance travelled	Driving time	Arrival time	Departure time	Working time	Profit collected	Load	
0	Depot A	0.00	0:00		23:00	0:00	0	17	
1	Corvallis, OR	11.55	0:20	23:20	00:05	1:05	400	9	
2	Newport, OR	60.42	1:24	01:09	01:54	2:54	650	4	
3	Tillamook, OR	129.16	3:04	03:34	04:19	5:19	850	0	
4	Depot A	219.17	5:04	06:19		7:19	850	0	

Vehicle:	V2 (T2)	Stops:		5 Net profit:	1167.28				
Stop count	Location Name	Distance travelled	Driving time	Arrival time	Departure time	Working time	Profit collected	Load	
0	Depot A	0.00	0:00	09:00	0:00	0	30		
1	Sweet Home, OR	30.07	0:45	09:45	10:30	1:30	250	25	
2	Bend, OR	123.81	2:40	12:25	13:10	4:10	700	16	
3	Roseburg, OR	299.74	5:53	16:23	17:08	8:08	1000	10	
4	Eugene, OR	370.98	6:59	18:14	18:59	9:59	1500	0	
5	Depot A	415.90	7:44	19:44		10:44	1500	0	
Vehicle:	V3 (T1)	Stops:		4 Net profit:	1032.58				
Stop count	Location Name	Distance travelled	Driving time	Arrival time	Departure time	Working time	Profit collected	Load	
0	Depot B	0.00	0:00	23:00	0:00	0	25		
1	McMinnville, OR	0.00	0:00	23:00	23:45	0:45	300	19	
2	Salem, OR	27.88	0:39	00:24	01:09	2:09	750	10	
3	Portland, OR	74.40	1:29	01:59	02:44	3:44	1250	0	
4	Depot B	121.78	2:27	03:42		4:42	1250	0	
Vehicle:	V4 (T2)	Stops:		6 Net profit:	1212.12				
Stop count	Location Name	Distance travelled	Driving time	Arrival time	Departure time	Working time	Profit collected	Load	
0	Depot B	0.00	0:00	09:00	0:00	0	30		
1	Hood River, OR	99.85	1:54	10:54	11:39	2:39	150	27	
2	Vancouver, WA	165.46	2:57	12:42	13:27	4:27	500	20	
3	Longview, WA	206.17	3:37	14:07	14:52	5:52	800	14	
4	Seaside, OR	272.49	5:10	16:25	17:10	8:10	1050	9	
5	Forest Grove, OR	335.00	6:29	18:29	19:14	10:14	1500	0	
6	Depot B	359.85	7:09	19:54		10:54	1500	0	

■ Other Financial Savings

Yearly Savings					
Description	Unit Saving	Qty	Total Savings	Source	
Daily Profit	\$ 531.61	355 D	\$ 188,721.55	\$3,966.64 - \$3,435.03 (current model)	
Truck Insurance	\$ 6,500.00	2	\$ 13,000.00	https://askthetrucker.com/what-it-really-costs-to-own-a-commercial-truck/#::text=On%20average%2C%20a%20brand%2Dnew,combinations%20will%20certainly%20cost%20more.	
Truck Repair	\$ 15,000.00	2	\$ 30,000.00	https://askthetrucker.com/what-it-really-costs-to-own-a-commercial-truck/#::text=On%20average%2C%20a%20brand%2Dnew,combinations%20will%20certainly%20cost%20more.	
Drivers Reduction (Moved to warehouse)	\$ 61,625.00	1	\$ 61,625.00	1 truck will have 2 drivers splitting the day's deliveries. https://www.indeed.com/career/truck-driver/salaries	
Full time to Part time Driver (Part time driver + Part time warehouse)	\$ 61,625.00	0.5	\$ 30,812.50	1 truck will have 2 drivers splitting the day's deliveries. https://www.indeed.com/career/truck-driver/salaries	
TOTAL	\$ 324,159.05				

One Time Savings					
Description	Unit Saving	Qty	Total Savings	Source	
Sell 3 trailers (~2008)	\$ 7,900.00	3	\$ 23,700.00	https://www.google.com/shopping/product/1?q=2010+53-foot+trailer+for+sale&prds=epd:3627066896752318242,eto:3627066896752318242_0.pid:3627066896752318242,prmr:1&sa=X&ved=0ahUKEwiC7qeWlYfvaHxC6Z4KHVDNCywQ9pwGCAU	
Sell 2 trucks (~2015)	\$ 50,000.00	2	\$ 100,000.00	We are keeping 1 truck for emergency situation. https://ryder.com/used-trucks/inventory/north-dakota/fargo/truck/box-trucks/2015/freightliner/m2-106/350152/	
TOTAL	\$ 123,700.00				

Other Financial Expenses

New Yearly Expenses

Description	Unit Saving	Qty	Total Savings	Source
New warehouse manager with new skillset	(\$65,000.00)	1	(\$65,000.00)	Oregon average is \$60,816. Since the employee will be paid \$61,625 (truck driver salary), we will set the salary to the manager to \$65,000 https://www.ziprecruiter.com/Salaries/Warehouse-Operations-Manager-Salary
Full time warehouse employee	(\$60,816.00)	1	(\$60,816.00)	Rotation or full time position from the current truck driver eliminated by our model.
Part time warehouse employee (Part time driver + Part time warehouse)	(\$60,816.00)	0.5	(\$30,408.00)	Part time responsibility to the part time truck driver.
TOTAL	(\$156,224.00)			

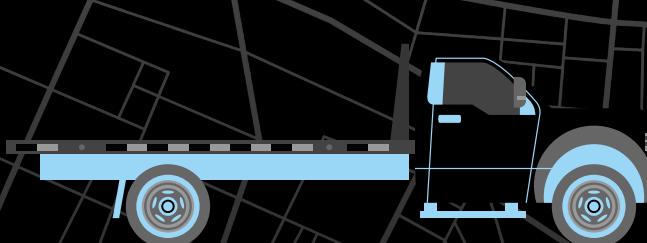
One Time Expenses

Description	Unit Saving	Qty	Total Savings	Source
1 New Depot in McMinnville	(\$332,626.00)	1	(\$332,626.00)	200 feet x 200 feet x 14 feet high.(Half a soccer field.) https://www.buildingsguide.com/estimates/building-cost-estimate/
1 Rack system for single-deep pallet	(\$80.00)	700	(\$56,000.00)	For 50 pallets per day for 14 days (2 week of inventory) = 700 pallets
Inventory Mgmt System licenses	(\$5,000.00)	2	(\$10,000.00)	https://www.bluelinkerp.com/blog/2012/11/22/how-much-does-inventory-and-accounting-erp-software-cost/#:~:text=These%20different%20systems%20can%20range,serving%20markets%20around%20the%20world.
IMS implementation consultant (hourly rate * hours)	(\$125.00)	400	(\$50,000.00)	40 hour * 10 weeks = 400 hours https://www.techrepublic.com/blog/it-consultant/10-mistakes-that-rookie-it-consultants-make-196586/
TOTAL	(\$448,626.00)			

Final Recommendation

(Ryan/Flo)





ROI

Return On Investment (or ROI)

In measure used to evaluate the efficiency or profitability of an investment by dividing the savings by the cost (expenses) of the investment.

FIRST COST REDUCTION MODEL

In this model, there wasn't much investment needed apart from time of an employee to setup the new routes and dispose of the trucks and trailers. The ROI is therefore equals to 0. It is a very worthy model to consider.

SECOND COST REDUCTION MODEL

The initial cost equal **\$326K** while generating a **\$167K** yearly savings. The rough ROI calculation is therefore 1.93. It will take 1.93 years to get the initial cost investment back from the savings.

	One Time \$\$	Yearly \$\$
Expenses	(\$448,626.00)	(\$156,224.00)
Savings	\$ 123,700.00	\$ 324,159.05
TOTAL	(\$324,926.00)	\$ 167,935.05
ROI	=ABS(1 Time Costs / Yearly Savings))	1.93

 NPV

7-years NPV – First Model

	0	1	2	3	4	5	6	7
Capital Investment								
1 New Depot in McMinnville								
2 1 Rack system for single-deep pallet								\$ -
3 Inventory Mgmt System licenses								
4 IMS implementation consultant								
Savings								
5 Sell 3 Trailers	\$ 23,700.00							
6 Sell 2 2015 Trucks	\$ 100,000.00							
6.1 TOTAL Capital (-1-2-3-4+5+6)	\$ 123,700.00							\$ -
Operating Cash Flow (per year)								
Yearly Savings / New Revenue								
7 Increased Yearly Profit (+)	\$ 157,975.00	\$ 157,975.00	\$ 157,975.00	\$ 157,975.00	\$ 157,975.00	\$ 157,975.00	\$ 157,975.00	
8 Truck Insurance Savings (+)	\$ 13,000.00	\$ 13,000.00	\$ 13,000.00	\$ 13,000.00	\$ 13,000.00	\$ 13,000.00	\$ 13,000.00	
9 Truck Repair Savings (+)	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	
10 Drivers Reduction (- 1 driver per year) (+)	\$ 61,625.00	\$ 61,625.00	\$ 61,625.00	\$ 61,625.00	\$ 61,625.00	\$ 61,625.00	\$ 61,625.00	
11 FT Driver to PT Driver (+)								
Yearly Expenses								
12 Depreciation Straight Line 7 yrs for New Depot (-)								
13 New WHS manager (-)								
14 FT Whs employee (-)								
15 PT whs employee (-)								
Total (7+8)								
16 Pretax Profit (7+8+9+10+11-12-13-14-15)	\$ 262,600.00	\$ 262,600.00	\$ 262,600.00	\$ 262,600.00	\$ 262,600.00	\$ 262,600.00	\$ 262,600.00	
17 Tax (40%*16)	\$ 105,040.00	\$ 105,040.00	\$ 105,040.00	\$ 105,040.00	\$ 105,040.00	\$ 105,040.00	\$ 105,040.00	
18 Net Income (16-17)	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	
19 Operating CF (18+12)	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	
NPV Calculation								
20 Total Cash Flow (19+6.1)	\$ 123,700.00	\$ 157,560.00						
21 Discount Factor @ 14%	1	0.877192982	0.769467528	0.674971516	0.592082077	0.519368664	0.455586548	0.399637323
22 Discounted CF (13*14)	\$ 123,700.00	\$ 138,210.53	\$ 121,237.30	\$ 106,348.51	\$ 93,288.17	\$ 81,831.73	\$ 71,782.22	\$ 62,966.86
23 NPV	\$ 799,365.31							

NPV = \$799,365

7-years NPV – Second Model

	0	1	2	3	4	5	6	7
Capital Investment								
1 New Depot in McMinnville								
2 1 Rack system for single-deep pallet		\$ 332,626.00						
3 Inventory Mgmt System licenses		\$ 56,000.00						
4 IMS implementation consultant		\$ 10,000.00						
Savings								
5 Sell 3 Trailers	\$ 23,700.00							
6 Sell 2 2015 Trucks	\$ 100,000.00							
6.1 TOTAL Capital (-1-2-3-4+5+6)	\$ (324,926.00)							\$ 409,088.02
Operating Cash Flow (per year)								
Yearly Savings / New Revenue								
7 Increased Yearly Profit (+)	\$ 188,721.55	\$ 188,721.55	\$ 188,721.55	\$ 188,721.55	\$ 188,721.55	\$ 188,721.55	\$ 188,721.55	\$ 188,721.55
8 Truck Insurance Savings (+)	\$ 13,000.00	\$ 13,000.00	\$ 13,000.00	\$ 13,000.00	\$ 13,000.00	\$ 13,000.00	\$ 13,000.00	\$ 13,000.00
9 Truck Repair Savings (+)	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00
10 Drivers Reduction (- 1 driver per year) (+)	\$ 61,625.00	\$ 61,625.00	\$ 61,625.00	\$ 61,625.00	\$ 61,625.00	\$ 61,625.00	\$ 61,625.00	\$ 61,625.00
11 FT Driver to PT Driver (+)	\$ 30,812.50	\$ 30,812.50	\$ 30,812.50	\$ 30,812.50	\$ 30,812.50	\$ 30,812.50	\$ 30,812.50	\$ 30,812.50
Yearly Expenses								
12 Depreciation Straight Line 7 yrs for New Depot (-)	\$ 47,518.00	\$ 47,518.00	\$ 47,518.00	\$ 47,518.00	\$ 47,518.00	\$ 47,518.00	\$ 47,518.00	\$ 47,518.00
13 New WHS manager (-)	\$ 65,000.00	\$ 65,000.00	\$ 65,000.00	\$ 65,000.00	\$ 65,000.00	\$ 65,000.00	\$ 65,000.00	\$ 65,000.00
14 FT Whs employee (-)	\$ 60,816.00	\$ 60,816.00	\$ 60,816.00	\$ 60,816.00	\$ 60,816.00	\$ 60,816.00	\$ 60,816.00	\$ 60,816.00
15 PT whs employee (-)	\$ 30,408.00	\$ 30,408.00	\$ 30,408.00	\$ 30,408.00	\$ 30,408.00	\$ 30,408.00	\$ 30,408.00	\$ 30,408.00
Total (7+8)								
16 Pretax Profit (7+8+9+10+11-12-13-14-15)	\$ 120,417.05	\$ 120,417.05	\$ 120,417.05	\$ 120,417.05	\$ 120,417.05	\$ 120,417.05	\$ 120,417.05	\$ 120,417.05
17 Tax (40%*16)	\$ 48,166.82	\$ 48,166.82	\$ 48,166.82	\$ 48,166.82	\$ 48,166.82	\$ 48,166.82	\$ 48,166.82	\$ 48,166.82
18 Net Income (16-17)	\$ 72,250.23	\$ 72,250.23	\$ 72,250.23	\$ 72,250.23	\$ 72,250.23	\$ 72,250.23	\$ 72,250.23	\$ 72,250.23
19 Operating CF (18+12)	\$ 119,768.23	\$ 119,768.23	\$ 119,768.23	\$ 119,768.23	\$ 119,768.23	\$ 119,768.23	\$ 119,768.23	\$ 119,768.23
NPV Calculation								
20 Total Cash Flow (19+6.1)	\$ (324,926.00)	\$ 119,768.23						
21 Discount Factor @ 14%	1	0.877192982	0.769467528	0.674971516	0.592082077	0.519368664	0.455586548	0.399637323
22 Discounted CF (13*14)	\$ 123,700.00	\$ 138,210.53	\$ 121,237.30	\$ 106,348.51	\$ 93,288.17	\$ 81,831.73	\$ 71,782.22	\$ 62,966.86
23 NPV	\$ 352,163.52							

NPV = \$352,164

 NPV

7-years NPV – First Model

	0	1	2	3	4	5	6	7
Capital Investment								
1 New Depot in McMinnville								
2 1 Rack system for single-deep pallet								\$ (409,088.02)
3 Inventory Mgmt System licenses								
4 IMS implementation consultant								
Savings								
5 Sell 3 Trailers	\$ 23,700.00							
6 Sell 2 2015 Trucks	\$ 100,000.00							
6.1 TOTAL Capital (-1-2-3-4+5+6)	\$ 123,700.00							\$ -
Operating Cash Flow (per year)								
Yearly Savings / New Revenue								
7 Increased Yearly Profit (+)	\$ 157,975.00	\$ 157,975.00	\$ 157,975.00	\$ 157,975.00	\$ 157,975.00	\$ 157,975.00	\$ 157,975.00	
8 Truck Insurance Savings (+)	\$ 13,000.00	\$ 13,000.00	\$ 13,000.00	\$ 13,000.00	\$ 13,000.00	\$ 13,000.00	\$ 13,000.00	
9 Truck Repair Savings (+)	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	
10 Drivers Reduction (- 1 driver per year) (+)	\$ 61,625.00	\$ 61,625.00	\$ 61,625.00	\$ 61,625.00	\$ 61,625.00	\$ 61,625.00	\$ 61,625.00	
11 FT Driver to PT Driver (+)								
Yearly Expenses								
12 Depreciation Straight Line 7 yrs for New Depot (-)								
13 New WHS manager (-)								
14 FT Whs employee (-)								
15 PT whs employee (-)								
Total (7+8)								
16 Pretax Profit (7+8+9+10+11-12-13-14-15)	\$ 262,600.00	\$ 262,600.00	\$ 262,600.00	\$ 262,600.00	\$ 262,600.00	\$ 262,600.00	\$ 262,600.00	
17 Tax (40%*16)	\$ 105,040.00	\$ 105,040.00	\$ 105,040.00	\$ 105,040.00	\$ 105,040.00	\$ 105,040.00	\$ 105,040.00	
18 Net Income (16-17)	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	
19 Operating CF (18+12)	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	
NPV Calculation								
20 Total Cash Flow (19+6.1)	\$ 123,700.00	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	\$ 157,560.00	
21 Discount Factor @ 14%	1	0.877192982	0.769467528	0.674971516	0.592080277	0.519368664	0.455586548	0.399637323
22 Discounted CF (13*14)	\$ 123,700.00	\$ 138,210.53	\$ 121,237.30	\$ 106,348.51	\$ 93,288.17	\$ 81,831.73	\$ 71,782.22	\$ 62,966.86
23 NPV	\$ 799,365.31							

NPV = \$799,365

Generate Yearly Revenue Growth of 25.10% 7-years NPV – Second Model

	0	1	2	3	4	5	6	7
Capital Investment								
1 New Depot in McMinnville								
2 1 Rack system for single-deep pallet		\$ 56,000.00						
3 Inventory Mgmt System licenses		\$ 10,000.00						
4 IMS implementation consultant		\$ 50,000.00						
Savings								
5 Sell 3 Trailers	\$ 23,700.00							
6 Sell 2 2015 Trucks	\$ 100,000.00							
6.1 TOTAL Capital (-1-2-3-4+5+6)	\$ (324,926.00)							\$ 409,088.02
Operating Cash Flow (per year)								
Yearly Savings / New Revenue								
7 Increased Yearly Profit (+)	\$ 188,721.55	\$ 236,090.66	\$ 295,349.41	\$ 369,482.12	\$ 462,222.13	\$ 578,239.88	\$ 723,378.09	
8 Truck Insurance Savings (+)	\$ 13,000.00	\$ 13,000.00	\$ 13,000.00	\$ 13,000.00	\$ 13,000.00	\$ 13,000.00	\$ 13,000.00	\$ 13,000.00
9 Truck Repair Savings (+)	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00
10 Drivers Reduction (- 1 driver per year) (+)	\$ 61,625.00	\$ 61,625.00	\$ 61,625.00	\$ 61,625.00	\$ 61,625.00	\$ 61,625.00	\$ 61,625.00	\$ 61,625.00
11 FT Driver to PT Driver (+)	\$ 30,812.50	\$ 30,812.50	\$ 30,812.50	\$ 30,812.50	\$ 30,812.50	\$ 30,812.50	\$ 30,812.50	\$ 30,812.50
Yearly Expenses								
12 Depreciation Straight Line 7 yrs for New Depot (-)	\$ 47,518.00	\$ 47,518.00	\$ 47,518.00	\$ 47,518.00	\$ 47,518.00	\$ 47,518.00	\$ 47,518.00	\$ 47,518.00
13 New WHS manager (-)	\$ 65,000.00	\$ 65,000.00	\$ 65,000.00	\$ 65,000.00	\$ 65,000.00	\$ 65,000.00	\$ 65,000.00	\$ 65,000.00
14 FT Whs employee (-)	\$ 60,816.00	\$ 60,816.00	\$ 60,816.00	\$ 60,816.00	\$ 60,816.00	\$ 60,816.00	\$ 60,816.00	\$ 60,816.00
15 PT whs employee (-)	\$ 30,408.00	\$ 30,408.00	\$ 30,408.00	\$ 30,408.00	\$ 30,408.00	\$ 30,408.00	\$ 30,408.00	\$ 30,408.00
Total (7+8)								
16 Pretax Profit (7+8+9+10+11-12-13-14-15)	\$ 120,417.05	\$ 167,786.16	\$ 227,044.91	\$ 301,177.62	\$ 393,917.63	\$ 509,935.38	\$ 655,073.59	
17 Tax (40%*16)	\$ 48,166.82	\$ 67,114.46	\$ 90,817.97	\$ 120,471.05	\$ 157,567.05	\$ 203,974.15	\$ 262,029.44	
18 Net Income (16-17)	\$ 72,250.23	\$ 100,671.70	\$ 136,226.95	\$ 180,706.57	\$ 226,350.58	\$ 305,961.23	\$ 393,044.16	
19 Operating CF (18+12)	\$ 119,768.23	\$ 148,189.70	\$ 183,744.95	\$ 228,224.57	\$ 283,868.58	\$ 353,479.23	\$ 440,562.16	
NPV Calculation								
20 Total Cash Flow (19+6.1)	\$ (324,926.00)	\$ 119,768.23	\$ 148,189.70	\$ 183,744.95	\$ 228,224.57	\$ 283,868.58	\$ 353,479.23	\$ 849,650.18
21 Discount Factor @ 14%	1	0.877192982	0.769467528	0.674971516	0.592080277	0.519368664	0.455586548	0.399637323
22 Discounted CF (20*21)	\$ (324,926.00)	\$ 105,059.85	\$ 114,027.16	\$ 124,022.61	\$ 135,127.27	\$ 147,432.44	\$ 161,040.38	\$ 339,551.92
23 NPV	\$ 801,335.63							

NPV = \$801,336

FINAL WORDS

	10 years NPV	7 Years NPV	5 Years NPV	3 Years NPV
Model 1 (1 depot & less trucks)	\$ 945,551.18	\$ 799,365	\$ 664,616	\$ 489,496
No Growth Revenue with Model 2				
Model 2 (2 depots & less trucks)	\$ 390,637.10	\$ 801,336	\$ 312,620	\$ 257,300

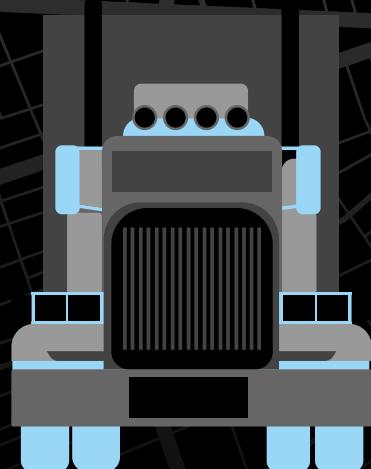
	10 years NPV	7 Years NPV	5 Years NPV	3 Years NPV
Model 1 (1 depot & less trucks)	\$ 945,551.18	\$ 799,365	\$ 664,616	\$ 489,496
Needed Growth Revenue with Model 2	17.60%	25.10%	37.00%	78.00%
Model 2 (2 depots & less trucks)	\$ 946,990.11	\$ 801,336	\$ 665,589	\$ 490,990

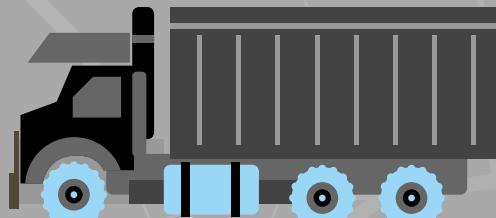
While the Return on Investment is really good for the investment in Model 2, the management team will need to launch a **market analysis** to identify whether the introduction of a new depot truly enable the company to new revenue growth which cannot be reached from the Albany warehouse.

Based on 7 years NPV analysis, the **yearly revenue growth will need to be 17.6%** so that the NPV of Model 2 is better than Model 1. It seems like a huge growth that will need to be sustain for a long time. We should also look into a **smaller warehouse** and **less safety stock** to be levers to consider for our Model 2 to be more interesting financially.

We recommend for the business to **NOT invest in a new warehouse** at the moment and to execute our proposal from model 1.

Model 1: The cost reduction strategy is to **lower the number of trucks** & **have the trucks run all day** to fulfill all the deliveries. When we have 2 trucks run all day with a mid-day stop at the depot we get total daily profit of **\$3880**.





Thank You
Group 3

// Eunjeong Heo
// Kwong Wa Lam
// Korbin Sorensen
// Tina Tangkittiwet
// Ryan Liu
// Tianhong Zhang
// Florian Houguet