# Module 12 – Location Graph

Exploratory Data Analysis

In this section, you should perform some data analysis on the data provided to you. Please format your findings in a visually pleasing way and please be sure to include these cuts:

- *Make a visual graph of your data on a map (coordinates should be within US borders)*
    - https://mymaps.google.com/
    - Find a map with latitude/longitude and place them approximately
    - Any alternative that gives the same effect
- Use your available data to determine a good starting coordinate for the DC
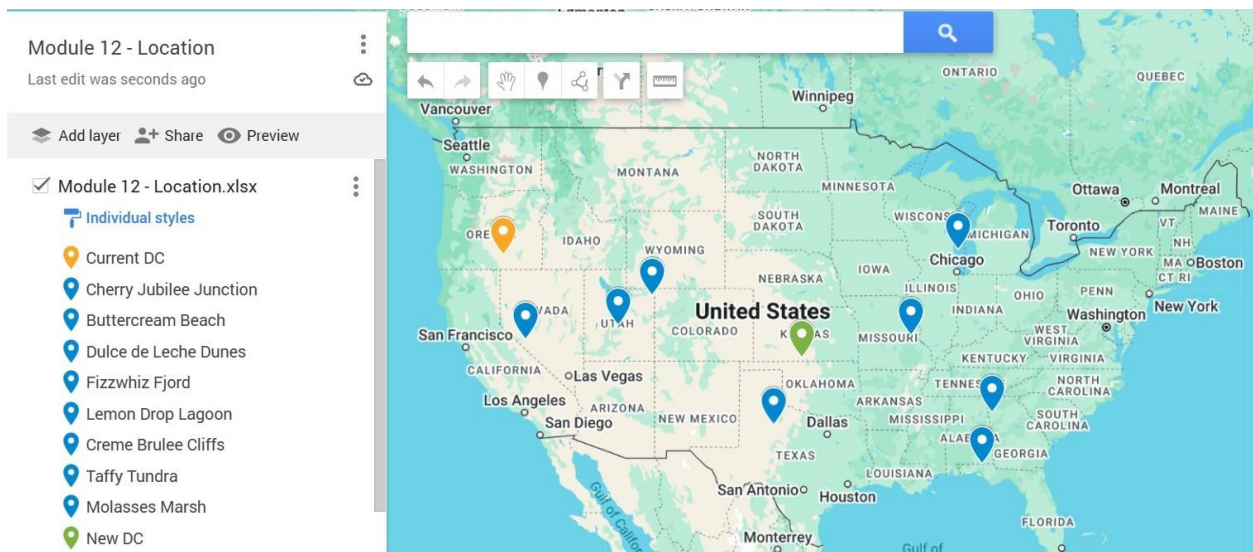
I used both options for finding the New DC by averaging the Lat and Long distances.

Model Formulation

Try to write the formulation of the model into here prior to implementing it in your Excel model. Be explicit with the definition of the decision variables, objective function, and constraints. Hint: Linking constraints aren't needed since we are using Nonlinear GRG but refer to the associated PowerPoint in your data if you need help.

Model Optimized for Distance Reduction from DC to Store

Implement your formulation into Excel and be sure to make it neat. This section should include:

Store Name	Store Location		Current DC		Current DC Dist	New DC		New DC Dist	Model Decision	
	Lat	Long	Lat	Long		Lat	Long		Use New?	Dist
Buttercream Beach	39	-111.74	42.81	-119.9	9.01	37.25	-98.73	13.13	FALSE	9.01
Cherry Jubilee Junction	40.62	-109.32	42.81	-119.9	10.80	37.25	-98.73	11.11	FALSE	10.80
Creme Brulee Cliffs	34.12	-85.25	42.81	-119.9	35.72	37.25	-98.73	13.84	TRUE	13.84
Dulce de Leche Dunes	33.33	-100.71	42.81	-119.9	21.40	37.25	-98.73	4.39	TRUE	4.39
Fizzwhiz Fjord	43.04	-87.6	42.81	-119.9	32.30	37.25	-98.73	12.55	TRUE	12.55
Lemon Drop Lagoon	38.49	-91.01	42.81	-119.9	29.21	37.25	-98.73	7.82	TRUE	7.82
Molasses Marsh	38.3	-118.26	42.81	-119.9	4.80	37.25	-98.73	19.56	FALSE	4.80
Taffy Tundra	31.09	-85.94	42.81	-119.9	35.93	37.25	-98.73	14.19	TRUE	14.19
					Objective:	77.40				

This model compares current DC distances with the new DC distances and highlighting which distances would be closer compared to the current distances. True for a change to new DC, and False meaning that the current DC is closer. The model recommends assigning each store to the DC that minimizes the total distance between them. This approach reduces overall transportation costs and improves supply efficiency.

Model with Stipulation

Please copy the tab of your original model before continuing with the next part to avoid messing up your original solution.

You should notice that while distance is minimized between each store and each DC, there is a discrepancy between how much demand is serviced between each DC (i.e. one DC may service a lot more demand than others). Please:

1. *Choose one:*
   a. *Implement a change that picks a location for the new DC to distance **AND** load. You can do this by multiplying distance by demand if a store is serviced by a particular DC.*

   I was able to find new distances, in red. Instead of averaging them all I found the average of the stores that are furthest from the current DC. This gave me the new DC center in red. My calculations weighed by distance are listed below with the new calculation.

	Store Location		Current DC			New DC			Model Decision	
Store Name	Lat	Long	Lat	Long	Current DC Dist	Lat	Long	New DC Dist	Use New?	Dist
Buttercream Beach	39	-111.74	42.81	-119.9	9.01	39.22	-96.15	15.59	FALSE	9.01
Cherry Jubilee Junction	40.62	-109.32	42.81	-119.9	10.80	39.22	-96.15	13.24	FALSE	10.80
Creme Brulee Cliffs	34.12	-85.25	42.81	-119.9	35.72	39.22	-96.15	12.03	TRUE	12.03
Dulce de Leche Dunes	33.33	-100.71	42.81	-119.9	21.40	39.22	-96.15	7.45	TRUE	7.45
Fizzwhiz Fjord	43.04	-87.6	42.81	-119.9	32.30	39.22	-96.15	9.37	TRUE	9.37
Lemon Drop Lagoon	38.49	-91.01	42.81	-119.9	29.21	39.22	-96.15	5.19	TRUE	5.19
Molasses Marsh	38.3	-118.26	42.81	-119.9	4.80	39.22	-96.15	22.13	FALSE	4.80
Taffy Tundra	31.09	-85.94	42.81	-119.9	35.93	39.22	-96.15	13.05	TRUE	13.05
					Objective:	71.70				