Bergen-Power Pipe Supports is a small manufacturer of pipe hangers and supports for power plants, mills, and refineries throughout the world. Most of their domestic shipments are single mixed pallets of various products weighing an average of 350 pounds that are destined for inside delivery at specific plants and mills. Since the shipments are small, Bergen utilizes LTL transportation from its Donora, PA facility (zip code 15033) via Overnite Transportation. They have negotiated contract rates that specify a 58% discount on Overnite’s current rate tariff, a $60 minimum shipment charge, and an FAK 50 freight classification.

1. Use the online rating tool provided on Overnite’s website (http://www.overnite.com) to rate 500 pound shipments to the following popular consignee destinations. Assume that Overnite charges a fuel surcharge of 16.3%. Duplicate the table below in your answer, breaking out the total charge into its various components. [5 points]

<table>
<thead>
<tr>
<th>City</th>
<th>State</th>
<th>Zip</th>
<th>Base Charge</th>
<th>Charge After Disc.</th>
<th>Delivery</th>
<th>Fuel</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conneaut</td>
<td>OH</td>
<td>44030</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raritan</td>
<td>NJ</td>
<td>08869</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brandywine</td>
<td>WV</td>
<td>26802</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St. Clairsville</td>
<td>OH</td>
<td>36101</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silver Spring</td>
<td>MD</td>
<td>20901</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mars</td>
<td>PA</td>
<td>16046</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parkland</td>
<td>FL</td>
<td>33076</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ft. Oglethorpe</td>
<td>GA</td>
<td>30742</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Plot a graph of the base freight charges determined in the previous part vs. the distance traveled. Put distance on the x axis, and the base freight charge on the y axis. Use http://maps.google.com or http://www.mapquest.com to determine the travel distance from the Donora plant to the customer cities. Are any economies of scale for distance evident? [3 points]
3. Since Bergen-Power Pipe Supports has many customers in the Raritan, NJ, area, it has considered consolidation as an option. In this situation the shipments of 10 customers would be sent together and then stored by Overnite Transportation for an average of 5 days before delivery. How much will Bergen save[^1] in transportation costs by utilizing this strategy? [3 points]

4. Draw a plot of the base freight charges vs. weight for shipping carpet from Donora to Raritan. Start with a shipment of 1,000 lbs. and finish at a shipment of 10,000 lbs., calculating the rate at 1,000 lb. increments. Are any economies of scale for weight evident? [4 points]

---

### Mode Selection for Gypsum Wallboard (35 points)

USG Corporation is a major manufacturer of mold-resistant building materials. The company’s flagship product is Sheetrock® Brand Humitek® Gypsum Panels, which can be installed on wall or ceiling interiors in order to minimize moisture and mold damage in building areas that are subject to incidental moisture. USG has just won a coveted contract with a major construction company in the growing Glendale, AZ, area. This company is expected to require 15,000 pounds of Sheetrock® Panels per day for the next year in order to satisfy its busy residential and commercial construction schedule. This contract is so lucrative that USG has agreed to operate a dedicated distribution center near Glendale that carries a safety stock of 100,000 pounds of inventory in order to fulfill the construction company’s orders quickly.

The USG traffic manager wants to determine the mode of transportation to utilize for shipments from the USG production facility in Santa Fe Springs, CA (zip code 90670) to the new distribution center in Glendale, AZ (zip code 85301) in order to minimize the total annual logistics cost. The feasible modes of transportation for these shipments are railcar and truckload.

1. The lane between Santa Fe Springs and Glendale is served by the Burlington Northern Santa Fe (BNSF) Railroad. Use BNSF’s online rating engine at [http://www.railprices.com](http://www.railprices.com) to determine the rate for carloads weighing less than 167,000 pounds to ship the commodity “Gypsum Wallboard” along this route. Also find the rate for carloads exceeding 167,000 pounds that are less than 63 feet long. Assume that no transloading services are required at the origin or destination, and you can use the current date as your search date. [5 points]

2. What is the average transit time[^2] for these shipments according to BNSF’s rating engine? [1 point]

---

[^1]: The savings should be calculated by comparing the cost of one consolidated shipment with the total cost of 10 individual shipments.

[^2]: Take the midpoint of the interval you are given as the average time.
3. The rates you obtained above are *ramp-to-ramp* rates; thus, they only cover transportation from BNSF’s terminal near Santa Fe Springs to its terminal near Glendale. USG has contracted with a third-party logistics provider that coordinates the local delivery and transloading services from USG’s facility to the BNSF terminal as well as the final delivery in Glendale. The negotiated rate is a flat $100 per carload (regardless of its size) plus a variable cost of $0.002 per pound of freight in the carload.\(^3\)

4. USG uses Schneider National for its truckload shipments. Each truckload (moved in a standard dry van) is able to haul 40,000 pounds of panels due to US Federal Highway weight restrictions. Use Schneider’s online rating engine\(^4\) at [http://www.schneider.com/customers/SchneiderRate.html](http://www.schneider.com/customers/SchneiderRate.html) to determine USG’s cost of shipping a truckload on this lane. [5 points]

5. Using the following cost data and additional information about USG’s production and inventory policies, determine the optimal shipment quantities (in pounds) for small railcar shipments (\(\leq 167,000\) pounds), large railcar shipments (\(> 167,000\) pounds), and truckload shipments. [20 points]

   - The value of 1 pound of Sheetrock\(^\circledast\) Panels held at the plant in Santa Fe Springs is $0.68.
   - The value of 1 pound of Sheetrock\(^\circledast\) Panels held at the warehouse in Glendale is $0.74.
   - USG’s inventory holding costs are computed as 20% of the inventory’s value per year held.
   - Storage space at the plant in Santa Fe Springs costs $0.30 / (pound*year).
   - Storage space at the warehouse in Glendale costs $0.33 / (pound*year).
   - The average truckload transit time is 2 days.
   - The USG plant in Santa Fe Springs produces 15,000 pounds of Sheetrock\(^\circledast\) Panels per day.

6. Compute the total annual logistics cost for all three methods of transportation using the optimal shipment quantities for each mode. Which mode results in the minimum annual cost? [4 points]

---

\(^3\)There is nothing for you to do in this question. The information is being provided here so that you use it in subsequent questions.

\(^4\)Select option 3; this allows you to obtain a rate without logging on or registering.