City of Bad Water
100 Main Street
Bad Water, NV 89422

Independent Mathematical Contractors
00 Anystreet
Anytown, Anystate 00000

Dear IMC:

I recently contacted you regarding the blending of water from three different wells to lower the amount of arsenic. In examining your solutions to our problem, it occurred to us that there might be other contaminants in our drinking water. An analysis of our water found a problem with another contaminant, selenium, in addition to the arsenic you already are familiar with.

Selenium is a metal that is found naturally in ore deposits. It is used in the manufacture of electronic s and photocopiers as well as in other industrial activities. While selenium is an essential nutrient at low levels, higher levels can cause damage if a person is exposed over a long period of time. Long term damage, such as that incurred by drinking water with high levels of selenium, can lead to kidney and liver damage.

The EPA has established a level of 0.05 part per million as the maximum allowable level in drinking water. Recall that the level for arsenic is 10 parts per billion. To insure a safety factor of 20%, we would like the blended water to have a level of selenium no higher than 0.04 parts per million and a level of arsenic no higher than 8 parts per billion.

The table below shows the three wells, their respective levels of arsenic and selenium.

Well	**Arsenic Level (ppb)**	**Selenium Level (ppm)**
1	5	0.03
2	8 + F	0.02
3	10 + L	0.05

In this table, F is the number of letter in your first name and L is the number of letters in your last name. The city has an average daily demand of $3.5+0.01\cdot M$ million liters that must be supplied from these three wells. M is the number of letters in your middle name. We need to make sure that we have at least this capacity to supply drinking water to our customers. We are no longer worried about the capacities from each well. You earlier research has convinced us that it is fairly cost effective to replace pumps to increase well capacity.

To meet this demand, we plan to blend water from these three wells. This is done by piping the water to a central location and then combining different amounts from each well together to get a mixture that no more than 8 ppb of arsenic and 0.04 ppm of selenium.

Our major constraint in this project is cost. The cost of pumping and transporting water to the central location varies. Since well 1 is farthest away from the central location, it costs the most to produce this water. Well 3 is the closest so it costs the least to produce the water. The table below gives the cost per thousand liters to produce water from each well.

Well	Cost per Thousand Liters (Dollars)
1	1.00
2	0.80
3	0.70

To help us write the plan for the EPA, we would like to know how much water we must pump daily from each of the wells. To insure the most efficient method possible, we want to do this at as low a cost as possible.

Please document your work in a research poster. This document must contain enough detail so that we could modify your calculations should any of the numbers above change. This means that numbers alone will not be sufficient. We need to see your calculations and understand the steps you followed to solve the problem outlined above.

Sincerely,

Mortimer Bruster
Director of Utilities
City of Bad Water, Nevada