

**Memo: Contaminated Soil**  
**To: High school-Chem**  
**From: SmileCorp**

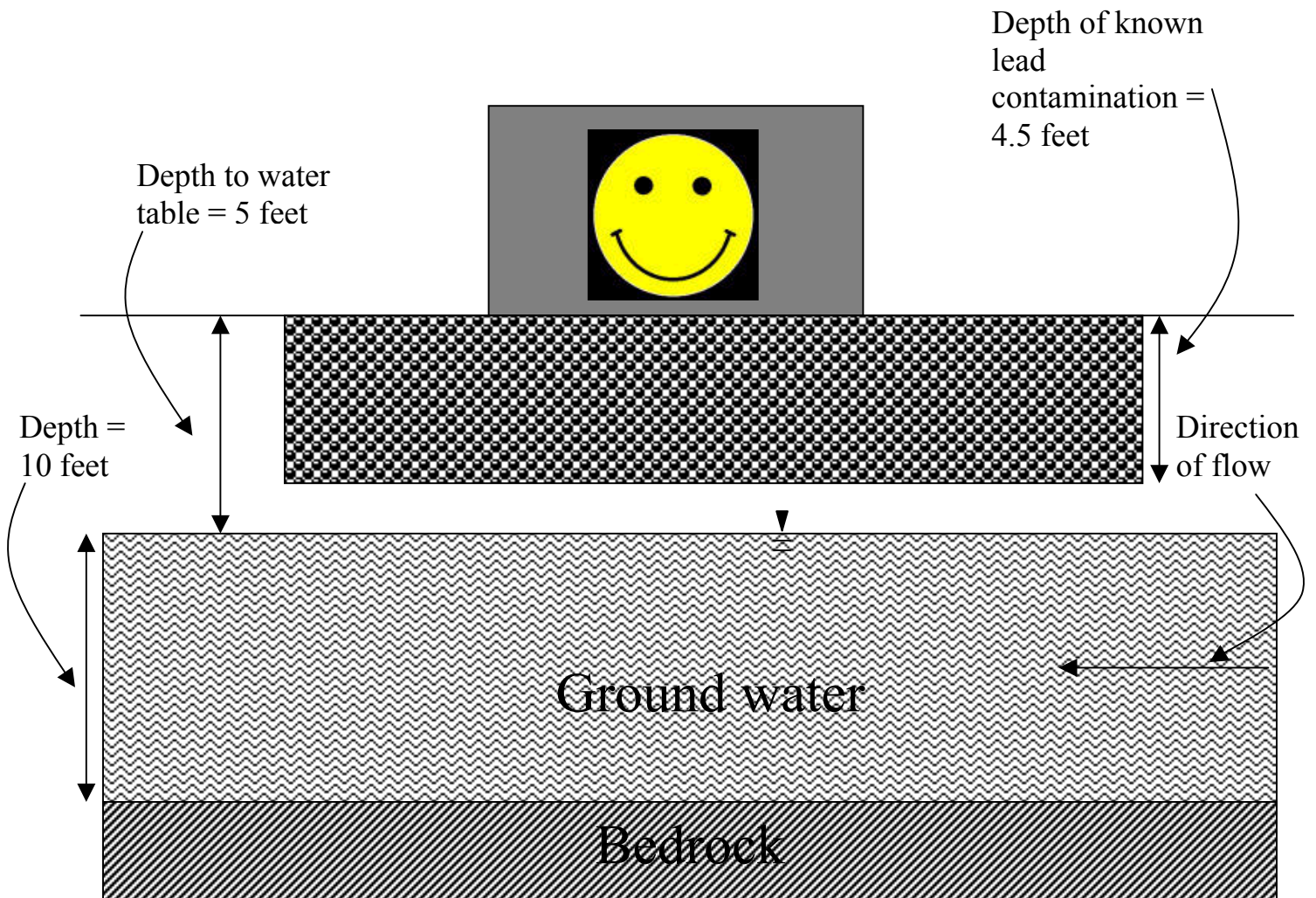
SmileCorp has been smelting metals on our site for 50 years. Times have changed since our company was founded. Practices that were considered acceptable in the past are no longer tolerated. The government has set new regulations to protect the environment. Currently we are not knowingly breaking any environmental violations. However, we know that our practices in the past would not meet today's standards. Therefore we expect that the land around our facility is contaminated with metals and other byproducts of our production. We are concerned that the metals, particularly lead, will get into the groundwater. If something like this happened SmileCorp would face serious law suits, government imposed fines and a lot of bad press.

We would like High school -Chem to advise us on how best to manage our property. One option is to use a "pump and treat" system to keep any contaminants on our property. We are interested in the possibility of using is the addition of ligands such as EDTA to help remove the metals from the soil. We would like High school -Chem to advise us on the following points:

- Is the lead likely to get into the groundwater (do we need to implement the pump and treat system)?
- Should we introduce EDTA into our pump and treat system?
- Is there a better way to handle our problem?
- Suggestions for further research.

SmileCorp will provide High school -Chem with soil samples,  $\text{Pb}^{+2}$  ion specific electrode, EDTA solutions and outside laboratory facilities to test any samples that require sensitive analysis. We will also provide High school -Chem with information about our property and other price information that you will need to advise us. A panel from SmileCorp will come to hear a presentation of your findings.

## SmileCorp site:



## Project information:

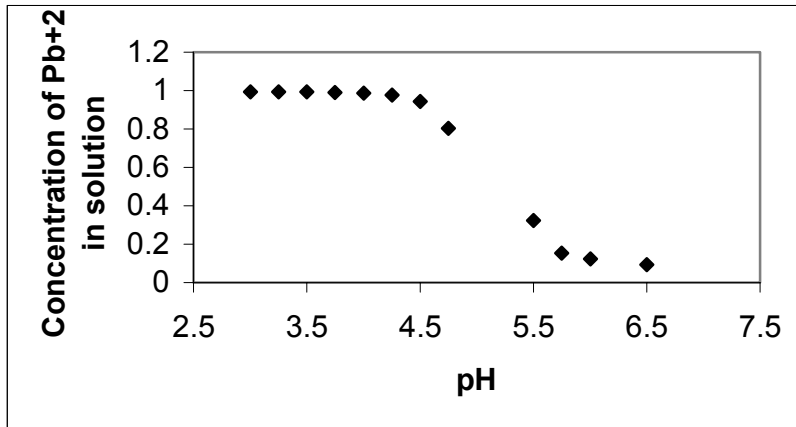
- ⊙ Area (square site),  $A = 50 \text{ acres} = 202,343 \text{ m}^2$
- ⊙ Soil pH = 7
- ⊙ Hydraulic conductivity of soil (rate at which water will move through the soil),  
 $K = 5 \text{ ft/day} = 1.5 \text{ m/day}$
- ⊙ Depth of known contaminated soil,  $d = 4.5 \text{ ft} = 1.37 \text{ m}$
- ⊙ Soil density  $\rho = 2.65 \text{ g/cm}^3$
- ⊙ 1L of 0.25M (0.5N) ethylenediaminetetraacetic acid EDTA costs \$50.00
- ⊙ Drinking water standard – 15 micrograms/L

## Lead concentration versus pH:

For system containing:

1M  $\text{Pb}^{+2}$

5mM  $\text{CaSO}_4$



## Ligand metal interaction:

