

## L'Acide Case Scenario 2 – Concerned Citizen

The City of L'Acide is located on the Gulf Coast of the U.S. with a population of 20,000. The main industry is the assembly of semiconductors (employment = 1523). The second largest industry, a battery manufacturer, closed last year, with an attendant layoff of 800 people. The City has two elementary schools and one middle school. Most high school students attend Bezique High School, which is 8 miles away.

Frankly, as a citizen, you are confused about what to do. You are terrified that your children are potentially being exposed to toxic substances, but you also worry about so-called genetically modified organisms [GMOs] -- but not so much, since the experts have been using them to clean up oil spills for quite a while.

The City has contracted with the engineering firm, Benebaction, Inc., to remediate a 3 hectare hazardous waste site from an old firing range that was deeded to the City by the military shortly after the Korean War. Part of the deed transfer included the stipulation that the transfer was "as is." Bezique Creek runs through town and is about 200 m downstream from the site. The average water table depth is 3 m. In the 1990's a local college conducted soil and water sampling and found "traces" of trinitrotoluene (TNT).

The site is a *brownfield*, i.e. the City has already retained an architectural firm to design a combined residential and commercial center, including an elementary school, on the site. Benebaction has been asked to study the hazardous compounds found in the soil and ground water at the site and find the best way to render them nontoxic. The company's feasibility study (attached) includes probes from 10 monitoring wells that indicate that TNT concentrations range from "not detected" to 100 ppm. TNT ultimate degradation rates of these concentrations vary by the type of engineering controls being used. To reach ultimate destruction of the TNT, the company has provided the following estimates:

Natural attenuation: 15 years. (Plume will reach drinking water well within 3 years).
Bioaugmentation alone: 7 years.
Pump and treat: 2 years. Will likely release VOCs without additional treatment.
Biostimulation and bioaugmentation: 1 year.
Biostimulation with genetically modified (GM) bacteria, with bioaugmentation: 3 months.
Above, with phytoremediation: 2.5 months.
Above, with GM plants: 1.5 months.

Benebaction recommends the use of a genetically modified bacterium to treat the waste. Biological treatment is preferred to chemical treatment because the local soil type and other conditions at the site support microbial growth and metabolism, as well as that of larger organisms. In fact, they recommend a specific culture of *Pseudomonas etemup*. The strain to be used here (Booboom A) has been genetically modified using plasmid insertion to use N-compounds as its food source; and N-compounds comprise the largest amount of contaminants by volume and mass at this site. In fact, researchers have successfully demonstrated that this

strain will degrade N-compounds much more rapidly than the non-modified strains in laboratory studies under controlled conditions similar to those at this site, so the company would expect it to be ideal here. Benebaction also recommends installing a white rot fungus (*Phanerochaete chryosporium*) bioreactor for all extracted materials (mainly soils) on site. The *P. chryosporium* will also be genetically enhanced, as will the sage grass to be planted around the site (to be weed resistant).

The attached feasibility study includes results from probes from 10 monitoring wells that indicate that TNT concentrations range from “not detected” to 100 ppm. Time of cleanup will vary by the type of engineering controls being used. It seems like the data that you have seen shows a big difference in cleanup time if the GMOs are used versus other methods. You want to know what others think, so you are having meeting (right now) at your house, especially to see why Europeans seem more concerned about biotechnologies than Americans.

## **Your charge**

Discuss the pros and cons of this approach and your role as a citizen who will be personally affected by these recommended actions. Select a spokesperson from your group to represent you on today’s panel discussion at L’Acide’s town hall meeting on next steps.

## **Questions**

1. What is your level of trust in the engineers in this case?
2. What do you believe is being held paramount in this project?
3. How can your views be expressed best?
4. Do you believe the company is working with your best interests in mind? If not, why not? If so, what is the company doing to reassure you?
5. What are the potential conflicts of interest in this case?