Online Ethics Center
FOR ENGINEERING AND SCIENCE

L'Acide Case Scenario 1: Consulting Firm Engineer

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Description

This case includes the point of view of Team 1, the consulting firm engineers, for the L'Acide cleanup case. This case includes handouts for 4 teams, each with hidden agendas, to be used in class discussion.

Body

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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.

The City has contracted with your 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. Your feasibility study (attached) included 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, your engineer in charge 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 be used 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, you 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).

You expect some tough questions regarding genetic engineering. For example, some articles and editorials have appeared recently in the local newspaper expressing concerns about genetically modified crops. There may be concerns about using the town as a “guinea pig,” when a nearby town used conventional non-modified bacteria and chemicals to clean up their waste site.

Benebaction has sent you fact sheet reminding you that bioengineers are often unprepared for questions specific to genetically engineered organisms used in the environmental fields, but these confrontations are not at all uncommon in other areas of biotechnology. Food crops have often been genetically modified, for instance to infuse resistance to temperature changes, pests and diseases or to require less water. However, such altered crops have been met with fear when the food reaches the marketplace. The company recommends that you be prepared to explain differences between food crops and environmental applications (e.g. the likelihood that the genetically modified bacteria will not migrate away from the remediation site and that these “bugs” have been altered not to survive beyond a second generation).

Your Charge

Discuss the pros and cons of this approach and your role as an environmental professional in this case. 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. How does the responsibility to the consulting firm influence professional responsibilities?

2. What is held paramount in this project?
3. Do you detect any biases (technical and otherwise) in the likely recommendations? How might these affect the ultimate decision?
4. To whom is the engineer a “faithful agent”?
5. What are the potential conflicts of interest in this case?

Rights

Resource Type

Case Study / Scenario

Topics

Catastrophes, Hazards, Disasters
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Discipline(s)

Engineering
Environmental Engineering