

# ACTIVITY BUILDING A MODEL LANDFILL ; PART 1.

## Resources:

- Paper for brainstorming

- waste Audit Sheet to record family waste

## Background information

The most convenient form of waste disposal has been to bury waste in landfills.

Convenience often comes with a cost, in this case a degraded and polluted environment. Some of the environmental issues of sending waste to landfill include land clearing, windblown waste, leachate, social impacts, burying resources and the production of greenhouse gases such as methane.

## Instructions

1. Record everything your family has thrown in the rubbish bin for two days. (See Activities Unit 1.)  
When recording the items thrown away, Remember not to include items currently recycled.
2. Note items that are hazardous waste, such as all batteries, paint, oil, pesticides, cleaners. These are items that can cause particular harm to soil and ground water this is something that should be considered when looking at the mini landfill model.
3. Write about and share some of the environmental issues associated with landfills, including the following:



Land clearing –loss of habitats.

Wind-blown waste – can generate litter in waterways.

Leachate –can cause soil and ground water pollution in unlined landfills when items such as batteries, pesticides, petrol, paint, and/or oil is dumped. When rain filters through the landfill it will pick up the liquids from these items and create a toxic soup called leachate.

Social impacts – no-one wants to live near a landfill site, they are not great to look at, they smell, are often loud due to large machinery, create dust and attract vermin.

Burying resources – sending waste to landfill is a huge 'waste', a lot of our waste is valuable, it can be recycled into something new. Some landfills are now mined for these materials.

Greenhouse gas – methane is generated when organic waste, like paper and food scraps break down in landfill. Methane gas is generated under anaerobic conditions (without oxygen). Methane is 20 times stronger than CO<sub>2</sub>, it captures and holds heat in our atmosphere. Methane lasts 100 to 150 years and contributes to global warming and climate change.

### Going further

Write a short story of a product that has become a waste item, what will become of it?

# Activity 2: Building a model landfill part 2

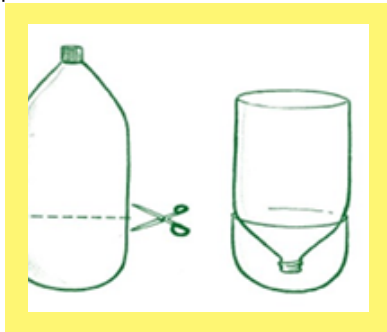
## Aim

We will learn that burying waste in the ground can lead to environmental impacts by making and observing mini landfills. In this activity, two or three mini landfills are constructed, one that is lined and one that is not, to show the impact rubbish can have on the soil, ground water, surrounding land/water, and the air, if not properly managed. The third mini landfill option is to construct an illegal dump site or mini tip/rubbish dump.

## Instructions

Take two-litre soft drink bottle and cut off bottom (about 10 centimetres from base). Place the top upside down into the base to use as a holder while you layer your landfill 'ingredients'. There are four to six layers in each landfill depending on the landfill you choose to make. The layers should be added in the following order: gravel, blue sponge, soil, (plastic bag liner in lined landfill), yellow sponge (with added food colouring), soil, paper/plastic flakes (see diagram).

### Lined landfill (sanitary landfill): from bottom to top



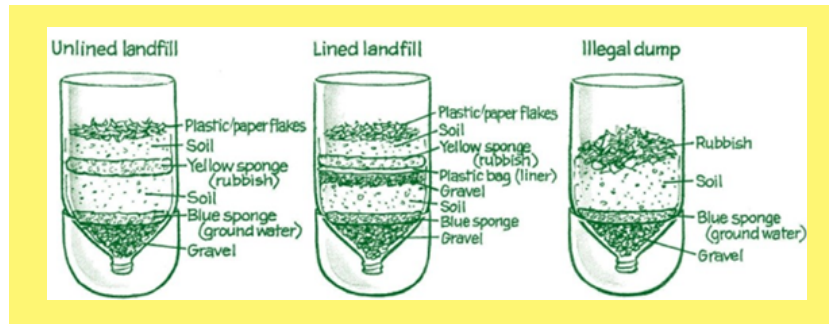
Gravel = bedrock or clay that would hold or contain water.  
Blue sponge = ground water, the water that a community sources its drinking and irrigation water from.  
Soil = just that - native soil (in Northland, probably sandy).  
Gravel (thin layer) = the impermeable material (such as clay) that they often add below the liner as an extra safety layer to prevent leachate from entering soil.  
Plastic bag liner = the thick plastic liner that prevents leachate from entering the soil and ground water.  
Yellow sponge = the layer of rubbish. Food colouring can be added to the sponge here to represent leachate (the idea is that when water is poured through, the leachate will move into the soil and ground water).

### Resources:

Soil,  
Clean gravel.  
At least two two-litre plastic soft drink bottles  
Plastic bag  
Two different coloured sponges  
Red food colouring  
Scrap paper

### Optional

(for illegal dump) used batteries, small plastic scraps (to be piled to form 'dump' on top of soil)



Soil = a layer of soil to cover the rubbish to prevent smell, pests from being attracted to the waste, and plastic bags blowing into waterways  
Paper/plastic flakes = litter that often blows from the landfill before it has a chance to be buried.

### Unlined landfill

All layers in the unlined landfill are the same, except without the thin gravel layer and plastic bag liner. See how leachate affects the soil and ground water.



Unlined landfill in Ploand (Wikipedia)

## Expected results

### Illegal dump/rubbish tip

Gravel, blue sponge and soil layers are all the same here. However, the yellow sponge should be torn or cut into smaller pieces and piled on top of the soil along with a battery, plastic and paper flakes, and perhaps a few twigs. This is to demonstrate that in these dumps/tips any type of rubbish is simply piled on the ground.



It is illegal to dump rubbish on Farms (Stuff.co.nz)

### Instructions

1. Keep bottle cap on while layering – it will be removed once the landfills are complete to watch the water flow through.
2. Select one of the three types of landfills and fill accordingly.
3. Once the mini landfills are complete, remove the cap, add food colouring to water. Film the water filtering through the landfills and share with the class to compare.
4. Pour a cup of water through slowly and watch what happens (pour more water if necessary).

The lined landfill should hold its water, however if you add a lot of water it may leak through, which can represent what can happen in a real landfill if the liner is too old. The blue sponge should stay dry, showing that the liner prevents contamination of the ground water.

The water in the unlined landfill should filter through to the bottom of the soft drink bottle (holder). You should also see the blue sponge change colour as the food dye seeps through. This shows how the ground water can become contaminated – you should have coloured water collecting in the bottom

of the bottle/holder. In the illegal dump/tip you should find that the leachate (coloured water) filters through the landfill quite quickly and the blue sponge will change colour. You should be able to see the impacts that waste can have on ground

water and soil. If the paper/plastic flakes (very top layer) didn't get too wet, blow gently on the paper/plastic. In a real landfill this rubbish/ litter could affect the surrounding land and water.

### A more realistic experiment!

You could make a mini landfill using actual waste using the same ratios found in the data collected from your family's waste! This is a bit of a stinky experiment, so make sure you have permission from your whanau!

Using the same bottles, replace the yellow sponge 'rubbish layer' with small amounts of waste from your rubbish, for example, the lid from a tin, a small amount of food, paper waste, and plastic and bury the bottle in your back yard. Mark where you buried the bottle and come back in a week, or even two to see what happened to your mini landfill, film and share your results, but watch out, if you have food in your rubbish your results will be difficult to convey as we don't have smelly vision!!!