

Landfill Lessons Teachers Notes



Students will learn about how landfills are constructed and their main operating components whilst completing activity sheets and making a tasty snack.

OBJECTIVES

- Define a landfill
- List the various layers of a landfill
- Describe the purpose of each landfill layer
- Determine environmental impacts and solutions
- Discuss different waste items disposed of in a landfill
- Discuss reducing, reusing and recycling of waste items
- Discuss sustainable alternatives to landfills

SYLLABUS CONTENT

The landfill lessons will provide opportunities for students to work mathematically in measuring ingredients and reviewing data.

Investigations into landfill construction and operation as well as managing waste sustainably uses geographical inquiry skills in support of the Geography K-10 Syllabus in

- Early Stage 1 People live in places – important places
- Stage 1 Features of places – how a place can be cared for
- Stage 2 The Earth's environment – protection of environments
- Stage 3 Factors that shape places – factors that change environments; humans shape places
- Stage 4 Interconnections – production and consumption
- Stage 5 Environmental change and management – environmental management.

Investigating reducing, reusing and recycling of waste items supports learning in the Science and Technology K-6 Syllabus and Science 7-10 Syllabus in:

- Stage 1 Earth and space – conservation of Earth's resources
- Stage 2 Material world – materials are used for a specific purpose
- Stage 3 Material world – properties of materials determine their use
- Stage 4 Earth and space – how scientific understandings influence choices.



Undertaking personal actions that reduce waste such as not littering, recycling, bringing low waste lunches and re-usable containers are actions that contribute to healthy and safe lifestyles and communities in support of the PDHPE syllabus.

GLOSSARY

Groundwater

Water that seeps into the ground and accumulates within cracks or pores in the rocks (aquifers), forming groundwater resources, this eventually flows into rivers, lakes or the ocean.

Landfill

An area of land used as a disposal site for waste material (also referred to as a tip or dump).

Landfill Gas

Landfill gas forms when organic waste breaks down. It comprises around 50% methane and 50% carbon dioxide. Methane has a global warming potential 21 times that of carbon dioxide.

Leachate

Liquid waste that seeps through a landfill.

Waste

Often referred to as rubbish, garbage, trash, junk, litter, refuse and stuff to be thrown away and is something we all produce as part of everyday living.

ACTIVITY 1

WHAT IS A LANDFILL?

VIDEOS

Begin this activity by asking students what they already know about landfill. Consider using questions such as:

- What is landfill? (Suggested answer: a site for the disposal of waste by burying.)
- Have you been to a landfill? What was it like? Was it smelly? What did you see?



Have students watch the following videos:

1. The Rubbish Process (2 minutes 35 seconds):
<https://youtu.be/NH9xIWNZEyk>
2. The Role of Landfill (1 minute 20 seconds):
<https://youtu.be/zuXCCKgOAmw>

Early Stage 1 and Stage 1 Students may also enjoy:

1. Garbage Truck Safety and Landfills (8 minutes 33 seconds):
<https://youtu.be/vlzOKSbcmaU>



ACTIVITY 2

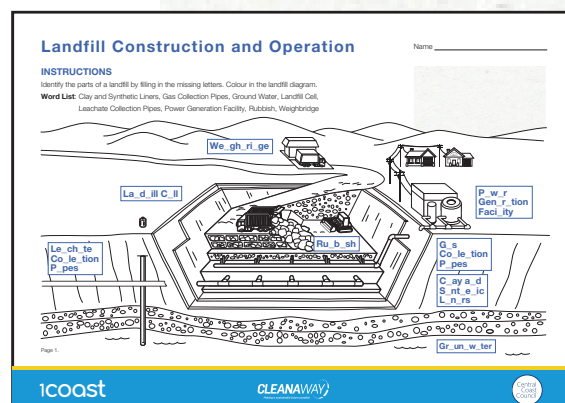
LANDFILL CONSTRUCTION AND OPERATION WORKSHEET

A modern waste disposal facility is highly engineered and constantly monitored throughout its operative life and for many years following closure. The location, construction, operation and closure of a landfill are carefully managed processes involving Local and State Government Departments, Geologists and Hydrologists.

Ask your students to consider:

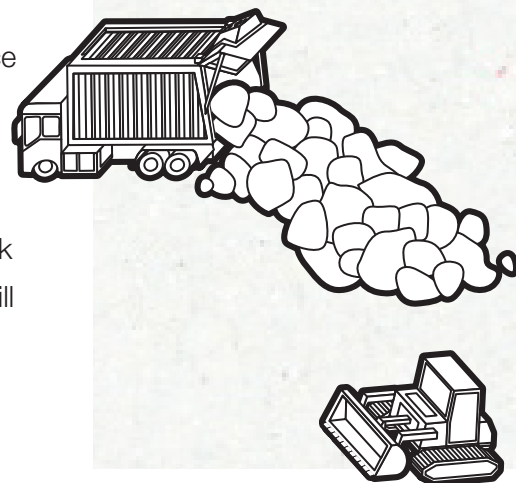
- What impacts a landfill could have on the local environment? (Consider smell, sound, location, emissions, ground water, litter, fauna).

Discuss the information below with your students on landfill construction and operation and then have them label and fill out the accompanying worksheet.



LANDFILL CONSTRUCTION

1. The first stage in landfill construction is to excavate an area or landfill cell. The excavated material is stored for use as cover once land filling is started.
2. The next step is to design and construct a liner system for each landfill cell to prevent leachate from entering the groundwater or natural drainage systems. Many older landfills have a 1metre thick clay liner only. With technology developments, many newer landfill cells use several layers to protect the groundwater from landfill leachate. Layers may include a synthetic clay liner; HDPE plastic; a filter protection layer; a drainage layer and a protection layer.



- ## LANDFILL OPERATION

- ## CLOSURE

Once a landfill reaches the end of its life, in other words no more space is available to deposit waste materials, it is closed and capped with a layer of compacted clay. Top-soil is added and the area is planted with grass or other cover material to stabilize the site and improve its appearance. Ongoing leachate, gas and stormwater monitoring is conducted for many years after closure. Once deemed safe, closed landfills are frequently used as active recreational areas such as playing fields after post-closure monitoring and maintenance are completed. On the Central Coast there are many playing fields that were once landfills including Hylton Moore Park, Adcock Park, James Browne Oval and Pat Morley Oval.

ACTIVITY 3 EDIBLE LANDFILL

Construct your own landfill out of delicious food, putting all the layers in place. You could make 1 large landfill together or set up students in groups to make individual landfills.

MATERIALS

- Glass jar, cup, or bowl (or clear plastic), to create landfill in. It needs to be clear so students can see the various layers.
- Crushable biscuits, blue jelly, custard, fruit roll ups, rice bubbles, choc fingers, mini marshmallows, mini m&ms, whit choc chips, dark choc chops, green hundreds & thousands, chocolate or caramel syrup.
- Spoons to eat the landfill with!

METHOD

- 1st layer – Blue Jelly to represent ground water
- 2nd layer – Crushed biscuit to represent the ground soil layer
- 3rd layer – custard to represent clay liner
- 4th layer – fruit roll up to represent the synthetic liner
- 5th layer – add rice bubbles to represent drainage if we do
- Insert choc fingers to represent leachate and also gas collection
- Mix together mini marshmallows, mini m&ms, white and dark choc chips to represent different rubbish items and add half to landfill.
- Top with crushed biscuit to represent soil covering.
- Add remaining layer of 'rubbish';
- Top with more crushed biscuit for final soil layer.
- Cap your filled landfill with a layer of custard to represent clay.
- Add some grass aka Green Sprinkles or coconut to represent grass.
- Now pour some syrup on top to represent leachate and let it sit for 10 minutes.

Ask your students:

Did you construct your landfill properly? Did the leachate (syrup) stay out of your ground water (jelly)?

Reiterate the importance of carefully designed, constructed and managed landfills when it comes to protecting our environment. Have students eat their landfill.

Page 6.

Edible Landfill Recipe

MATERIALS NEEDED

- Glass jar, cup or bowl (or clear plastic) to create landfill in (must be see-through).
- Teaspoon.
- Tablespoon.
- Plastic bag.
- Bowl for mixing.

INGREDIENTS

- 2 tablespoons blue jelly
- 3 biscuits (oreos, arrowroots, choc chip – anything you can crush up)
- 4 tablespoons custard (chocolate or vanilla)
- 1 fruit roll up
- 2 tablespoons rice bubbles
- 2 chocolate fingers (if kids could be used)
- 1 tablespoon mini marshmallows
- 1 teaspoon mini M&Ms
- 1 teaspoon white chocolate chips
- 1 teaspoon chocolate chips
- 1 tablespoon of green coconut (use green food colouring) or green sprinkles
- 2 tablespoons of chocolate or caramel syrup

METHOD

1. Place 2 tablespoons of blue jelly in the bottom of your cup. This 1st layer represents "Groundwater".
2. Place 1 biscuit in the plastic bag and gently crush it by squashing it down with your spoon. Place your crumbled biscuit on top of the jelly. This 2nd layer represents the ground/soil layer.
3. Place 2 tablespoons of custard on top of the biscuit. This 3rd layer represents the clay liner used to protect the soil and groundwater from the landfill.
4. Place the fruit roll up on top of the custard. Make sure you completely cover the custard as the 4th layer represents your synthetic liner, also used to protect the soil and ground water from the landfill.
5. Add 2 tablespoons of rice bubbles. This 5th layer is to represent drainage.

Page 2

1coast CLEANAWAY central coast council

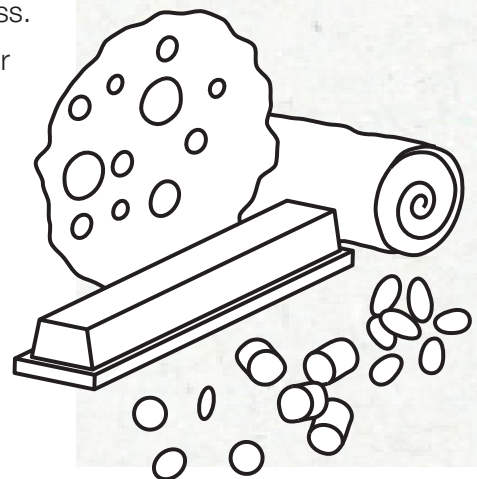
Edible Landfill Recipe

METHOD CONTINUED

6. Place the following in your mixing bowl and stir with a spoon to mix them together:
 - 1 tablespoon mini marshmallows
 - 1 teaspoon mini M&Ms
 - 1 teaspoon white chocolate chips
 - 1 teaspoon chocolate chips
 These represent the different garbage you might throw in your red lid bin and which will be sent to the landfill for disposal. Add approximately half of this mixture to your landfill. This 6th layer is a rubbish layer.
7. Place 1 biscuit in the plastic bag and gently crush it by squashing it down with your spoon. Place your crumbled biscuit on top of the rubbish layer. This 7th layer represents soil used to cover the rubbish.
8. Put the remaining mixed mini marshmallows, mini M&Ms and chocolate chips as your 8th layer – more rubbish.
9. Place 1 biscuit in the plastic bag and gently crush it by squashing it down with your spoon. Place your crumbled biscuit on top of the rubbish. This 9th layer represents soil used to cover the rubbish.
10. Place 2 tablespoons of custard on top. This 10th layer represents the clay liner to cap your filled landfill.
11. Place chocolate fingers or kit kats into the custard sticking out to represent the leachate and gas collection pipes.
12. Sprinkle your tablespoon of green coconut or sprinkles to represent grass growing on top of your filled landfill.
13. Finally pour your syrup on top of the landfill and let it sit for 10 minutes. The syrup is going to represent the leachate. If you built your landfill correctly your leachate should not reach our first 2 layers – the ground soil and groundwater!

Page 3

1coast CLEANAWAY central coast council



ACTIVITY 4

REDUCE OUR LANDFILL WORKSHEET

Discuss with students the types of waste we dispose of in our red lid bins and that this waste is disposed of to landfill. Talk about how we 'throw-away' this waste – but do we ever really think about where 'away' is? Once the item is in the red lid bin – it will be buried in landfill and stay there forever.

Review the following information with students on the types and quantities of waste disposed of in red bins on the Central Coast and how we can reduce this and then have them label and fill out the accompanying worksheet.

WHAT CAN BE DISPOSED OF IN THE RED LID GENERAL WASTE BIN?

The red bin is for general waste that cannot be recycled or placed in the garden bin.

Ask students what they throw away in the red lid bin.

Encourage the following replies:

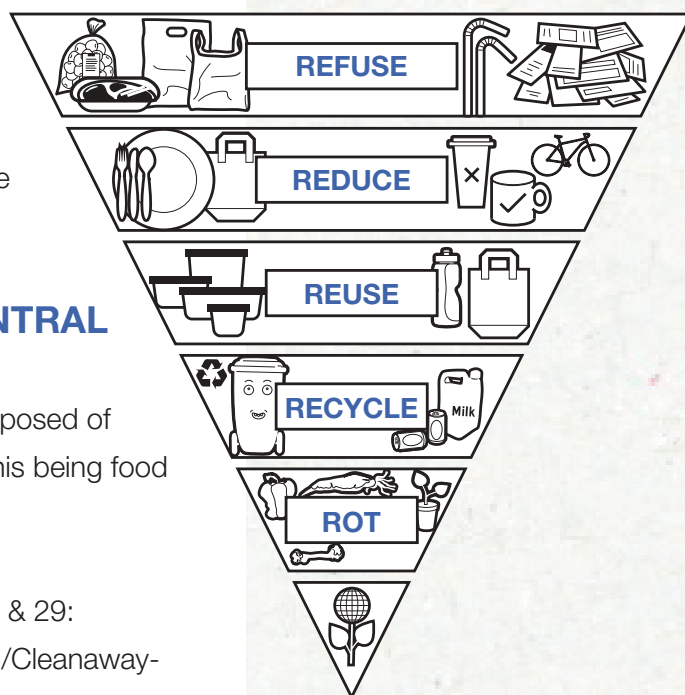
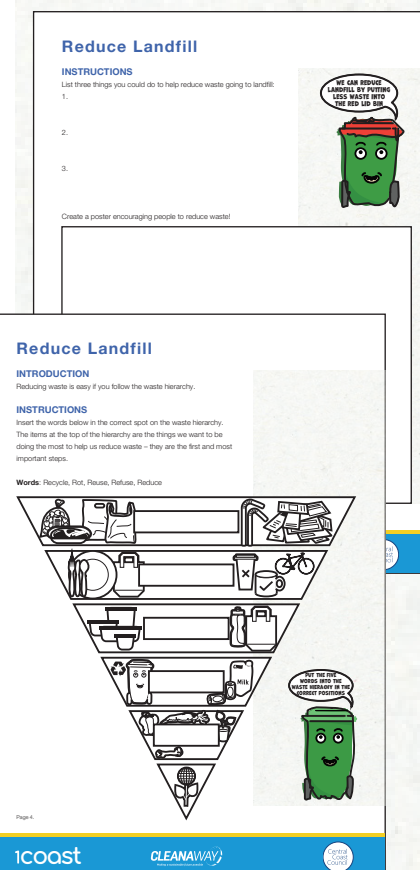
- food scraps and leftovers
- plastic bags & wrappers,
- dirty or used waste – such as disposable nappies, tissues, paper towel, kitty litter and pet waste,
- Other garbage that cannot be recycled such as polystyrene foam, shredded paper, disposable coffee cups, meat trays, old clothes, old toys, etc.

HOW MUCH IS DISPOSED ON THE CENTRAL COAST?

Approximately 80,000 tonnes of household waste is disposed of each year through the red lid bin, with around 30% of this being food waste alone!

How can we reduce waste in our red lid bin?

- Discuss the waste hierarchy (copy info from page 28 & 29:
<https://1coast.com.au/wp-content/uploads/2020/11/Cleanaway-High-School-Booklet-2020-FINAL.pdf>)



ACTIVITY 5

QUALIFIED GARBOLOGIST

1Coast, Cleanaway and Central Coast Council have teamed up to create a fun, educational quiz on rubbish and recycling. Students can take the interactive quiz and become Qualified Garbologists.

What's involved? They will need a computer, tablet or smart phone to access the platform and will be asked to enter a name, select a grade and type in the name of the school.

They will move through a series of interactive activities and videos to learn all about the Central Coasts' waste and recycling services - from what can go in the Yellow Lid Bin, to what happens to the grass you put in the Green Lid Bin and why it's important to reduce waste in the Red Lid Bin.

To access the quiz, visit: <https://learn.1coast.com.au/> and select the K-6 quiz for Primary School students or the 7-12 quiz for High School students.

BEFORE WE START...

What's your first name?

What year are you in?

KINDERGARTEN YEAR 1 YEAR 2 YEAR 3
YEAR 4 YEAR 5 YEAR 6 OTHER

Where do you go to school?

