



# Soil Savers

Classroom activity workbook

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## Introduction

Welcome to the ICE Soil Savers classroom activity.

It uses the story of Crossrail to showcase engineering ingenuity and to show how civil engineering can have a positive effect on the environment – in this case by using the spoil from tunnelling to create a new natural habitat on Wallasea Island.

The hands-on part of the activity asks the students to work in small groups to design and make model boats out of tinfoil sheets and to load test them with marbles (representing soil).

The students get the chance to find out about civil engineering from an opening presentation and to reflect on what they have learnt from a class discussion after completing the hands-on activity.



## Planning and preparation

The following summary is designed to help you plan and prepare for the activity. Please discuss your requirements in advance with the teacher or youth group leader to make sure everything ready on the day.

<b>Type of activity</b>	Interactive classroom activity
<b>Aim</b>	An understanding of civil engineering, its benefit to society and how to become a civil engineer
<b>Age range</b>	11-14 years
<b>Duration</b>	45 minutes
<b>Number of participants</b>	Whole class (30-40 students)
<b>Space required</b>	Classroom
<b>Resources to be provided by STEM ambassador</b>  	<ul style="list-style-type: none"> <li>▪ Soil Savers PowerPoint presentation</li> <li>▪ Printed copies of the ICE careers leaflet 'The everything you need to know guide to civil engineering'</li> </ul> <p>Activity materials:</p> <ul style="list-style-type: none"> <li>▪ 1x roll of tinfoil and scissors: cut tinfoil into sheets before the session 20cm x 15cm in size, 2 sheets per group plus some spares</li> <li>▪ 50x marbles all the same size/weight per group of 4-5 students. Could also use decorative glass pebbles, copper coins etc instead</li> <li>▪ Plastic basin(s) at least 20cm deep and 30cm wide and filled <math>\frac{3}{4}</math> with water</li> <li>▪ Kitchen roll to clear up any spillages</li> </ul> <p>Estimated cost of materials £25</p>
<b>Resources to be provided by school</b>	<ul style="list-style-type: none"> <li>▪ Projector with screen connected to laptop with internet and speakers</li> <li>▪ Access to water supply</li> </ul>
<b>Risk assessment</b>	See Annex A. Note specific risks around the use of water (e.g. slip hazards) and marbles (choking and projectile hazards).
<b>Civil engineering types featured</b>	Transport, tunneling, environmental engineering.

## Running the activity

The activity is designed to be completed in a single classroom session. It is structured into the following stages:

1. Preparation
2. An opening presentation
3. A hands-on team activity
4. A discussion period
5. Time to clean-up before the next class

### Preparation

- Before you deliver the session take time to run through the power point and the attached notes to each slide, these notes are in bullet point format and designed to be brief to give you a general sense of the talking points of each slide without confining you to a set script. The notes contain links to background reading on the slide content and this guide provides you with a timing breakdown to help you with time management.
- Make sure the PowerPoint presentation is loaded and ready to run. It is a good idea to check the video link before starting, if you have internet access, so you know if you can use it or not in the lesson
- Fill the testing basins with water and have them ready on the desks for the start of the lesson.
- Have the other activity materials organised so they are ready to hand out.
- Make sure you have pens at the ready to write up the scoreboard

If you have any questions about the session, please contact Stuart Rogers at [stuart.rogers@ice.org.uk](mailto:stuart.rogers@ice.org.uk) or [careers@ice.org.uk](mailto:careers@ice.org.uk)

### Opening presentation (10 minutes)

1. Introduce yourself and say who you are
2. Use the presentation to give an introduction to civil engineering and to set the scene for the activity to follow. The PowerPoint notes can be used as a prompt for each slide. The Crossrail media clip requires internet access
3. Start the hands-on activity when you reach the 'Your task' slide

### Hands-on activity (25 mins)



1. Explain that you are about to give instructions for the hands-on part of the session and you expect everyone to use the equipment in a responsible manner
2. Ask the teacher to split class room into numbered groups of 4-5 students. Write up a basic scoreboard on blackboard / whiteboard / smartboard so you can record the number of marbles supported by each group's boat
3. Brief class on the challenge, inform them that they will be given two sheets of tinfoil (one for practice) and they have a testing basin filled with water. Explain that they have 15 mins to design, plan and complete the construction of their boat
4. Hand out the materials so they can start
5. Monitor the design and planning of boats, informally ask the students to explain their design considerations, let them know when they have 10, 5 and 1 minutes left before the testing phase
6. At the start of the testing phase, instruct one person from each group (all groups load marbles simultaneously) to start loading marbles into the boat one at a time and record progress on scoreboard – test each boat until it sinks and announce a winner

### Discussion period (5 mins)

Discuss with the groups what they thought of their design and what they would do differently next time. You can use the remaining slides in the PowerPoint presentation to illustrate how barges are designed.

If time allows, you can prompt questions and discussion about on how the spoil can be re-used. The PowerPoint presentation includes slides on Wallasea Island.

### Conclusion and tidy-up (5 mins)

Thank them for listening and for their questions. Ask them to tidy-up their desks and reset the room for the next class. Ask the teacher for feedback.

## After the event

We would appreciate your help with two things after running the activity.

### 1. Information for students and teachers

Please do direct students and teachers to the following resources if they want to explore the issues for themselves.

#### **The project:**

- Crossrail: <http://www.crossrail.co.uk/>
- Wallasea Island: [www.rspb.org.uk/reserves-and-events/find-a-reserve/reserves-a-z/reserves-by-name/w/](http://www.rspb.org.uk/reserves-and-events/find-a-reserve/reserves-a-z/reserves-by-name/w/)

#### **Engineering careers:**

- Tomorrow's Engineers <http://www.tomorrowengineers.org.uk/>
- ICE <https://www.ice.org.uk/what-is-civil-engineering>

## 2. Feedback for ICE

Please go to [surveymonkey.co.uk/r/ICEambassador](https://surveymonkey.co.uk/r/ICEambassador) to let us know how you got on. As well as hearing about the activity, we'd very much like to know about the school and the number and type of students who took part. Please feel to note down that information against the prompts below if that helps.

### **Date**

**The name of school** (or STEM event)

**Postcode** (or town/area if not known)

The **year group(s)** that took part

**Number of students** who took part

An estimate of the number of **girls**

An estimate of the number of **black or minority ethnic** (BME) students

The information and feedback helps us improve what we do and we can then include your activity on the Tomorrow's Engineers schools database. It is how we track which schools have been engaged by different engineering organisations and how many STEM activities have been delivered by ICE members. **Thank you!**

## Contact us

If you have any questions please contact:

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## ANNEX A: Risk assessment

### RISK ASSESSMENT FRAMEWORK

Hazards Identified, Control Measures in Place & Risk Evaluation

<i>RISK EVALUATION KEY</i>	<b>SEVERITY:</b>	5 Fatal	4 Major Harm	3 Moderate Harm	2 Minor Harm	1 Delay Only
	<b>LIKELIHOOD:</b>	5 Very likely	4 Likely	3 Possible	2 Unlikely, but conceivable	1 Highly Unlikely
	<b>RISK RATING:</b>	20 – 25 Intolerable	15 – 19 High	10 – 14 Medium	7 – 9 Low	1 – 6 Trivial

### RISKS FOR THIS ACTIVITY

Hazards	Description of the Hazard & Possible Events Leading to Harm	Existing Control Measures / Information, Instruction & Training	Additional Risk Factors which may further increase the likelihood &/or severity of harm	Risk Evaluation			Recommendations
				S	L	R	
Water spillages	Water makes floor slippery and leading to injuries from falls	Monitor closely and make sure class is aware of any spillages and clean up immediately		3	3	9	Note equipment lists recommends that paper towels are available in case of spillages
Choke hazards	Students swallow marbles	Teacher manages class behavior and clear instructions given at start		4	3	12	Zero tolerance for misuse of equipment.

		of activity					
Projectiles	Students throw marbles	Teacher manages class behavior and clear instructions given at start of activity		4	3	12	Zero tolerance for misuse of equipment.
People hazards – Safeguarding	A student may disclose information that suggests they are at risk.	The volunteer must state that they cannot keep the information to themselves; report to the person in the institution responsible for child-protection/safeguarding		2	1	3	