

TUNNELWORKS

POST-16 CREST GOLD AWARD

PROJECT MATERIALS

How has science helped plan the Thames Tideway Tunnel?
CREST Science Communication Gold Award Project
Introduction and Guidance for Teachers

Tunnelworks includes an idea for a student science communication project that can lead to a CREST Gold Award.

About the Thames Tideway Tunnel

The Thames Tideway Tunnel is a major new sewer that will help tackle the problem of sewage overflows from London's sewers and will protect the River Thames from increasing pollution for at least the next 100 years, enabling the UK to meet European Union environmental standards. The Tunnel will control the 34 most polluting combined sewer overflows (CSOs), as identified by the Environment Agency, which currently discharge untreated sewage directly into the River Thames after it rains.

The majority of London's sewers collect both sewage and rainwater and after heavy rainfall the volume flowing through the sewers is a lot higher than the system can take. The original Victorian system is designed to discharge this excess sewage directly into the River Thames through a series of combined sewer overflows (CSOs). The new Thames Tideway Tunnel will control the most polluting CSOs by capturing combined rainwater and sewage and allowing it to flow down a new tunnel before being pumped out for treatment at Beckton Sewage Treatment Works.

Find out more about the Thames Tideway Tunnel here: <http://www.thamestidewaytunnel.co.uk/>

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What is CREST?

CREST is a project-based awards scheme for the STEM subjects (Science, Technology, Engineering and Maths), managed by the British Science Association. It links the personal passions of students aged 11-19 to curriculum-based learning.

UCAS endorse CREST Awards for inclusion in students' personal statements – they're well regarded, high quality and a tangible recognition of success.

Find out more at: <http://www.britishteamscienceassociation.org/crest>

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What can my students do?

Post-16 students can complete a science communication project to gain a Gold Award. Gold Awards allow the most able students to conduct some real research and will require around 70 hours work. Some students may prefer to complete a Tunnelworks CREST Silver award project as an alternative.

What is the challenge?

For their Gold Award students should:

- Research the science that helps us understand why the number of discharges into the River Thames is increasing and the effect these have on river wildlife.
 - Find out about what people think about the River Thames, their understanding of the key contexts your research identifies, and the themes and issues you would like to communicate.
 - Identify an audience and design a communications activity to explain the science behind the Thames Tideway Tunnel and the health of the river and encourage personal actions that will also help ensure the health of the Thames.
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How do I get started?

Awards are organised and administered through a network of Local Coordinators. You can find your Local Coordinator by visiting the contacts page on the CREST website, above. They'll help you register and provide expert guidance throughout the scheme.

How should students tackle a project once I've registered them?

Use the Thames Tideway Tunnel web link above to make sure that students are aware of the background to their project.

Students can work alone or in a team of 2-4 students to complete their project. Students can share the work in their teams and split into pairs or individuals to complete parts of it, coming together to share and combine their work. **However, every student needs to complete the minimum time and meet the requirements of the award.**

Your Local Coordinator will guide you through the process and will show you what's expected of each student, including the minimum time they should spend working on their project, how they should plan and document their work and the award requirements at Gold level.

Key points to remember:

Commitment:

- Takes 70+ hours project time per student
- Can be completed as individual or team project (assessment is based on individual achievement)

Project Approval:

- Must be by CREST Local Coordinator following submission of outline proposal by student

Registration:

- Via CREST Local Coordinator after discussion with mentor
- The registration fee is currently £20 per student

Recording:

- Gold CREST profile form and report/portfolio completed

Mentor:

- Students should normally have a mentor from higher education or industry
- May be chosen by student but must be approved by CREST Local Coordinator

Reviewing:

- Projects should be reviewed by the teacher in conjunction with the mentor, at appropriate times during the project
- Final evaluation by second industrial or educational evaluator selected by CREST Local Coordinator and in conjunction with mentor

How are projects assessed?

To gain their CREST awards students must spend a sufficient amount of time on their project and produce original work at an appropriate intellectual level. The requirements at Gold level are laid out clearly in this PDF on page 6, and this also provides an assessment grid to help teachers supervising students at Gold level.

Gold awards are assessed externally by a second educational or industrial evaluator, in addition to reviews by the teacher and mentor. Your CREST Local Coordinator will be happy to advise you on Gold assessment, especially if you are new to the scheme. Please note: A CREST assessor may decide to issue a Silver Award or suggest further work if the Gold Award criteria are not met.

What resources will students need?

These will depend on what activities students choose to include in their project and at Gold level students should be largely self-directed in planning and sourcing suitable resources. They might include:

- Internet and public library access for research
 - Publishing and other software to produce written work, images, web content, podcasts and other digital or printed content
 - Video cameras and audio recording equipment, and facilities to edit content
 - Materials, tools and workshop space to produce exhibits, interactive displays or other practical material
 - A suitable venue to host a public display, debate, presentation or guided discussion.
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How should I support students?

At Gold level students should take the lead and be largely self-sufficient in their work. Your CREST Local Coordinator can help you identify the best ways to support your students. This may include:

- Working alongside their mentor to set deadlines or milestones and be a focus for their planning, coordination and progress reporting.
- Providing informal feedback at each stage and on their communications materials during development.

Students will require a mentor. If you live in Southwark, Wandsworth, Hammersmith and Fulham, Newham or Greenwich, you may be able to access a Thames Tideway Tunnel STEM ambassador who can help. Contact education@tidewaytunnels.co.uk.

How has science helped plan the Thames Tideway Tunnel?

CREST Science Communication Gold Award Project Student Brief

What's the background?

Increasingly, when it rains in London there is not enough capacity in London's Victorian sewerage system to convey all the rainwater as well, as foul water, from homes and businesses. The system was designed to overflow into the River Thames so that peoples' homes and streets are not flooded with untreated sewage when the system is full. This means that in an average year 39 million tonnes of untreated sewage, combined with rain water, overflows into the River Thames each year.

The Thames Tideway Tunnel is a major new sewer that, in conjunction with the Lee Tunnel and upgrade of sewage treatment works along the Tidal Thames, will help to tackle this problem. These will help protect the River Thames from increasing pollution for at least the next 100 years and enable the UK to meet European environmental standards. The Thames Tideway Tunnel project will address the sewage overflows from these combined sewer overflows (CSOs), either by intercepting the flows and diverting them to the Tunnel, or by making other alterations to the sewerage system which will make more effective use of the existing capacity. The flows diverted into the Tunnel will be stored and pumped out for treatment at Beckton Sewage Treatment Works.

But what factors mean that we now need a solution like the Thames Tideway Tunnel? How has science helped us to understand these changes and the effect that sewage discharge is having on public and environmental health, on the dissolved oxygen levels in the Thames and the effect on river wildlife? And how can personal actions help preserve the health of the River Thames?

Your science communication challenge

- Research the science that helps us understand why the number of sewage discharges into the River Thames is increasing and the effect these have on river wildlife and the environment.
- Find out about what people think about the River Thames and their understanding of the key scientific contexts your research identifies.
- Identify an audience and design a communications activity to explain the science behind the Thames Tideway Tunnel and the health of the river and encourage personal actions that will also help ensure the health of the Thames.

Some things to think about...

- What are the key contexts that influence why and when overflow water discharges into the Thames?
- How are these contexts changing and what evidence tells us this?
- What roles are people playing?
- What shapes peoples' behaviour and how could a communications activity influence this?
- What ideas do you want to communicate?

What you need to do

This is just an outline. Your teacher and CREST Local Co-ordinator will explain exactly what you need to do to complete your project and meet the requirements of the CREST Award at Gold level.

Each individual will need to spend about 70 hours on this project.

1: Research	<ul style="list-style-type: none"> • Research the science that explains the key contexts and drivers behind the need for a new Thames Tideway Tunnel, and the evidence that one is required. • Research awareness, understanding and emotional response to the River Thames and the Thames Tideway Tunnel. • Identify a key target audience for your science communications activity and the themes and issues you wish to tackle. 		
2: Plan	<p>Plan your science communications activity:</p> <ul style="list-style-type: none"> • Identify your audience and explain why you have chosen them • List your objectives (eg increase in awareness, changes in attitude or understanding etc.) • Describe what you will do and what will take place • Explain how you will evaluate your activity and its outcomes 		
3: Approval	<p>Submit your plan to your CREST Local Coordinator for approval before you begin.</p>		
4: Activity	<p>Your project should be a combination of activities that could include, for example:</p> <table style="width: 100%; border: none;"> <tr> <td style="vertical-align: top;"> <ul style="list-style-type: none"> • Text and imagery • Website • Video • Podcasting • Live event or presentation </td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> • Interactive display • Debate or guided discussion • Ways to gather feedback, appreciation, comments, media coverage and evaluation data. </td> </tr> </table>	<ul style="list-style-type: none"> • Text and imagery • Website • Video • Podcasting • Live event or presentation 	<ul style="list-style-type: none"> • Interactive display • Debate or guided discussion • Ways to gather feedback, appreciation, comments, media coverage and evaluation data.
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5: Outcomes	<p>Use your initial research and activity data to evaluate the outcomes of your project against your objectives and describe the changes in attitudes etc. that you achieve.</p>		
6: Reporting	<p>Follow the CREST guidance and write a report of your project for submission to your CREST assessor.</p>		