Leeds Flood Alleviation Scheme - Phase 2

Carbon savings and low carbon innovation

This second edition provides an overview of the carbon impact of the Leeds Flood Alleviation Scheme Phase 2 (LFAS2). It demonstrates the carbon savings of reducing flood risk and captures some of the innovative low carbon activities taking place through the scheme construction.

LFAS2 aims to reduce flood risk to communities and businesses along the River Aire corridor between Leeds Rail Station and Apperley Bridge. The scheme will provide a one-in-200-year level of protection against flooding in this area. Once delivered, the scheme will reduce flood risk and provide better protection for 1,048 homes and 474 businesses.

Big reduction in Zone 10 emissions



The concrete wall at Wellington Place was built using by-products from the steel industry

LFAS2 has been sub-divided into zones (see plan at the end of this update).

Our work in Zone 10 is now mostly complete, allowing us to assess the carbon emissions associated with material use and transporting those materials to site across the zone. Our baseline calculations expected these to contribute 269 tonnes of CO_2e to the total emissions of the scheme. Following changes to the materials we were using and by changing the scheme design to reuse existing sections of wall where possible, we've been able to reduce these emissions to 74 tonnes of CO_2e. This is a reduction of 69% from our baseline, exceeding our target of 20%. For this calculation, we excluded from the baseline some sections of a wall where there's been a scope change on the scheme (so that we have a fair comparison and aren't overestimating the reductions).

We reused the existing wall of a viaduct bridge and re-pointed other sections of wall in the area to reach the level of protection the scheme needs. By reusing the walls that are already in place we have been able to reduce the amount of material and transportation needed to complete the entire section.

The concrete used for the walls in Zone 10 has been made using a material called GGBS – Ground Granulated Blast-Furnace Slag. GGBS is a by-product from the furnaces used in iron and steel production. GGBS replaces half of the cement used in the concrete walls for Zone 10 without compromising on quality.



Local materials for flood storage area

The LFAS2 project team are conscious of the current climate emergency, and the need to act urgently to prevent and mitigate further environmental impact. We continually assess our working methods to ensure our work has minimal effect on the natural environment.



For example, in the construction of the earthworks for the embankment at the flood storage area near Calverley we are using clay from the field by the access track. This reduces the carbon impact of our scheme, as we would need around **5,000 wagon loads** to deliver the same material from elsewhere. As this clay is being acquired from an adjacent site, we are saving on transportation emissions and preventing congestion on local roads, reducing the negative environment impact associated with construction. At the end of this work the re-laid & seeded topsoil will return the field to agricultural use.

Recycled plastic piles lighten the load



The stretch of flood embankment (zone 12c) adjacent to Redcote Lane bridge has been built using piles made of plastic, instead of the traditional steel.

This has allowed a big saving in carbon emissions. A metre stretch of wall made with steel sheet piles normally means emissions of just over 11 tonnes of CO2e, but by using plastic sheet piles this is reduced to less than 3 tonnes per metre.

The sheet plastic material used for these piles is made from recycled plastics, which is responsible for most of the carbon saving. The manufactured piles are also lighter and easier to move around, which reduces the carbon used in transporting them both to and around the site.

Plastic is not suitable for all areas. Our ground investigations help with this decision making. The ground around Redcote Lane is made up of a lot of sandy gravels, which is ideal for the installation of plastic sheet piles. In other areas, where the ground contains more rock, steel is often the best option. We have sourced steel piles made from 100% scrap metal for when this is needed, which saves 414kg of CO2e for every tonne of metal we use.

3D printed concrete

We have installed 3D printed concrete planters at the Cardigan Fields Retail Park, close to the Buffalo Bill Bridge. The planters are much lighter because they were built using 3D printing. This means that the carbon emissions associated with material use and installation are 40% of what they would be with a traditional design. The planters also offer the only public seating in the area.



Concrete planters at Cardigan Fields

Tree planting at Cragside Recreation Ground, Hawksworth

Leeds FAS2 is required to plant three trees for each one that it is necessary to fell for our work. In the long term, together with our catchment-wide Natural Flood Management (NFM) works, this will contribute to reducing carbon in the atmosphere.

As part of the 3:1 re-planting we are aiming to plant trees nearby to the location that others were felled. At Cragside Recreation Ground in Hawksworth, Leeds we planted 34 specimen fruit trees, a mixture of apple, pear, plum and damson to create a community orchard this February. These trees were well received by the local community, and our student volunteers, pictured below, enjoyed this volunteering opportunity.



Volunteers from Forge Your Future with the LFAS2 project team

Big carbon savings by reducing flood risk

To re-cap on something we included in our first edition newsletter. Carbon emissions from construction projects come from a wide variety of sources, such as making and transporting materials, travel, machinery emissions, electricity used, or a host of other sources. But what would be the carbon impact of not constructing the scheme?

Last year the LFAS2 scheme worked with the University of Edinburgh to estimate the difference between the carbon footprint of FAS2 construction versus the recovery after a large flood event. FAS construction (including FAS1) was worked out as 45,130 tonnes of CO2e. The same study found that recovery from the floods of Boxing Day 2015 caused by Storm Eva, a 1-in-200 year event, caused 51,670 tonnes of CO2e in emissions in the same study area. This means that if LFAS2 prevents just one flood event of the same size it will mean a net saving of 6,540 tonnes of CO2e, the difference between those two figures. Depending on the magnitude, each further flood event prevented after that first one could save a further 51,670 tonnes of CO2e.

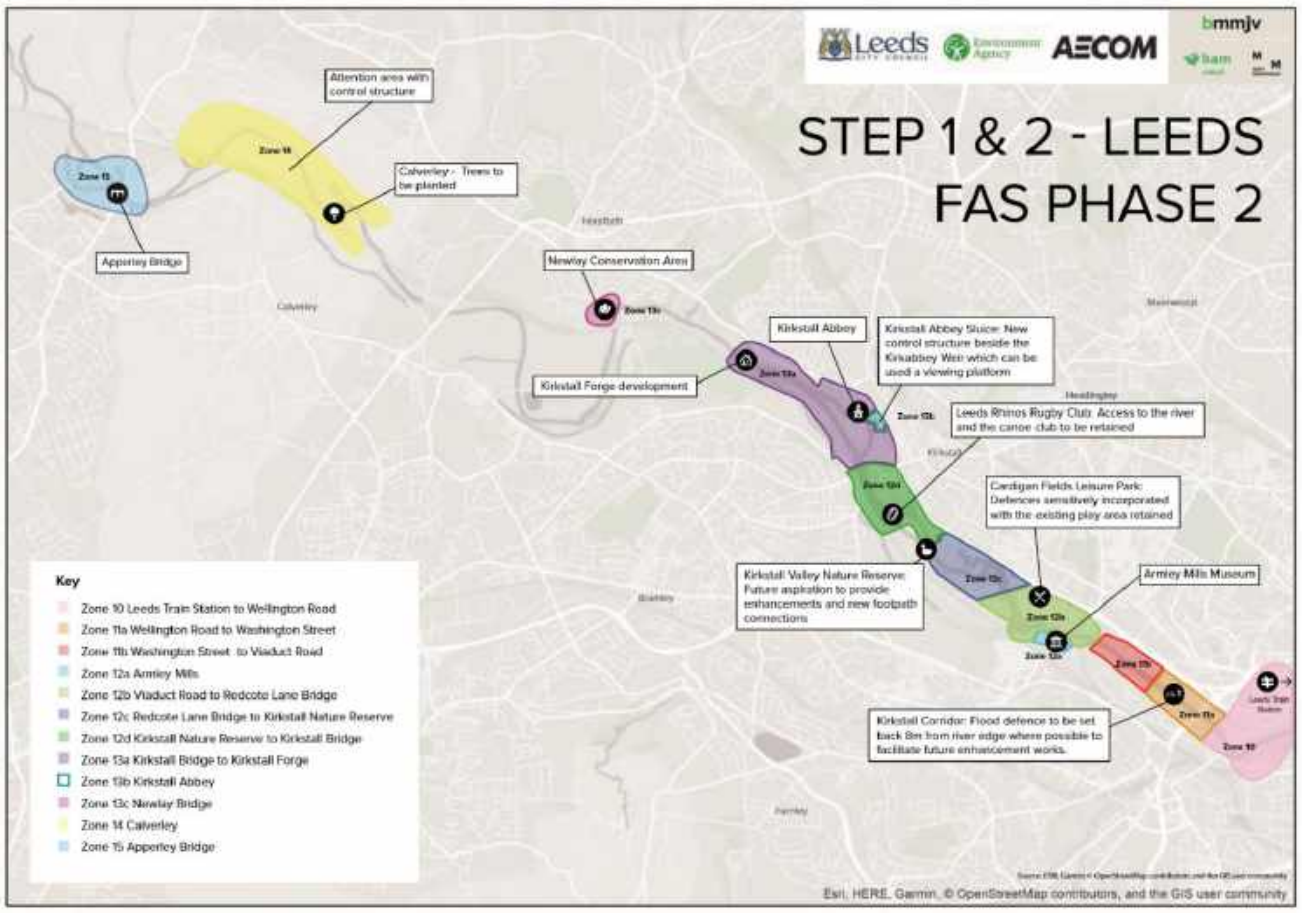
What is CO2e?

While Carbon Dioxide (CO2) is the best-known greenhouse gas, others – such as methane or nitrous oxide – contribute to global warming too. Some of these can contribute more than CO2, either because they absorb more heat or they last longer in the Earth's atmosphere.

Carbon Dioxide Equivalent (CO2e) is calculated by taking the Global Warming Potential of a gas (GWP), the multiple of the heat it absorbs compared to CO2 and multiplying it by the amount of the gas released into the atmosphere. This provides a scale for measuring the effects of different gases on the environment which can then be used across different teams of people and projects.

For example, the gas methane has a GWP of 27.9, as it warms the Earth 27.9 times as much as CO2, so one tonne of methane has a CO2e of 27.9 tonnes.

Step 1 and 2 zone plans



Keep in touch

You can sign up to the quarterly newsletter at LFAS@leeds.gov.uk and follow us on Twitter at @leedsfas. Further information about FAS2 can be found here on our website – https://leedscitycouncilfloodresilience.commonplace.is/en-GB/proposals/Leeds-FAS2-engineering-works-updates/step1