Lessons from pilot-scale sediment reuse projects on the Scottish canal network.

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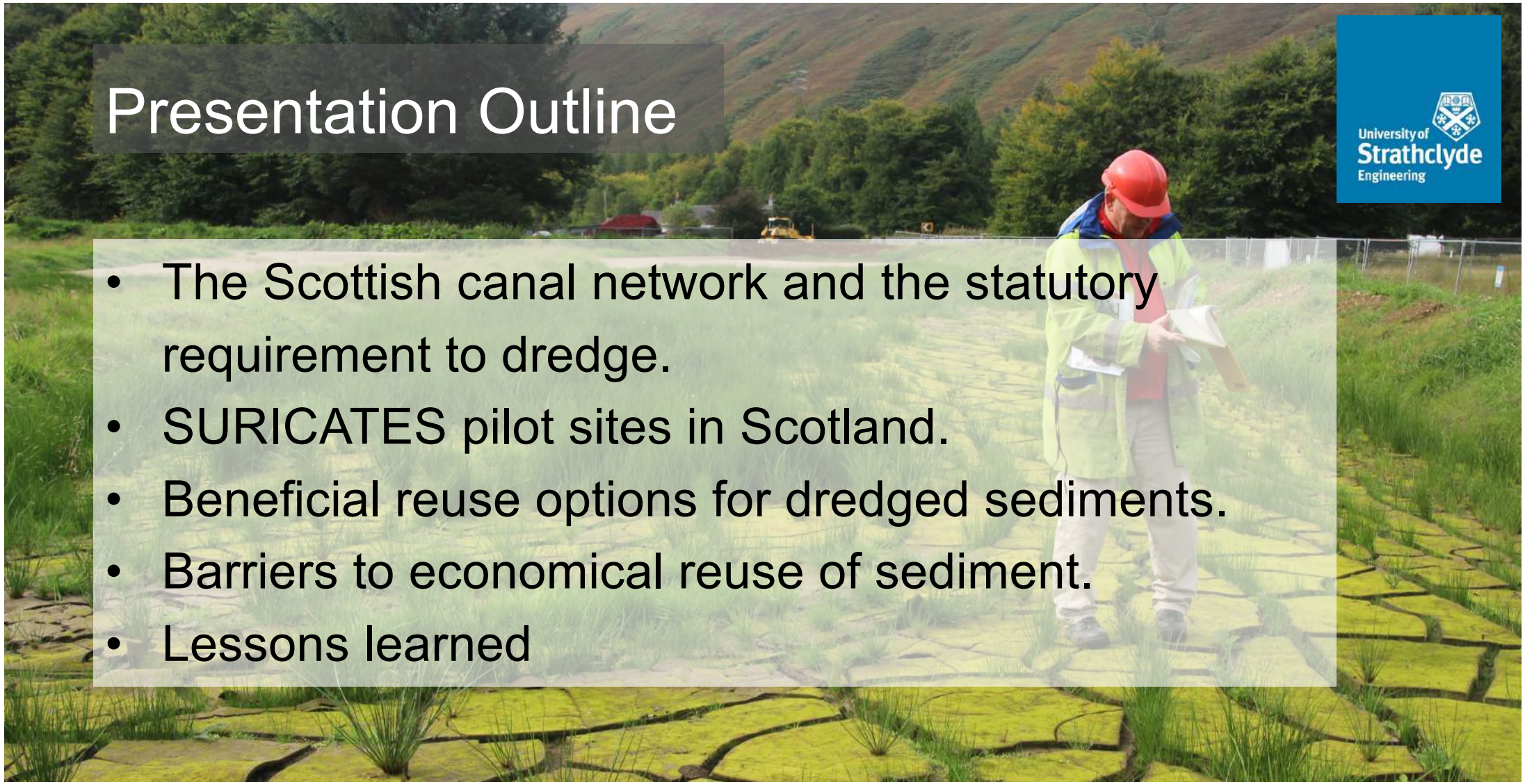
Interreg North-West Europe SURICATES

Scottish Canals

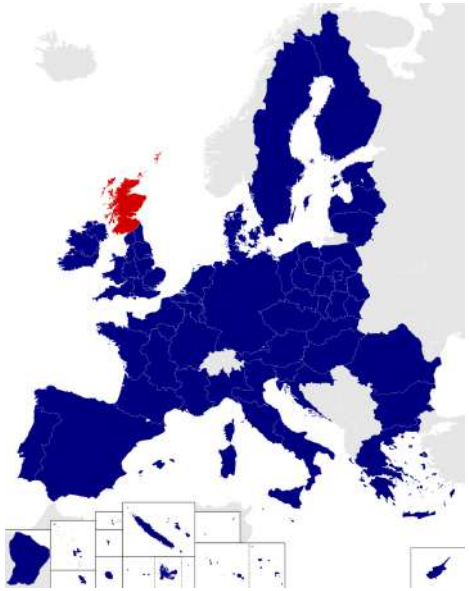


Presentation Outline

- The Scottish canal network and the statutory requirement to dredge.
- SURICATES pilot sites in Scotland.
- Beneficial reuse options for dredged sediments.
- Barriers to economical reuse of sediment.
- Lessons learned

Scottish Canal Network

- Built between 1768 and 1822
- 137 linear miles of navigable canals
- 90 locks
- Largely used for recreation



Scottish Canals

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SURICATES sites

- Falkirk South – Union Canal
- Laggan Spout – Caledonian Canal
- Bowling – Forth & Clyde Canal
- Stockingfield – Forth & Clyde Canal

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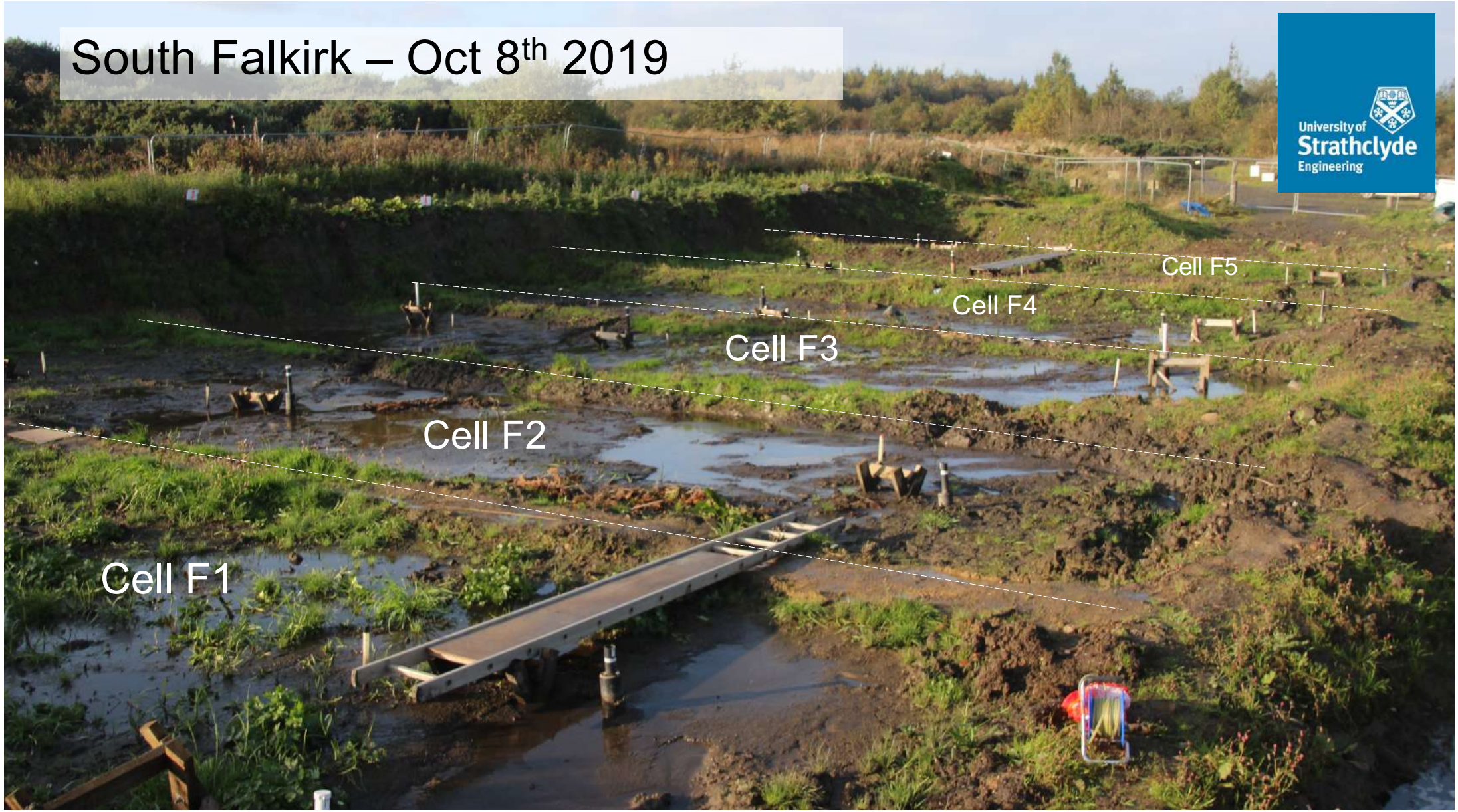
First steps – Falkirk South

- cell design trials;
- monitoring,
- logistics of sediment transport

Road transport of wet sediment


South Falkirk – Oct 8th 2019
University of Strathclyde Engineering
Cell F5
Cell F4
Cell F3
Cell F2
Cell F1

Validation of IXANE modular sediment dehydration unit

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SURICATES pilot sites – Stockingfield Junction

SURICATES pilot sites – Stockingfield Junction

- Junction of the Forth & Clyde Canal with the Glasgow Branch.
- Dredging is required as part of a new bridge construction and bank regeneration.
- Pilot for pozzolan addition to wet sediment to stabilise land behind pilings.
- Sediment trials will begin November 2020.
- Dredging is scheduled for March 2021.

Stockingfield Junction, Forth & Clyde Canal


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Bowling Basin, Forth & Clyde Canal


Earthworks to create basin


Basin lined with geofabric and wells installed


Partially filled with dredged sediment


Complete

Sediment placed into basin from Sept 2 – 19, 2020


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Laggan, Caledonian Canal


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Suction dredging by Royal Smals, with pipeline to cells

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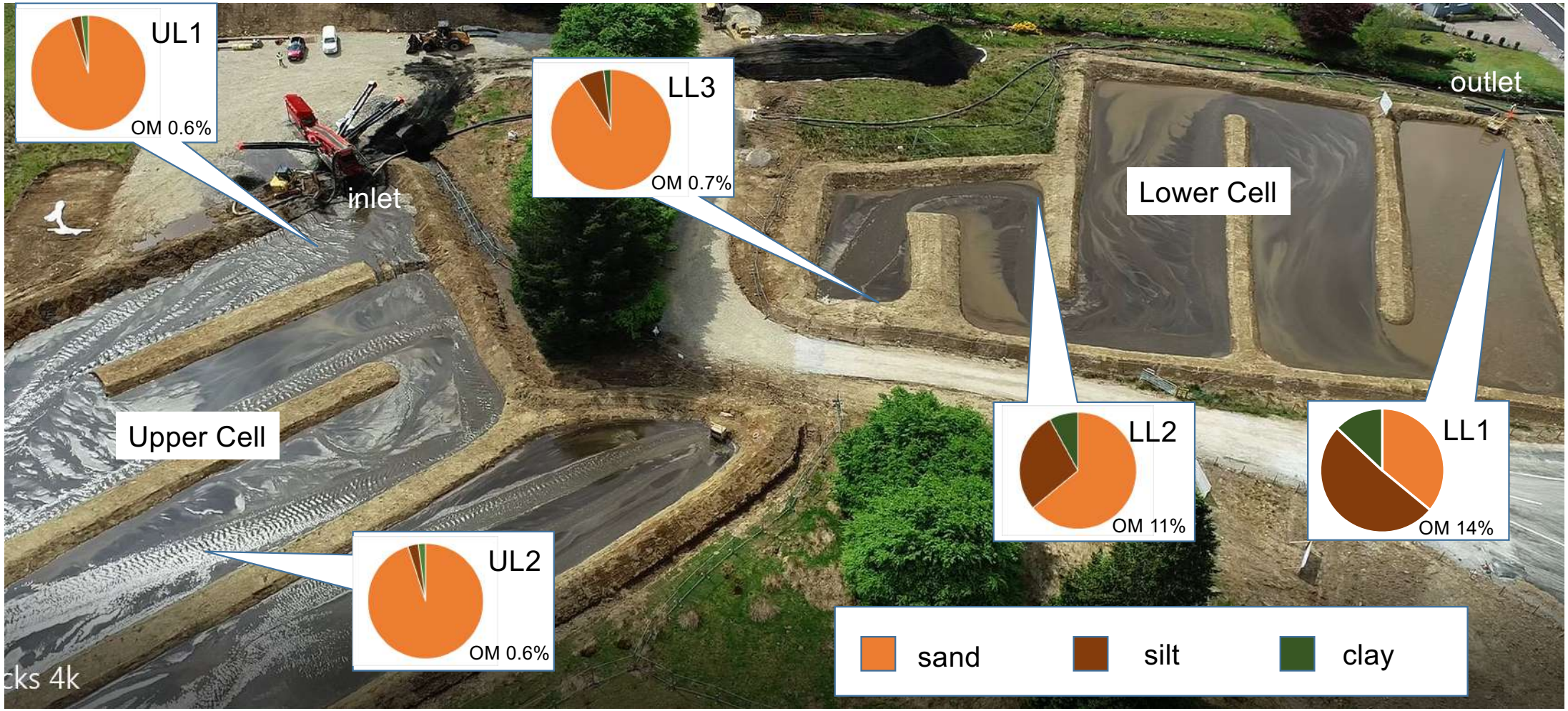
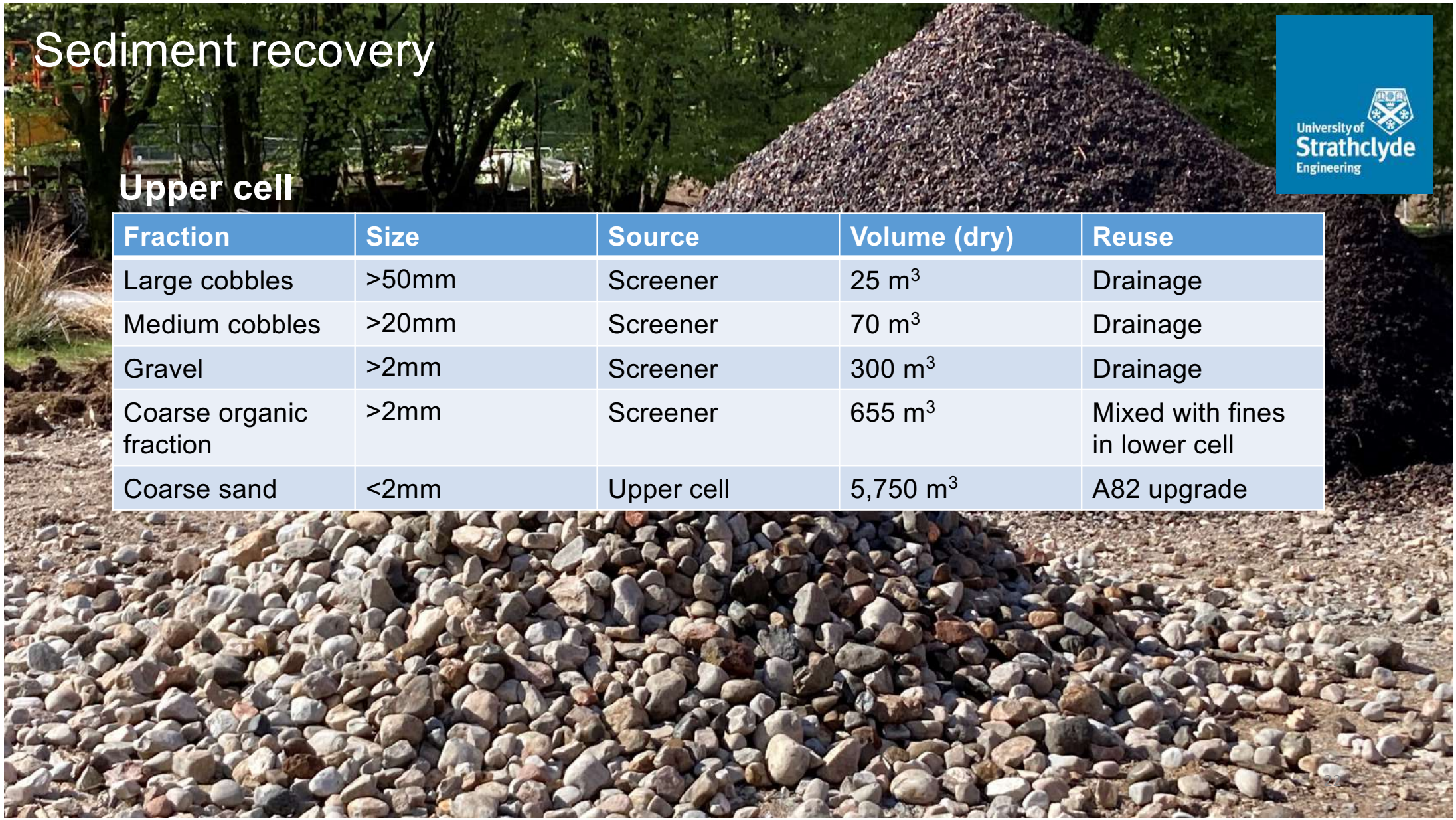
Laggan – Sediment Particle Size Distribution



Samples collected 7th June 2021

Sediment recovery



Upper cell

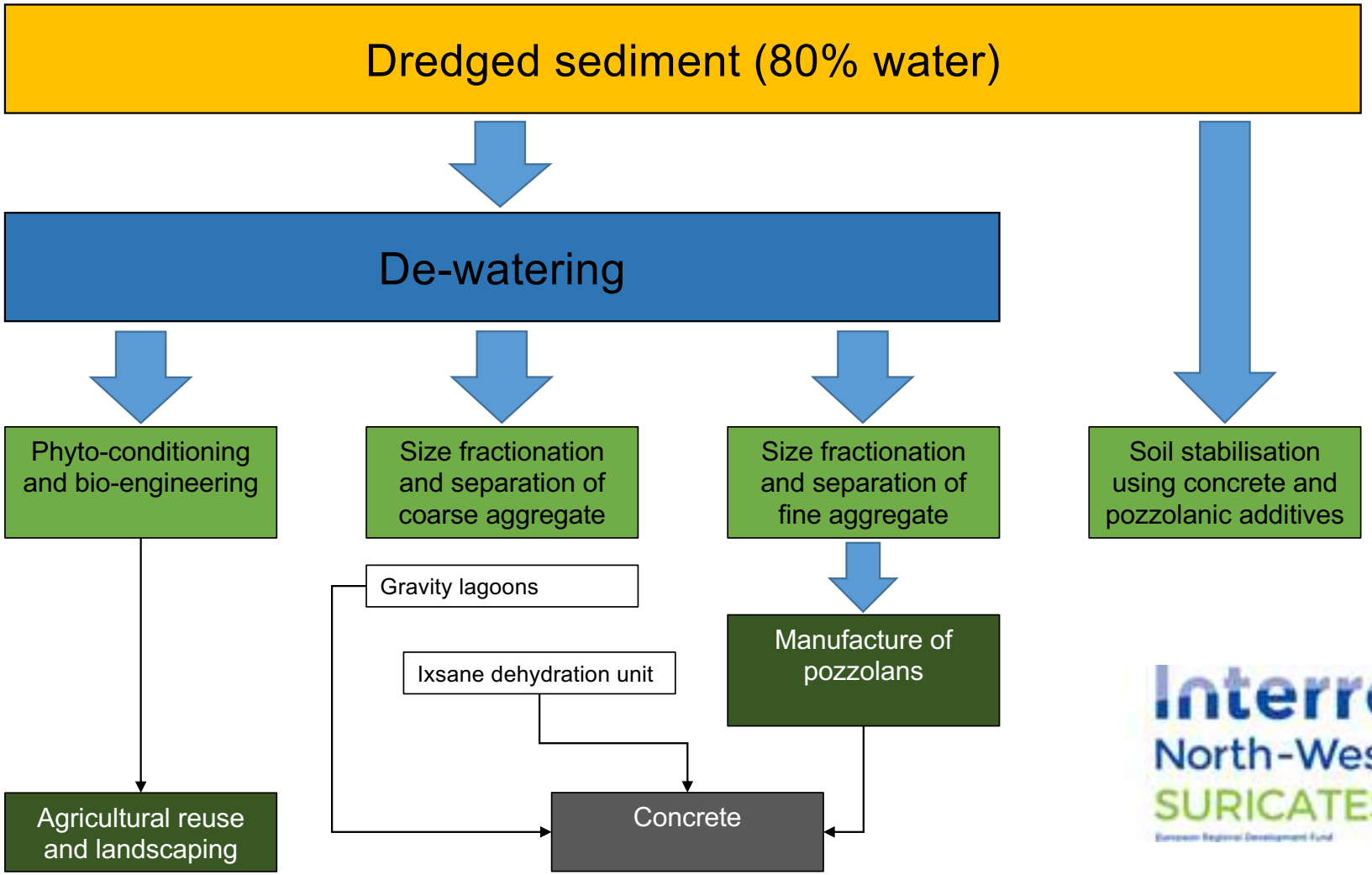
Fraction	Size	Source	Volume (dry)	Reuse
Large cobbles	>50mm	Screener	25 m^3	Drainage
Medium cobbles	>20mm	Screener	70 m^3	Drainage
Gravel	>2mm	Screener	300 m^3	Drainage
Coarse organic fraction	>2mm	Screener	655 m^3	Mixed with fines in lower cell
Coarse sand	<2mm	Upper cell	5,750 m^3	A82 upgrade

Concrete made from the dredged sediment

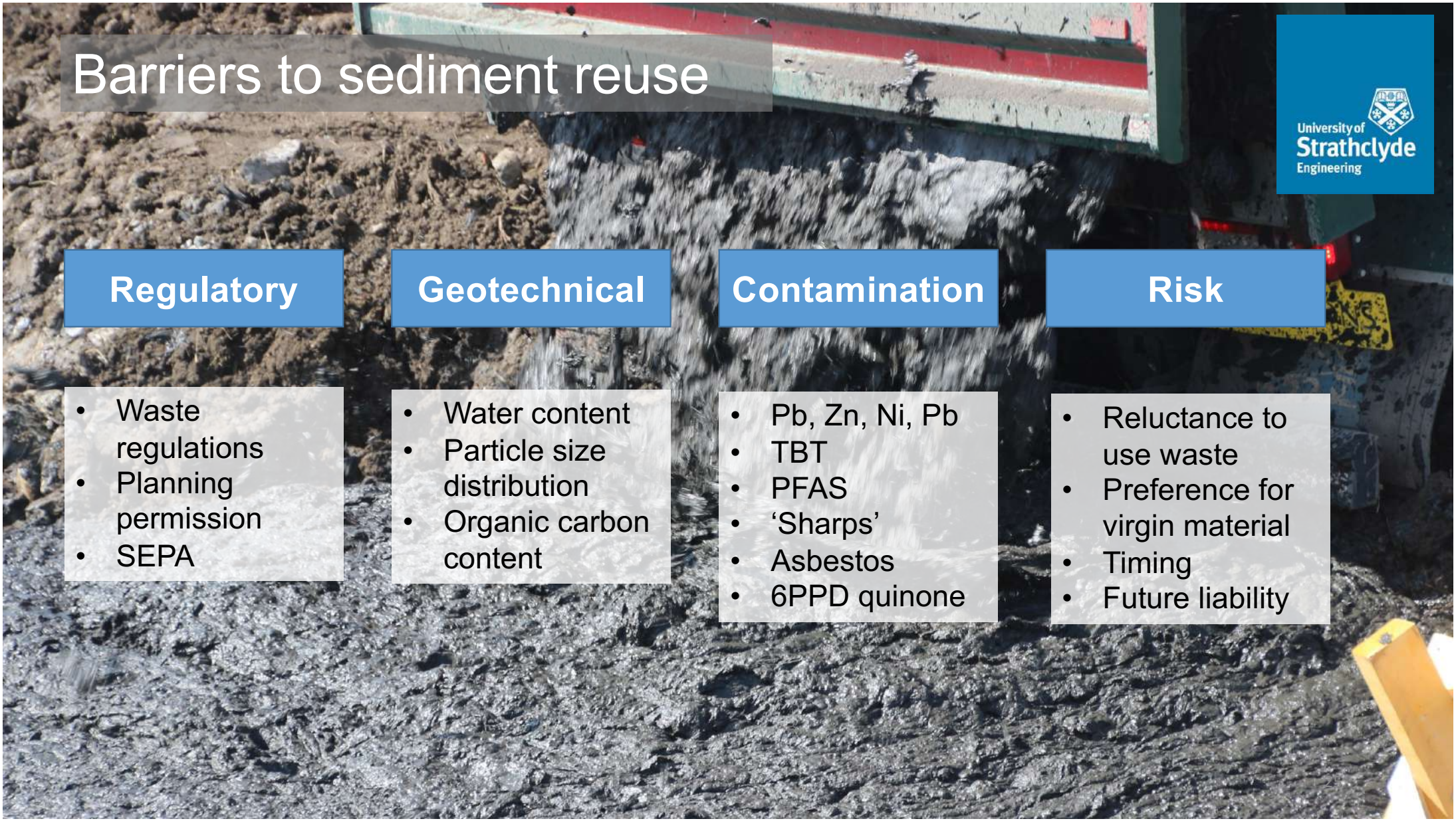
Concrete block for retaining wall – flood control

A 150mm test block achieved 7.5 MPa in a laboratory compression test, after 21 days curing.

Sediment reuse options



Barriers to sediment reuse



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Regulatory	Geotechnical	Contamination	Risk
• Waste regulations • Planning permission • SEPA	• Water content • Particle size distribution • Organic carbon content	• Pb, Zn, Ni, Pb • TBT • PFAS • ‘Sharps’ • Asbestos • 6PPD quinone	• Reluctance to use waste • Preference for virgin material • Timing • Future liability

Lessons

Sediment physical and chemical characteristics are the primary determinants of suitable reuse options.

Transportation distances and sediment handling determine economic viability of a reuse option. Ideally, the sediment should be transported from the dredger to the final reuse site.

Carbon is released by the wet sediment during conditioning, but soils produced from dredged sediment can sequester carbon over longer timescales.

Civil engineers are reluctant to use repurposed sediments on infrastructure projects, even when they are suitable, if there is an option to use raw aggregates.

Questions?

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Photo credit: Scottish Canals