Sediment movement through a Swale

Delivering & Evaluating Sediment, Debris and Habitat Benefits of Blue-Green Cities

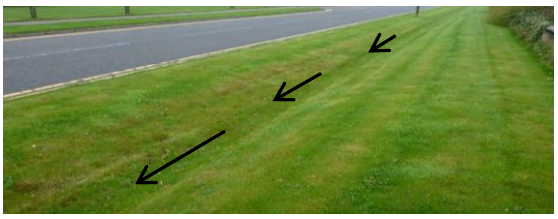
FACTSHEET

Project area: *Sediment transport; urban debris movement; river habitat analysis*
Intended readership: *Practitioners, academics, interest groups*

Current best management design and modelling is based on the **assumption** that *if we deal with the pollution during the event, then the pollution is dealt with*.

This research aims to look at what happens to the pollution, attached to sediment, after the design event, and focusses on:

- Post design event deposition
- Resuspension and transport due to subsequent events
- Long term detention/ treatment of pollutants by a SuDS asset
- Residual and continual release of pollutants from the SuDS asset after the design event



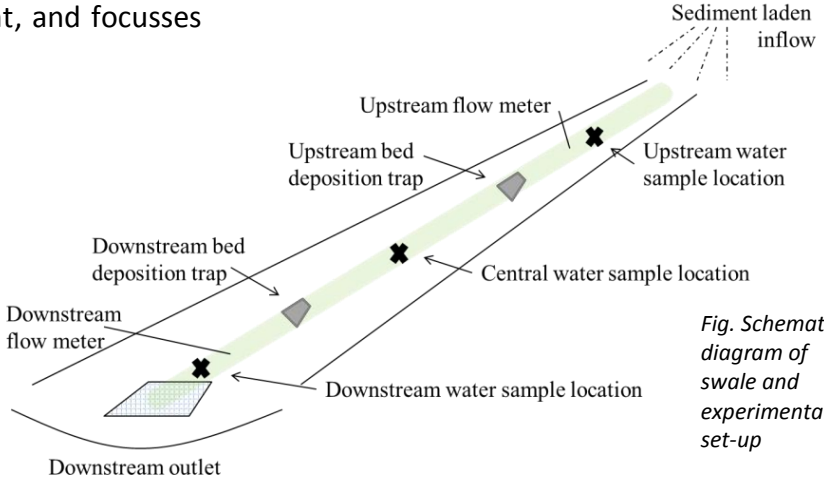


Fig. Schematic diagram of swale and experimental set-up

To discover the ongoing sediment transport in a case study SuDS asset, an REO (Rare Earth Oxides) sediment tracing method was used. The ***design event*** refers to the critical rainfall-runoff event that the swale is designed to convey and treat.

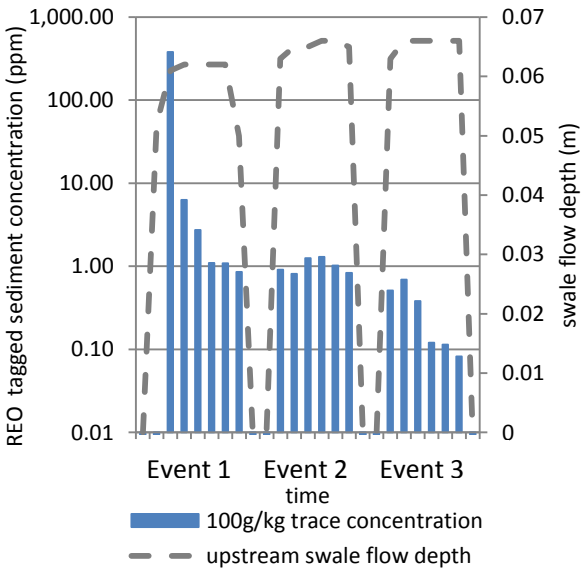


Fig. Flow event suspended sediment transport concentrations

Sediment in suspension

The first flow (Event 1) showed an influx of pollution that decreased over the duration of the event.

If the assumption of design event treatment is correct, we would expect no further concentration variation in subsequent events.

However, the following two flow events show pollutant movement.

Therefore, the sediment pollution continued to move after the initial flow event.

Sediment is therefore only detained in the SuDS asset *temporarily*.

There is a continued slow release of sediment from the SuDS as a result of subsequent events.

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Sediment deposited

As a result of the design event (Event 1) there is notable sediment deposition on the swale bed. If the assumption of design event treatment is correct, we would expect no variation in the deposition on the swale bed as a result of subsequent flow events. The figure below shows this assumption does not hold true. There is a continued sediment shift and deposition within the swale as a result of Events 2 and 3. When this deposition is monitored over an extended time period, up to 12 months, the continued transport of sediment pollution can be seen to follow a pattern. The total sediment load within the swale decreases and the peak concentration moves down the swale.

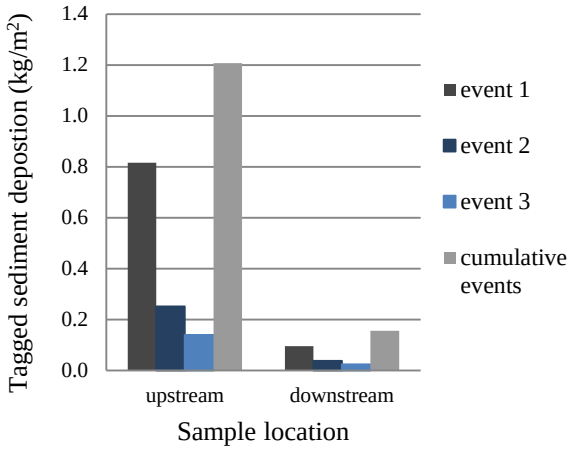

Fig. Deposition of tagged sediment within sediment traps placed in the base of the swale between runoff events

The influence of subsequent events causes a *continued slow release of temporarily detained sediment*. When this is considered over an extended period, i.e. 100+ events, the long term sediment pollution detention within the swale is significantly lower than the Event 1 detention rate. Only 8% of the sediment entering the swale in Event 1 is detained within the swale after 2 years/+100 events.

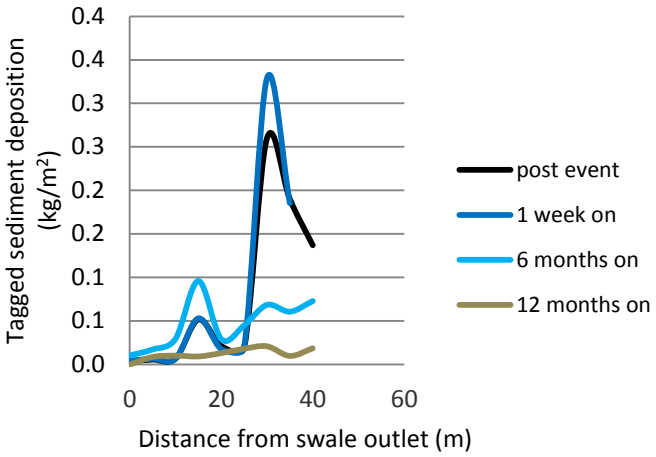

Fig. Deposition of tagged sediment within sediment traps placed in the base of the swale over the 12-month following period

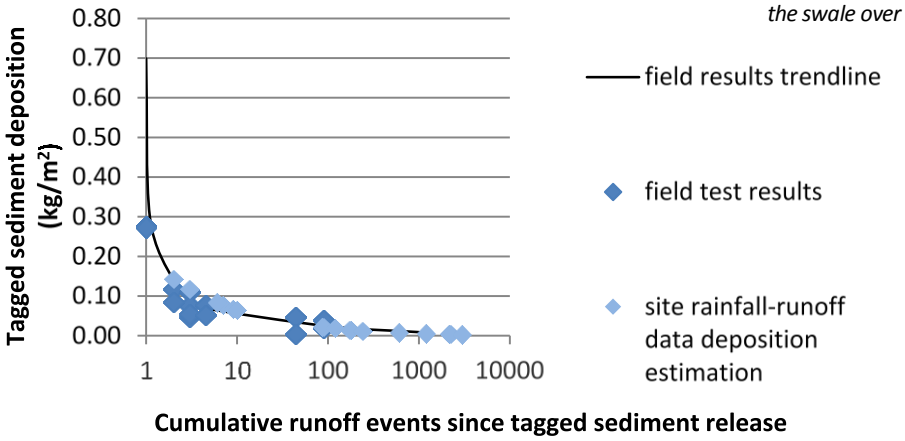

Fig. Trace sediment deposition within the swale over multiple runoff events

- The trend suggests that there is continued but small resuspension and release of tagged sediment over cumulative runoff events
- This results in a small long-term sediment deposition quantity (from one single sediment release) over an extended period

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