Tackling polluted runoff from established industrial estates: the case for SUDS retrofits

FACTSHEET

Project area: water quality, hydrology, civil engineering, environmental pollution, economic geography, social science
Intended audience: industry practitioners, legislators, politicians, students, NGOs, general public

Introduction

Industrial stormwater pollution

There are two forms of stormwater pollution in industrial areas: acute and diffuse. The former occurs as a result of an incident or accident, e.g. a major spill, malfunction or overflow. Diffuse pollution is the weather-driven mobilisation of contaminants from the landscape into the water environment. It is often chronic and its characteristics are a function of the drainage catchment (e.g. land use, topography, soil). This form of pollution occurs continuously, requires ongoing management to protect receiving watercourse water quality and is linked to poor stormwater management. Diffuse pollution from industrial estates has been identified as a major cause of low river quality in Scottish waterways (SEPA, 1996) and worldwide (D'Arcy et al. 2018). This factsheet illustrates a possibility of alleviating industrial stormwater pollution problems with case studies of proposed Sustainable Urban Drainage Systems (SUDS) retrofits at an industrial estate in Livingston, Scotland.

Practical application of this research:

- Improves understanding of issues related to pollution in industrial areas to help practitioners design and implement effective SuDS to tackle industrial stormwater pollution;
- Provides examples from the UK (Houston Industrial Estate in Scotland) and abroad that may be relevant for practitioners designing SUDS retrofit measures;
- Provides an estimate of economic costs of SuDS retrofit in industrial areas and details sources where the breakdown of costs and further details can be found for practitioners to use in their own costings.

Stormwater pollution management in industrial areas

Sustainable Urban Drainage Systems (SUDS) have been identified as an important option to address water pollution risk. Whilst in the UK retrofitting SUDS on industrial estates is relatively new, there are a number of successful international case studies, including industrialised areas in Hoppergarten, Berlin, Germany and Kingston, Melbourne, Australia (D'Arcy et al. 2018).

In Scotland, stormwater management in industrial estates has mainly focused on retrofitting end-of-pipe measures, e.g. Caw Burn wetland at Houston Industrial Estate (Heal et al. 2005). However, the size of such features is often constrained by logistics, and restoration to satisfactory conditions may be held back by intermittent pollution episodes, as well as overloading on a routine basis. This highlights the need for complementary SUDS retrofit measures at source, which is illustrated in the case studies presented here.

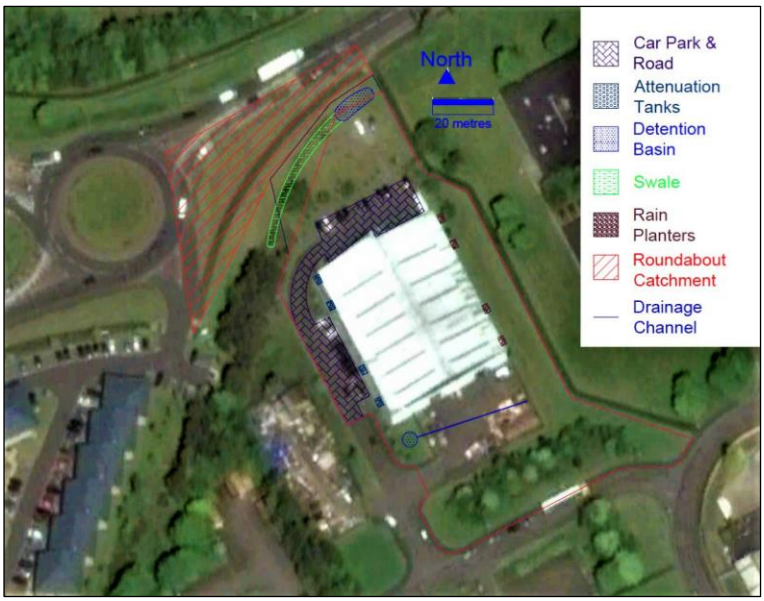

Figure 1: Aerial view of the Transcal case study site (Google DigitalGlobe, 2016) and layout of proposed SUDS features.

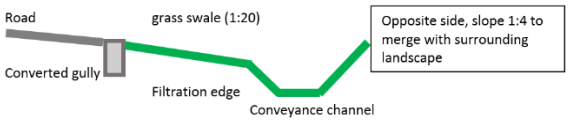

Figure 2: Asymmetrical cross section profile of the virtual swale, to provide filtration of road runoff, and conveyance, with minimal land requirement, using sealed gullies with high-level overflow to grass.

Figure 3: The proposed regional SUDS feature (Google DigitalGlobe 2018). Arrows show connecting swales.

References

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Retrofit SUDS Opportunities

The research conducted by Heriot-Watt University aims to investigate opportunities for retrofitting SUDS at a number of case study companies. Detailed visits to propose specific SUDS retrofits have identified opportunities at source on several premises (e.g. DS Smith, Wyman Gordon, NRS), two possibilities for conveyance SUDS, and one opportunity for a regional detention basin. A number of combinations of various SUDS components (including permeable block pavements, pervious asphalt, swales, flow attenuation tanks, raised bed planters and detention basins) have been assessed with regards to their functional characteristics, economic costs and logistical constraints. For one of the companies (Transcal, HIE, Livingston), the most comprehensive retrofit (Figure 1) would cost over £96,000. A partial retrofit, however, is feasible: e.g. installation of raised raingarden planters and flow attenuation tanks would cost only a few thousand pounds (Krivtsov et al, 2019a).

The research showed that there is green space for public SUDS retrofits even on existing industrial estates such as HIE. Discussions with land owners regarding any considerations of land transfer, e.g. to the council water utility, were beyond the scope of this project. A swale and a regional detention basin (to serve as a public facility) could be retrofitted in extensive green space to the East of Transcal (Figures 2-3). It would serve a public road and number of companies situated further away, and connected to this feature by a conveyance swale. Ideally, it would be designed to alleviate consequences of a 100 years return period storm. That would require further detailed investigation, costing and planning, and may well be subject to logistical and financial constraints. However, this study presents an important step in retrofitting SUDS at Houston Industrial Estate, and the methodology used will be easily applicable elsewhere.

It should also be noted that when implemented, the SUDS features also provide a number of additional benefits, including biodiversity and amenity, as well as helping to decrease the runoff intensity thus reducing flood risk. These aspects are addressed in parallel research (Krivtsov et al, 2019b) and will be examined in detail in another factsheet.

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