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Dear Richard

RE: Warren Crescent, Oxford – SuDS Case Studies

Following on from the Oxford City Council Planning Committee meeting for Warren Crescent, Peter Brett Associates LLP (PBA) has been asked to provide evidence where the use of Sustainable Drainage Systems (SuDS) have been successfully used to manage surface water and water quality at ecologically sensitive locations. This letter report outlines this information and provides a comparison with the proposed surface water drainage scheme at Warren Crescent.

1. Introduction

The Warren Crescent site is located adjacent to the Lye Brook Site of Specific Scientific Interest (SSSI). The SSSI consists of fenland and springs which produce calcareous and nutrient rich water. At present, the site is greenfield and drains through infiltration to groundwater and through to the SSSI and the Lye Brook.

As part of the Flood Risk Assessment (FRA) a surface water drainage strategy was prepared for the site and includes water quality treatment stages as follows:

- The access roads, pavements and parking bays would drain via permeable paving, providing the first tier of storage and treatment;
- Treated water from the permeable paving would then pass through catchpits and be conveyed to a swale (with underlying limestone base) bounding the edge of the Lye Valley. The swale would act as the second tier of water quality treatment;
- Roof drainage, access paths to the bike sheds and patio areas will be directed, via a pipe network, to the swale such that this relatively clean water would receive two levels of water quality treatment; and
- For design exceedence flows, a bund between the edge of the Lye Valley and the development site would prevent overland flows from entering the Valley.

2. Gartloch Hospital, near Glasgow, Scotland (provided by the University of Abertay, Dundee)[1]

The Gartloch Hospital and Estate is located adjacent to the Bishops Loch, which is classified as a Site of Specific Scientific Interest (SSSI), a Local Nature Reserve (LNR) and a Site of Importance for Nature Conservation (SINC).

Due to the sensitivity of the Bishop Loch and the surrounding area, and concerns of soil disturbance during construction and impact on water quality, the surface water drainage from the development was considered

[1] Berwick, N (n.d.) Gartloch Hospital Case Study

for the temporary construction phase in addition to the post-construction installation of a SuDS treatment train as follows:

- Temporary /construction phase – surface water runoff from the site was managed using a network of channels which conveyed overland flows to flocculant enhanced settlement basins. The clean water is then released to the Bishops Loch through a temporary channel. Vegetated buffer zones were also used to provide additional protection for watercourses. Regular water quality monitoring and visual inspections were undertaken varying from daily, when surface water runoff was occurring, to weekly.

- SuDs Treatment Train – The site was split into three sub-catchments based on topography. The management train within each sub-catchment consisted of three SuDS features, which each act as a tier of water quality treatment; permeable paving within the curtilage of each property, filter areas and retention ponds.

The Gartloch Hospital is similar to the Warren Crescent in that it is located adjacent to a SSSI and utilises permeable paving for the first stage of water quality treatment.

3. Hopwood Motorway Service Area, near Bromsgrove, Worcestershire (provided by the University of Coventry)[2]

The Hopwood Park Motorway Services on the M42 motorway drains into the Hopwood Stream and the adjacent wildlife reserve. The SuDS management trains were completed in 1999 for the each of the four areas as follows:

- HGV park – sheet runoff is treated in a grass filter strip, followed by a stone-filled and lined infiltration trench, a spillage basin and a final attenuation wetland, with treatment in a further grass strip and swale for overflows;

- The coach park, fuel filling area service yard and main access road – runoff is collected through conventional gullies and pipes and is passed through a silt and oil interceptor before being discharged into a wetland/pond/wet swale management train;

- The car park – runoff from this area is collected via slotted kerbs into sub-surface, gravel-filled collector trenches that drain to a balancing pond; and

- The amenity building roof – runoff is piped to a balancing pond, before draining towards the Hopwood Stream.

The SuDs features are maintained regularly, with contractors visiting every 2 weeks to inspect and undertake maintenance as part of the overall landscape management of the Services Area. The drainage pipes and gullies are maintained by separate contractors.

Between 2003 and 2008, several studies by various organisations have been conducted to assess the performance of the SuDs management trains at Hopwood.

The highest contaminant concentrations were found in the 1st pond, which is presumed to be due to the diesel spillage in 2003, but were lower at its outlet in comparison to the interceptor outlet (conventional piped drainage). In the car park, the concentrations of sediment contamination were shown to progressively decrease down the management train. The lessons learnt were that the SuDs system was able to effectively deal with the pollution incident.

The contaminant concentrations in the grass filter strips generally decreased with distance from the pavement edge.

[2] Heal, K.V; Bray, R; Willingale, S.A.J; Briers, M; Napier, F; Jefferies, C and Fogg, P (2008) *Medium-tern performance and maintenance of SUDS: a case-study of Hopwood Park Motorway Service Area, UK*. 11th International Conference on Urban Drainage, Edinburgh.

This case study therefore shows that a 3 stage SuDS management train (the level of treatment proposed at Warren Crescent) can provide the robust water quality treatment required to mitigate against the impact of contamination to the receiving watercourse and Nature Reserve. This case study in particular shows the efficiency of containing contaminants from oil/petrol spillages within the HGV/petrol filling area within the SuDS features.

4. Lamb Drove, Cambourne, Cambridgeshire (provided by Susdrain)[3]

The Lamb Drove site in Cambridgeshire utilises a range of different SuDs components which form an effective management train for the conveyance, treatment and storage of surface water runoff, aiming to control the runoff as close to its source as possible:

- Roofwater is collected in water butts for use on gardens or flows directly to grass swales;
- Rain falling on paths and roads drains through permeable paving and is filtered/treated before draining to swales. The swales treat and convey runoff through the site to a series of detention basins and wetlands before it reaches a final retention pond;
- Water is stored in the retention pond before being released to a local drainage ditch, Bourn Brook, outside the development site.

A 3 year monitoring programme was undertaken by Royal Haskoning between 2008 and 2011 to assess and compare the performance of the SuDS components and compare with a piped drainage system within a local control site[4]. The monitoring results showed that the SuDs management train at Lamb Drove improves water quality in comparison to the conventional piped drainage at the Control site, particularly with regard to hydrocarbons, heavy metals and suspended solids and therefore reduces pollutant loads into the retention basins and ultimately the Bourn Brook.

The report also shows that after 6 years after installation, the permeable pavement at the site is still functioning well and has an infiltration rate in exceedence of the maximum rainfall intensities observed at the Control site over the 3 year monitoring period for the 1 in 50 and 1 in 100 annual probability rainfall events.

The Warren Crescent site would utilise a similar treatment and conveyance route of permeable paving and a swale. The Lamb Drove site, even though it is not discharging to a SSSI/sensitive area shows that in comparison to utilising conventional piped drainage, flows to the receptor are managed and water quality is significantly improved.

5. Summary

These case studies therefore show that SuDs have been successfully utilised to manage surface water runoff and to provide robust and improved water quality treatment in comparison to conventional drainage. In particular, the Hopwood Services and Lamb Drove case studies showed a reduction in contaminants down the treatment train.

Yours Sincerely

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Associate

For and on behalf of

Peter Brett Associates LLP

[3] Susdrain (2013) Lamb Drove, Residential SuDS Scheme, Cambourne.

[4] Stevens, R (2012) *Lamb Drove Sustainable Drainage Systems (SuDS) Monitoring Project (Final Report)*. Royal Haskoning, Peterborough and Cambridgeshire County Council.

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