3. **A site specific management plan including an initial scheme of maintenance**

Habitat Management Plan for Tybald Estate.

1. **Landscape Management Objectives**
2. **Background to the Management Plan**
3. **Review of the Management Plan**
4. **Maintenance Programme**
5. **Maintenance and Monitoring**
   Initial 10 weeks
   Establishment Period 1-2 yrs
   Maintenance Period 3-5 yrs

1. Landscape Management Objectives

The landscape and habitat management plan for Tybalds Estate is based on the initial Ecology report and subsequent biodiversity specification for the roof areas. The key components of which are:

- A broad variety of sustainable habitat such as: log piles; stone and sand areas; wet area
- An increasing number of flora and fora species present on the site.

The build-up is detailed in the Report under 1a & 1b
To be read in conjunction with the roof plans of the green roof areas.

2. Back ground Information

Extract from Camden BAP 2013-2018

Green Roof Design Basics
There are many things to consider when designing and implementing a green roof:
□ Whether site is overlooked and any potential privacy infringements;
□ Root barriers and waterproofing and drainage capacity (*see below for design specifications*);
□ Amount of external heat generated by the building and surface flooding risk;
□ Weight and structural considerations;
□ Ease of installation and maintenance;
□ Aesthetics, access and amenity provision;
□ Habitats and biodiversity.

Biodiversity design and considerations
The following outline some key principles for maximising the biodiversity benefit of living roofs. These can be most extensively be applied on green or brown roofs designed for biodiversity; however they can also be incorporated to varying degrees into intensive and semi-intensive green roofs.

Surroundings
□ In built-up areas, living roofs and walls can make a significant contribution to an area's greenspace.
□ Habitats in the surrounding areas should be considered e.g. if there are important brownfield sites nearby, the strategic provision of brownfield habitat on roofs could increase connectivity between sites.

Substrate
□ Substrate depth should be between 80 and 150mm and vary across the roof.
□ For brown biodiverse roofs, reclaimed building material can be used but should be screened to ensure that it is not contaminated. *(This is no longer recommended!)*
□ Areas of bare ground can provide habitat for warmth-loving invertebrates and recreate an open mosaic habitat structure.
□ Mounds and ridges can provide varying microclimates suitable for different species and create structurally diverse vegetation

Planting
□ Planting should consider the climate, microclimate, plant attributes and objectives.
□ Vegetation can establish either through natural colonisation or planting
o Colonisation can produce habitat of high value but can also create problems with

undesirable species.
□ The sowing of annuals or plug planting combined with seeding can be beneficial as it provides a resource for species for the first few years during establishment
□ **Sedum** has less biodiversity value but can still deliver drainage benefits etc. and can be combined with other plantings and substrates (on biodiverse roofs should be less than 30%).
□ **Wildflowers** provide a habitat for beetles, bees, butterflies and moths. Planting density should be 15-20 species/m2. In addition to constituting the main planting for biodiverse green roofs, they can be incorporated into extensive brown roofs and sedum roofs. Mosses, succulents and grasses can provide additional variation.
□ **Shrubs and cover** can be provided depending on structural considerations and substrate depth and can provide cover for wildlife, perches and winter food for birds, and windbreaks.

Other Biodiversity Features
□ *Over-wintering* vegetation allows many invertebrates to complete their lifecycle;
□ *Log piles and deadwood* can provide habitat and perches for invertebrates and birds;
□ *Bee banks* are mounds of sand and provide valuable nesting sites;
□ *Stones and mounds of cleaned bricks* can provide insect and spider habitat;
□ *Ponds and wet areas* can provide a valuable resource for many species;
□ *Bug hotels and habitat walls* for nesting and overwintering invertebrates.

Maintenance
□ Maintenance will vary between roofs and it is important to understand the maintenance requirements before the roof is installed;
□ Most extensive green roofs do not require extensive irrigation and fertiliser;
□ Initial watering will usually be required during establishment (for around 6 weeks);
□ Monitoring and removal of undesirable species may be required;
□ Habitat management e.g. re-creating bare-ground areas may be required.

Suggested wildflowers
Achillea millefolium / Yarrow (BL)
Agrimonia eupatoria / Agrimony

Anthyllis vulneraria / Kidney vetch

Centaurea nigra / Common knapweed
Echium vulgare / Viper's-bugloss
Galium verum / Lady's bedstraw
Hypericum perforatum / Perforate St. Johnswort
Knautia arvensis / Field scabious
Lamium album / White dead nettle (BL)
Leontodon autumnalis / Autumn hawkbit
Leontodon hispidus / Rough hawkbit
Leucanthemum vulgare / Oxeye daisy
Ranunculus acris / Meadow buttercup
Ranunculus bulbosus / Bulbous buttercup
Reseda lutea / Wild mignonette
Sanguisorba minor / Salad burnet
Silene latifolia / White Campion
Silene noctiflora / Night flowering catch-fly
Silene uniflora / Sea campion (GRG)

Linaria vulgaris / Common toadflax
Silene vulgaris / Bladder campion
Lotus corniculatus / Bird's-foot trefoil
Thymus ducci / Wild Thyme (GRG)
Malva moschata / Musk mallow
Trifolium Pratense / Red clover (BL)

Origanum vulgare / Wild marjoram *Plantago media* / Hoary plantain
Primula veris / Cowslip
Prunella vulgaris / Selfheal

3. Review of the Management Plan

The flora and fauna on the roofs is likely to evolve over time. It is therefore highly likely that the plan be required to change and along with it the maintenance requirements. To facilitate this the plan calls for monitoring in the second summer with a review of the plan and maintenance for years three to five. This process to be repeated again after five years.

4. Maintenance Programme

2 visits per year in Spring/summer and autumn for five years.
Additional monitoring visit in summer of second and fifth year.

Work to be carried out by Bauder Green Roof Maintenance.

Note: None of the green roofs are designed to be trafficked in any way, the roofs should not be accessed by anyone except for repair or essential maintenance works, any damage to the surface finishes of the roofs should be reported to Bauder immediately.

Initial 10 weeks (directly after installation)
The green roofs, both sedum and biodiverse are designed to need a minimum of maintenance. However, some intimal watering will be required during the first 10 weeks after installation if there is insufficient rain fall.

- Watering of seeded areas (after the seed has germinated) should be regular (every day) when there are periods without rainfall, this can be reduced as the planting become more established.
- Watering should be carried out with a fine mist sprinkler or rose. Care should be taken not to wash out the seed with excessive water or pressure.
- Efforts should be made to not to traffic the roof during watering.

Bird and Bat boxes: Assess the site for suitable locations for bird and bat boxes (It was felt at planning stage that there were no suitable locations)

Establishment Period (Yrs 1-2)
Maintenance. During the first 2 years maintenance visits should be twice yearly (spring/summer and autumn)
Maintenance Works

All Areas, every visit work required:

- Pebble Border: remove all vegetation from Pebble borders
- Outlets: check outlets are clear and free from slit and detritus

Biodiverse Roofs work required:

- Remove unwanted and invasive weeds.
- Log piles: check for movement caused by wind or animal activity
- Sand and stone piles: If required weed some areas of sand to insure bare ground is present in some locations
- Wildflower areas: Cut and remove flower seed heads and taller grasses above 150mm. if required (during autumn visit only).

Sedum roof work required:
Sedum is not tolerant of foot traffic. Access to the sedum areas should be restricted to essential maintenance only.
Work Required:

- Remove unwanted and invasive weeds.
- Fertilise blanket in spring/summer visit as per Bauder Specification
- Remove grass and weed from sedum areas
- Patch any open joints or bare areas with substrate and sedum cuttings

Monitoring
Summer of year 2

- Assessment of the number of original plant species still present on site, plus additional species which may have colonised the roofs
- Assessment of the success of the log piles. Stone and sand areas with details of what species are flourishing in these areas.
- Assess the % failure of seeding. If failed area larger than 10m2 should be over seeded in the following spring or autumn.

From these assessments the management plan for the following 3 yrs can be adjusted.

Maintenance Period (Yrs 3-5)
Maintenance. During the years three to five maintenance visits should be twice yearly (spring/summer and autumn)

Maintenance works all areas every visit:

- Pebble Border: remove all vegetation from Pebble borders
- Outlets: check outlets are clear and free from slit and detritus

Biodiverse Roofs work required:

- Remove unwanted and invasive weeds.
- Log Piles: check for movement caused by wind or animal activity
- Sand and stone piles: If required weed some areas of sand to insure bare ground is present in some locations
- Wildflower: Assess the percentage coverage of wildflowers
- Cut and remove flower seed heads and taller grasses (above 150mm) if required during Autumn visit only

Sedum roof work required:
Access to the sedum areas should be restricted to essential maintenance only

- Remove unwanted and invasive weeds.
- Fertilise blanket in spring/summer visit as per Bauder Specification
- Remove grass and weed from sedum areas

- Patch any open joints or bare areas with substrate and sedum cuttings.

Monitoring
Summer of year 5

- Assessment of the number of original plant species still present on site, plus additional species which may have colonised the roofs.
- Assessment of the success of the wet area, log piles. Stone and sand areas with details of what species are flourishing in these area.

From these assessments and reference to the Camden BAP (2013-2018) the management plan for the following 5 yrs can be adjusted.

4.A section at scale 1:20 showing that adequate depth is available in terms of the construction and long term viability

Please refer to enclosed details.