

Swansea University Bay Campus Centre for Integrative Semiconductor Materials (CISM)

Landscape and Habitat Management Plan (LHMP)

Swansea University

Project number: 60605215

February 2020

Quality information

Prepared by	Checked by	Approved by
LF	UJ	
Ecologist	Principal Ecologist	

Revision History

Revision	Revision date	Details	Authorized	Name	Position

Prepared for:

Swansea University

Prepared by:

AECOM Limited
1 Callaghan Square
Cardiff CF10 5BT
United Kingdom

T: +44 29 2067 4600
aecom.com

© 2020 AECOM Limited. All Rights Reserved.

This document has been prepared by AECOM Limited ("AECOM") for sole use of our client (the "Client") in accordance with generally accepted consultancy principles, the budget for fees and the terms of reference agreed between AECOM and the Client. Any information provided by third parties and referred to herein has not been checked or verified by AECOM, unless otherwise expressly stated in the document. No third party may rely upon this document without the prior and express written agreement of AECOM.

Table of Contents

1.	Executive Summary.....	5
2.	Introduction.....	6
2.1	Aims and Objectives.....	6
2.2	Structure of the Report.....	7
3.	Site Description and Evaluation.....	8
3.1	Introduction.....	8
3.2	Ecological Information.....	8
3.3	Factors Influencing Management.....	10
4.	Site Level Biodiversity Action Plan.....	12
4.1	Introduction.....	12
4.2	Targeted Habitats and Species.....	12
4.3	Potential Threats to Biodiversity.....	12
4.4	Objectives and Actions.....	13
5.	Prescriptions.....	15
5.1	Introduction.....	15
5.2	Target Habitat Management Prescriptions.....	15
5.3	Target Species Management Prescriptions.....	19
6.	Work Programme.....	23
6.1	Key Responsibilities.....	23
6.2	Five Year Work Programme.....	23
7.	References.....	27
	Figure 1 - Phase 1 Habitat Plan.....	28
	Figure 2 - Landscape Outline Plan.....	29
	Figure 3 - CISM Relocation of 'Flora Industria Garden'.....	30
	Appendix A Boston Seeds Growing and Maintenance Instructions.....	31
	Appendix B Small Blue Butterfly Fact Sheet.....	32
	Appendix C NRW Pre Application Consultation.....	33
	Appendix D Swansea University Biodiversity Action Plan.....	34

1. Executive Summary

AECOM was instructed by Swansea University to prepare a Landscape and Habitat Management Plan (LHMP) for Swansea University Bay Campus Centre for Integrative Semiconductor Materials (CISM) (the Site). The Site is approximately 3790 m² and located in the Swansea University Bay Campus, Fabian Way, Skewen, Swansea SA1 8EN. The central grid reference for the Site is SS 70204 92884. The boundary of the Site is shown on Figure 1.

This LHMP will outline the creation, enhancement and management of new habitats created during the development of the Site. This LHMP has been produced to fulfil the requirements for the BREEAM Land Use and Ecology credit LE05 Long Term Impact on Biodiversity (BREEAM, 2018) and requests from Natural Resources Wales (NRW) during the pre-application consultation. This LHMP pays due regard to the Swansea University Biodiversity Action Plan 2016-2020.

The development proposals are to construct a new building – The Centre for Integrative Semiconductor Materials (CISM). The development will require the complete removal of all habitats within the footprint of the building. The proposed development will comprise of buildings, hardstanding and areas of soft landscaping within the Site boundary. An off-Site mitigation area totalling 170 m² has been allocated approximately 400 m south west of the Site. It is understood that construction is programmed to commence in June 2020 and be completed by March 2022.

The Site is a courtyard area between existing University buildings, predominately of hardstanding paving and gravel with areas of native-species rich planting including a grant funded Flora Industria Garden. There is a bicycle store and one other wooden building used as a base for management of Crymlyn Burrows SSSI. Crymlyn Burrows SSSI is located 10 m east of the Site. An off-Site mitigation area totalling 170 m² has been allocated approximately 400 m south west of the Site.

This LHMP outlines management prescriptions for habitats on Site for five years following project completion and suggests ongoing management after five years. This LHMP is intended to guide Site management actions in line with biodiversity, best practice and legislative requirements. BREEAM Ecology credits are being targeted and the management plan could be used to contribute to the credits available under LE05 Long Term Impact on Biodiversity for BREEAM.

All existing habitats will be removed. Newly created habitats include: Species-rich grassland (off-Site); and, Soft landscaping (on-Site).

The soil from the Flora Industria Garden on Site will be translocated to the off-Site area. Soft landscaping habitats will be seeded with Boston Seeds BS10M Coastal Areas 80/20 Wildflower Meadow. Habitats will be managed to benefit invertebrates (including Priority Section 7 Species small blue butterfly *Cupido minimus*), breeding birds and foraging and commuting bats. Measures will be undertaken to avoid impacts on designated Sites and adjacent habitats.

A Site Level Biodiversity Action Plan (BAP) will be implemented to meet the following objectives:

1. Create and Manage Species Rich Grassland (off-Site);
2. Creation and Management of Native Species Rich Soft Landscaping (on-site);
3. Avoid Impacts on Crymlyn Burrows SSSI;
4. Translocation of Kidney Vetch *Anthyllis vulneraria* to Sustain Small Blue Butterfly Population;
5. Create and Manage Invertebrate Habitat;
6. Create and Manage Habitats for Breeding Birds;
7. Create and Manage Habitats for Foraging and Commuting Bats; and,
8. Ongoing Management and Monitoring of Species and Habitats.

Prescriptions for the implementation of these objectives are included in Section 5 of this plan.

Please note the Executive Summary is not a substitute for reading the full LHMP. Refer to the full LHMP for details.

2. Introduction

AECOM was instructed by Swansea University to prepare a Landscape and Habitat Management Plan (LHMP) for Swansea University Bay Campus Centre for Integrative Semiconductor Materials (CISM) (the Site).

This LHMP will outline the management of retained ecological features and new and enhanced habitats created during the development of the Site.

This LHMP has been produced to fulfil the requirements for the BREEAM Land Use and Ecology credit LE05 Long Term Impact on Biodiversity.

A mandatory requirement of LE05 requires that a LHMP appropriate to the Site is produced covering at least the first five years after project completion. In order to achieve the LE05 credit this LHMP must include the following:

- Management of any protected features on Site;
- Management of any new, existing or enhanced habitats; and,
- A reference to the current or future Site level management plan or local Biodiversity Action Plan.

A detailed LHMP was requested by Natural Resources Wales (NRW) during the Pre Application Consultation. NRW requested this LHMP addressed the points listed in Appendix C.

This LHMP will satisfy the requirements of BREEAM LE05 and the request from NRW.

The pre-development baseline information is based on the following reports:

- AECOM (2019). Swansea University Bay Campus Centre for Integrative Semiconductor Materials (CISM) Preliminary Ecological Appraisal; and,
- AECOM (2020). Bay Campus Centre for Integrative Semiconductor Materials (CISM) BREEAM Ecology Report.

The recommendations in this LHMP are based on the following drawings provided to AECOM in February 2020:

- Soft Landscape Plan (Drawing Number 152296-STL-XX-00-DR-L-ZZZZ-09140) (Stride Treglown, 2020); and,
- CISM - Relocation of Temporary Buildings Rev A (Swansea University, 2018).

The final detailed design has not been issued at this stage. This LHMP is therefore subject to change following receipt of the final detailed design.

The Swansea University Biodiversity Action Plan (BAP) 2016-2020 (Swansea University Biodiversity Working Group, 2016) has been reviewed and the management actions in this LHMP pay due regard to the overarching management plan for the Swansea University Bay Campus. The main objectives of the BAP are provided in Appendix D. The Swansea University Biodiversity Officer has been consulted and recommendations for management included in this report.

2.1 Aims and Objectives

The aims and objectives pay due regard to BREEAM 2018 LE05 Criteria 6, the pre application consultation comments provided by NRW (Appendix C) and Swansea University BAP (Appendix D). This LHMP aims to satisfy the following objectives:

- Ensure all protected features on Site are managed appropriately during construction and operation to minimise impacts on Site and adjacent habitats (including Crymlyn Burrows SSSI);
- Provide guidance and appropriate management, monitoring and maintenance advice for existing, new and enhanced habitats on Site;
- Support and meet the objectives of Section 7 of the Environment (Wales) Act 2016 under which are a list of habitats and species of principal importance for the purpose of maintaining and enhancing biodiversity in relation to Wales;

- Provide a Site Biodiversity Action Plan (BAP), including basic objectives to be met;
- Outline key roles and responsibilities for site management; and,
- Provide a five year management programme, and monitoring advice, starting on completion of the development including any replacement measures should these be required and identify opportunities for ongoing ecological enhancement.

2.2 Structure of the Report

This LHMP is set out as follows:

- *Chapter 3: Site Description and Evaluation*
Describes the ecological status of the Site prior to development and factors that influence future management.
- *Chapter 4: Site Biodiversity Action Plan*
Lists the habitats and species selected to be targeted by the Site BAP. The specific and quantifiable conservation targets are detailed along with the necessary actions to be implemented to meet the targets.
- *Chapter 5: Management Prescriptions*
Provides detailed management prescription for retained, new and enhanced habitats.
- *Chapter 6: Work Programme*
Assigns responsibility for management actions and provides a timetable for the work over the first five years post-construction.

2.2.1 Quality Assurance

This report was undertaken in line with AECOM's Integrated Management System (IMS). Our IMS places great emphasis on professionalism, technical excellence, quality, environmental and Health and Safety management. All staff members are committed to establishing and maintaining our certification to the international standards BS EN ISO 9001:2015 and 14001:2015 and BS OHSAS 18001:2007. In addition, our IMS requires careful selection and monitoring of the performance of all sub consultants and contractors.

All AECOM Ecologists who worked on this project are members of (at the appropriate level) the Chartered Institute of Ecology and Environmental Management (CIEEM) and follow their code of professional conduct (CIEEM, 2019) when undertaking ecological work.

3. Site Description and Evaluation

3.1 Introduction

3.1.1 Land Use Before Development

The Site is approximately 3790 m² and located in the Swansea University Bay Campus, Fabian Way, Skewen, Swansea SA1 8EN. The central grid reference for the Site is SS 70204 92884. The boundary of the Site is shown on Figure 1.

The Site is a courtyard area between existing University buildings, predominately of hardstanding paving and gravel with areas of native-species rich planting. There is a bicycle store and one other wooden building used as a base for management of Crymlyn Burrows SSSI.

An additional area, approximately 170 m² located approximately 400 m south west of the Site on the southern edge of the Swansea University Bay Campus has been allocated for off-Site mitigation. This area comprises bare ground and is currently used for overflow parking. This area is hereafter referred to as 'off-Site mitigation area'.

3.1.2 Site Ownership

The Site and off-Site mitigation area are owned by Swansea University.

3.1.3 The Development

The development proposals are to construct a new building – The Centre for Integrative Semiconductor Materials.

The building's occupied spaces will include primarily research and development laboratories, workshops, academic offices and seminar spaces. The building will be served by a substantial amount of mechanical services plant, located primarily in large plant rooms on the ground and the second floors. The development will require the complete removal of all habitats within the footprint of the building. Soft landscaping will be created along the northern and eastern boundaries of the Site. These areas will be sown with Coastal seed mix, BS10M by Boston Seeds, 80/20 Wildflower Meadow to create areas of species rich grassland. The areas will be managed to increase diversity including non-intensive mowing. Interpretation boards will be provided to explain the appearance and management of the areas.

An off-Site mitigation area has been provided. An area of species rich grassland will be created and managed in this area.

It is understood that construction is programmed to commence in June 2020 and be completed by March 2022.

3.2 Ecological Information

A Phase 1 Habitat Survey (JNCC, 2010) of the Site was undertaken by a SQE (BSc, MCIEEM) of AECOM on 27 June 2019.

The survey involved a Site walkover and preliminary assessment of habitats, land use and ecological features. The main habitats present were recorded using standard Phase 1 Habitat Survey methodology as described in the Handbook for Phase 1 Habitat Survey: A technique for Environmental Audit (JNCC, 2010). The plant species defining the habitat types on Site were recorded. Evidence of any Invasive Non-Native Species (INNS) of plant subject to legal controls was recorded.

The Phase 1 Habitat Survey was 'Extended' by including a desk study, as described above, and an assessment of the potential for the Site to support Protected or Priority Species in order to identify potential ecological constraints and to guide recommendations for further surveys.

Habitat outside of but adjacent to the Site boundary was noted to aid in the determination of the Zone of Influence. These features and other information relating to the site, including the results of the ecological data search, are

outlined in more detail in Swansea University Bay Campus Centre for Integrative Semiconductor Materials (CISM) Preliminary Ecological Appraisal (AECOM, 2019).

The habitats and features recorded on Site are summarised in Table 3.1 and are shown on Figure 1. Refer to the PEA report for full details, Target Note descriptions and photographs (AECOM, 2019).

3.2.1 Desk Study Summary

For full desk study results refer to the PEA report (AECOM,2019).

There is one SAC (Crymlyn Bog), one Ramsar (Crymlyn Bog), four SSSI (including Crymlyn Burrows located immediately adjacent to the Site) and 10 SINC's (closest located 80 m from the Site) within 2 km.

A Local Environment Record Centre (LERC) search returned records of a range of Protected and Priority Species within 2 km of the Site.

There are no Ancient Woodlands or Tree Protection Orders within or adjacent to the Site.

Consultation was undertaken with Neath Port Talbot Council (NPTC) county ecologist and the Swansea University Biodiversity Officer. Both responded with details of the grant funded 'Flora Industria' garden located within the Site and recommended that this is translocated to a new area and increased in extent.

The Site is included within a Bug Life B-Line. This is a key corridor for pollinator species.

3.2.2 Habitats

Table 3.1 Summary of Habitats and Features on Site

Habitat Type	Pre-Development Description	Habitat Retained/Removed
Semi-improved grassland	An area of semi-improved grassland is located in the centre of the Site. The Semi-improved grassland is a wildflower garden called 'Flora Industria'. It has been seeded with a diverse mix of wildflowers and grasses as part of an initiative between Kew Gardens, Grow Wild and Swansea University via National Lottery grant funding in 2018. It comprises mounded rough soil and	This area will be completely removed during construction and replaced with buildings and hardstanding. The top soil including the seed bank will be translocated to the off-Site mitigation area. A total of 315.75 m ² of semi-improved grassland will be removed.
Poor semi-improved grassland	A strip of poor semi-improved grassland is present in the south of the Site, either side of the planted hedgerow. On the north of the hedgerow, there is a mown area with diverse mix of species. On the south of the hedgerow, this area is dominated by grass species with occasional forbs, becoming more dominated by forbs at the western end.	This area will be completely removed during construction and replaced with buildings and hardstanding.
Ephemeral short perennial	Two areas of ephemeral short perennial are located in the east of the Site. These areas are thought to be self-seeded on gravel/rough ground from the adjacent 'Flora Industria' planting and are in an early successional stage. There are some areas of bare ground (soil, gravel) and some areas which are more densely vegetated and beginning to become semi-improved grassland.	This area will be completely removed during construction and replaced with buildings and hardstanding.
Introduced shrub	Non-native ornamental planting is located in the south east and south west corners of the Site.	This area will be completely removed during construction and replaced with buildings and hardstanding.
Other habitat (native species planting)	Areas of planted native species are located in the west and north west corner of the Site. An area planted with species typical of wetter habitats.	This area will be completely removed during construction and replaced with buildings and hardstanding.
Amenity grassland	Areas of species-poor grassland frequently managed with regular mowing.	This area will be completely removed during construction and replaced with buildings and hardstanding.
Species poor intact hedgerow	A short, approx. 1m tall, 0.3 m wide, planted hawthorn <i>Crataegus monogyna</i> hedgerow in the south of the Site.	This area will be completely removed during construction and replaced with buildings and hardstanding.

Habitat Type	Pre-Development Description	Habitat Retained/Removed
Standalone trees	Four birch trees with native species planting below. One birch tree within amenity grassland.	The trees will be completely removed during construction and replaced with buildings and hardstanding.
Wall	Retaining wall made from wooden railway sleepers.	This will be completely removed during construction and replaced with buildings and hardstanding.
Buildings	Building 1 - Cycle shed constructed of wood with a green roof. Building 2 – Wooden clad building with stone walled base topped with mud and a green roof. Used as a base for management of the Crymlyn Burrows SSSI.	Existing buildings will be completely removed during construction and replaced with buildings and hardstanding. The cycle shed and Building 2 will be relocated to the off-Site mitigation area.
Hardstanding	Gravel, paved and concrete areas.	This area will be completely removed during construction and replaced with buildings and hardstanding.
Bare ground	An off-Site mitigation area has been selected for mitigation. This is currently bare ground used as over flow car parking	170 m ² new species rich grassland will be created in this area.

3.2.3 Protected and Priority Species

The following species have either been confirmed to be present on Site, or considered likely to occur:

- Invertebrates;
- Breeding birds; and,
- Bats.

The mosaic of diverse native species planting on Site provides habitat for a range of common and Priority Species of invertebrates. Cinnabar moth caterpillars *Tyria jacobaeae* (a S7 Priority Species), small blue butterfly *Cupido minimus* (a S7 Priority Species), several butterfly species, hoverflies, bee species, seven spot ladybird *Coccinella septempunctata*, beetles and a dragonfly were noted within the semi improved grassland.

The hedgerow on Site has some limited potential to supporting nesting birds.

Habitats on and adjacent to the Site offer limited opportunities for foraging and commuting bats, and they may be visited on an occasional basis. The abundance of hard standing, buildings and lighting limits the suitability of the Site for foraging and commuting bats. There are no habitats on Site with the potential to support roosting bats.

No Invasive Non-Native Species (INNS) were recorded on Site during the survey.

Additional Phase 2 species surveys were not required at the Site.

3.3 Factors Influencing Management

3.3.1 Landscape Perspective

The Site is located within the Swansea University Bay Campus on Fabian Way, Skewen. Natural habitats within the Swansea University Bay Campus are limited to planted areas of landscaping.

To the north of the Site are Swansea University Bay Campus buildings with the A483 Road (Fabian Way) located beyond the Campus boundary. Further north of the A483 Road are industrial buildings of the Bay Studios, Swansea Gate Business Park and former Elba Works. North of this is a railway line and the Tennant Canal located 600 m and 650 m north respectively.

Located 10 m to the east of the Site is Crymlyn Burrows SSSI. The River Neath enters Baglan Bay 1.8 km east of the Site.

To the south of the Site are Swansea University Bay Campus buildings and beyond the Campus boundary is the coastline of Baglan Bay.

To the west of the Site are Swansea University Bay Campus buildings. Beyond the Campus boundary is brownfield land and further west is Swansea Docks.

There is one SAC (Crymlyn Bog), one Ramsar (Crymlyn Bog), four SSSI (including Crymlyn Burrows located 10 m from the Site) and 10 SINCs (closest located 80 m from the Site) within 2 km. The Site (including off-Site mitigation area) have limited connectivity with the wider landscape. Green corridors across the campus are absent. However, the Site offer opportunities for more mobile species (invertebrates, bats and birds) from adjacent and surrounding habitats including designated sites.

3.3.2 Natural Trends

If soft landscaping and semi-natural habitats are left unmanaged or subject to low management inputs, a process of colonisation and succession is likely to occur. This can include establishment of herbaceous, ruderal and scrub species and can change the character of the landscaped area. Therefore, management prescriptions will need to take these processes into account. The management outlined below is intended to provide suggestions which are compatible with local environmental conditions (e.g. soil type, local native habitats and species).

3.3.3 Man-Induced Trends

This LHMP considers positive management for biodiversity whilst maintaining the primary core land use purposes of the Site. However, certain limiting factors may only become apparent through use of the new developed Site. For example, excessive trampling of areas may require appropriate changes in management. Whilst this report is intended to be prescriptive, a pragmatic approach should be taken involving ongoing monitoring so that appropriate management techniques are applied.

3.3.4 External Factors

Climate change is a global issue and relevant actions to limit contributing to this issue are largely beyond the scope of this LHMP. However, care should be taken to minimise the use of machinery on Site which emit greenhouse gasses. Wherever possible, consideration of species planted should be given to likely impact on local climatic variables e.g. if prone to flooding or drought. Changes in management may be required in the long-term to reflect the impact of local climatic fluctuations e.g. timing of grass cutting to avoid during flowering season.

3.3.5 Legal and Non Legal Obligations

Additional management of retained, new and enhanced habitats may be required for Health and Safety reasons. This may conflict with some of the management recommendations outlined below.

3.3.6 Buried Services

Whenever digging or disturbing the ground it is important to be aware of any buried services prior to digging. Permissions may be required prior to significant works near to some services.

4. Site Level Biodiversity Action Plan

4.1 Introduction

The Site BAP lists the targeted post-development habitats and species that have been identified for conservation action. Objectives for each habitat or species are described along with the actions required to achieve these objectives.

4.2 Targeted Habitats and Species

Habitats and species to be targeted for management and enhancement on this Site were chosen using a range of criteria. These criteria included:

- Protected and Priority Species and habitats of conservation value known to be already present on Site or in the vicinity of the Site;
- Priority Species and Habitats listed on in Section 7 of the Environment (Wales) Act 2016; and,
- Species and habitats which are likely to benefit from management at a Site Level.

The species and habitats that are being targeted by beneficial management practices on this Site are listed below in Table 4.1.

Figure 2 is the soft landscape plan for the Site.

Figure 3 shows the location of off-Site mitigation.

Table 4.1 Species, Habitats and Designated Site Targeted in the Site Biodiversity Action Plan

Species / Post Development Habitats / Designated Site	Criterion
Species rich grassland – ‘Flora Industria Garden’	A Priority Habitat. Likely to benefit Protected and Priority Species.
Small blue butterfly	A Priority Species.
Invertebrates	Several Priority Species have potential to be on Site.
Breeding birds	Breeding birds are protected under UK legislation. Priority Species unlikely on Site but birds present in surrounding landscape will benefit from mitigation.
Bats	Protected under UK/EU legislation. A Priority Species. Mitigation will be of benefit to bats commuting and foraging across the Site and bats in the surrounding landscape.
Crymlyn Burrows SSSI	Protected under UK legislation. Provides habitat for Protected and Priority species

4.3 Potential Threats to Biodiversity

Potential threats to Site biodiversity include:

- **Disturbance:** Activity levels, or Site management such as lighting regime or heavy frequent management of vegetation, could potentially cause disruption to species and make the habitat unsuitable for them.
- **Neglect:** Lack of management can detrimentally affect habitats by allowing succession or nutrient enrichment. Incorrect management can detrimentally affect habitats by damaging habitats, poor timing or too frequent management practices.
- **Demands for space:** Future expansion results in development on the retained or newly created habitats.

- **Funds:** Lack of resources to implement management and monitoring.
- **Lack of information:** Site users may be unaware of the importance of certain habitats and the rationale behind management decisions and, unknowingly, damage important features. Management contractors and their staff should also be fully aware of the importance of habitats and ecological features on Site.

4.4 Objectives and Actions

The objectives of the Site Biodiversity Action Plan are outlined below. Prescriptions for practical management measures are outlined in Section 5.

Figure 2 and Figure 3 show the locations of target habitats and features.

Objective 1: Create and Manage Species Rich Grassland (Off-Site)

Actions:

1. Relocate the existing 'Flora Industria Garden' to the off-Site mitigation area.
2. Manage area to maintain and increase value to biodiversity.
3. Implement a management regime that includes not using chemical fertilisers and herbicides/ insecticides in these areas.
4. Provide interpretation board to explain the purpose and value of the area.

Objective 2: Create and Manage Native Species Rich Areas of Soft Landscaping (On-Site)

Actions:

1. Create areas of species rich grassland in new areas of Soft Landscaping.
2. Newly created habitats to be managed sympathetically to increase biodiversity.

Objective 3: Translocation of Kidney Vetch to Sustain Small Blue Butterfly Population (Off-Site)

Actions:

1. Identify locations of kidney vetch specimens within the Site.
2. Identify suitable receptor areas to translocate specimens to, within the Swansea University Bay Campus.
3. Appoint an appropriate landscape management contractor to undertake translocation of specimens.
4. Appoint an ecologist to supervise translocation of specimens.
5. Translocate specimens at the appropriate time of year recording locations of receptor areas.
6. Implement suitable management to ensure survival of the specimens including not using chemical fertilisers and herbicides/ insecticides in these areas.

Objective 4: Create and Manage Invertebrate Habitat

Actions:

1. Relocate the existing 'Flora Industria Garden' to the off-Site mitigation area.
2. Create areas of species rich grassland in new areas of Soft Landscaping.
3. Build a stone wall with features suitable to support invertebrates.

4. Implement a management regime that includes not using chemical fertilisers and herbicides/ insecticides in these areas.

Objective 5: Create and Manage Breeding Bird Habitat

Actions:

1. Provide bird boxes within or off-Site.
2. On-site and off-Site landscaping to include mix of species suitable for seed feeding birds and provide cover for birds.

Objective 6: Create and Manage Foraging and Commuting Bat Habitat

Actions:

1. Avoid light spill greater than 3 Lux onto adjacent habitats suitable for foraging and commuting bats (specifically Crymlyn Burrows SSSI).
2. Create habitats of benefit to invertebrates to provide a food source for bats on Site.

Objective 7: Crymlyn Burrows SSSI

Actions:

1. Implement measures that will be in place to deal with pollution incidents efficiently during construction.
2. Implement measures that will be in place to minimise dust generated during construction.
3. Avoid introduction of non-native species to the Crymlyn Burrows SSSI as a result of the development by using existing seed bank and appropriate seed mixes to create new semi-improved grassland areas.
4. Manage external lighting so that light spill does not exceed 3 Lux on Crymlyn Burrows SSSI.

Objective 8: Ongoing Monitoring and Management

Actions:

1. Monitor the condition of newly created habitats on an annual basis.
2. Replace planting where they have failed or have been damaged.
3. Monitor invertebrates and habitats in the off-Site mitigation area.

5. Prescriptions

5.1 Introduction

The Target Habitats and Species that have been identified as requiring management are listed below.

5.1.1 Target Habitats and Designated Site

- Species rich grassland (off-Site);
- Native species rich planting (on-site); and,
- Crymlyn Burrows SSSI (10 m from the Site).

5.1.2 Target Species

- Small blue butterfly;
- Invertebrates (general);
- Birds; and,
- Bats.

5.2 Target Habitat Management Prescriptions

5.2.1 Creation and Management of Species Rich Grassland (Off-Site)

5.2.1.1 Background

An off-Site mitigation area has been designated (approximately 170 m²). This will be established as species rich grassland to mitigate against loss of the 'Flora Industria Garden' (145 m²).

The soil from the existing 'Flora Industria Garden' will be translocated to the off-Site area. The soil will be of the correct nutrient composition for establishment of the species rich grassland and include the existing seed bank as well as micro-organisms and invertebrate species some of which may be in a larval phase below the ground.

The existing seed bank should provide enough cover for the mitigation area but after a one year growing season, if any gaps are present, they should be seeded. Gaps should be seeded with a Coastal Area Wildflower Mix for example Boston Seeds BS10M Coastal Areas 80/20 Wildflower Meadow. New seed mix should be sown between March and November.

Species which will benefit from management of this habitat:

- Invertebrates;
- Birds (foraging); and,
- Bats (foraging);

5.2.1.2 Establishment

Prepare the off-Site mitigation area (existing bare ground) by removing any existing plants and weeds by hand prior to translocation of the soil.

Move the translocated soil to the off-Site area and cultivate to 10 cm to relieve compaction and create a fine level tilth.

5.2.1.3 Management Prescriptions

Year 1

- Newly established areas are unlikely to flower in the first year. Control growth of weeds by topping or mowing (before they go to seed).
- Top/mow nurse grasses (the first grasses to grow) in March and May. Remove all clippings from the area.
- In September/October cut area to 10 cm and leave cuttings for a week before removing to allow them to shed seeds.
- Mow regrowth through autumn and winter, if needed.

Year 2 and Subsequent Years Once Established

- Sward should be well-established after 12 months.
- Mow in March and September/October. Avoid cutting from mid spring to summer.
- Remove weeds if present.
- If any gaps are present after one growing season, sow seed mix between March and November, ideally in spring or autumn when conditions are optimal. Sow at a rate of 5g/sqm. Once sown, lightly rake area.

General Management

Cutting should be undertaken using hand tools including strimmers or scythes. Do not use lawn mowers. Persistent weeds such as thistles should be dug up (including root) and disposed of in green waste.

Do not use chemical fertilisers and herbicides/ insecticides in these areas.

Provide an interpretation board to explain the purpose and value of the area. Create a path around the area to avoid people from cutting through and trampling the habitat.

Ongoing monitoring will be undertaken. If any areas do not establish successfully or is damaged, the area should be sown to replace lost habitat as detailed above.

For full details on establishment and management refer to Boston Seeds Information provided in Appendix A.

5.2.1.4 Timing

Year 1

- Establish: March to November
- Cut: March, May and September/October.
- Weed Control: As required.

Subsequent Years

- Cut: March and September/October.
- Weed Control: As required.

5.2.2 Creation and Management of Native Species Rich Soft Landscaping (On-Site)

5.2.2.1 Background

An area of 148.18 m² including four planting beds has been allocated as 'Soft Landscaping' within the proposed development boundary. These areas will be seeded with Coastal Area Wildflower Mix for example Boston Seeds BS10M Coastal Areas 80/20 Wildflower Meadow to mitigate against loss of the semi-improved grassland (315.76 m²). The areas will be managed to increase botanical and invertebrate diversity. Interpretation boards should be provided to explain the appearance and management of the area.

Species which will benefit from management of this habitat:

- Invertebrates;
- Birds (foraging); and,
- Bats (foraging).

5.2.2.2 Establishment

Soil must be nutrient poor subsoil. Prepare soil by removing any existing plants and weeds by hand. Cultivate to 10 cm to relieve compaction and create a fine level tilth. Tread or lightly roll to prepare for sowing.

Sow seed mix between March and November, ideally in spring or autumn when conditions are optimal. Sow at a rate of 5g/sqm. Once sown, lightly rake area.

5.2.2.3 Management Prescriptions

Year 1

- Newly established areas are unlikely to flower in the first year. Control growth of weeds by topping or mowing (before they go to seed).
- Top/mow nurse grasses (the first grasses to grow) in March and May. Remove all clippings from the area.
- In September/October cut area to 10 cm and leave cuttings for a week before removing to allow them to shed seeds.
- Mow regrowth through autumn and winter.

Year 2 and Subsequent Years, Once Established

- Sward should be well-established after 12 months.
- Mow in March and September/October. Avoid cutting from mid spring to summer.
- Remove weeds if present.

General Management

Cutting should be undertaken using hand tools including strimmers or scythes. Do not use lawn mowers. Persistent weeds such as thistles should be dug up (including root) and disposed of in green waste.

Do not use chemical fertilisers and herbicides/ insecticides in these areas.

Ongoing monitoring will be undertaken. If any areas do not establish successfully or is damaged, the area should be sown to replace lost habitat as detailed above.

Provide an interpretation board to explain the purpose and value of the area.

For full details on establishment and management refer to Boston Seeds Information provided in Appendix A.

5.2.2.4 Timing

Year 1

- Establish: March to November
- Cut: March, May and September/October.

- Weed Control: As required.

Subsequent Years

- Cut: March and September/October.
- Weed Control: As required.
- Monitor and replace habitats. As required.

5.2.3 Avoid Impacts on Crymlyn Burrows SSSI

5.2.3.1 Background

Crymlyn Burrows SSSI is located 10 m east of the Site and 350 m east of the off-Site mitigation area. Introduction of non-native species into Crymlyn Burrows SSSI will be avoided as result of the development by using a native species seed mix. Management of grassland will include periodic removal of weeds which will limit their spread into adjacent habitats.

Light spill from the development will be limited to 3 Lux onto adjacent habitats, including Crymlyn Burrows SSSI. Detailed lighting plan is not available at this stage. Consultation has been undertaken with the lighting engineer who has ensured light spill will be avoided onto Crymlyn Burrows SSSI.

Pollution and dust generated during construction will be managed by using standard pollution control measures and standard dust control methods (such as reduce extents of exposed soil where possible, using surfaced/reinforced tracks for site vehicles where possible, and dampening tracks/work areas to limit dust release into the air).

Pollution control measures as required Guidance for Pollution Prevention (GPPs) and where these have not been replaced the Environment Agencies Pollution Prevention Guidelines (PPGs) will be implemented in order to avoid and minimise adverse effects of pollution and runoff on designated sites and surrounding environment.

As of the 17th December 2015 all Pollution Prevention Guidance Documents published by the UK environment agencies were withdrawn. Although they provide useful advice on the management of construction to avoid, minimise and reduce environmental impacts, they should not be relied upon to provide accurate details of the current legal and regulatory requirements and processes. They are referred to in this document alongside other current guidance and in the context of scheme and site specific mitigation measures.

Measures will be employed to minimise dust during the construction works.

Measures will be in place in order to deal with pollution incidents efficiently.

In order to avoid potential pollution effects to the sites during construction, all refuelling and servicing of vehicles will be carried out within a designated area with an impermeable base. To prevent spillages, refuelling will be carried out by pumping through a trigger delivery nozzle. Fuel, oil and other potential contaminants will be stored within bunded tanks to 110% of the volume stored and only the minimum quantity required will be stored on Site. The designated area will be maintained in a secure and clean manner. An adequate quantity of oil absorbent material will be stored on Site and spillages cleared up immediately. All construction equipment will be maintained in good working order and checked regularly for spillages/leaks.

Concrete will either be imported from a local batching plant or a concrete batching plant will be established on Site. The final choice will depend on the chosen contractor, the availability of local supply and the time of year. If concrete is to be batched on Site, appropriate containment and clean-up measures and procedures will be put in place that are in accordance with industry standards. Particular care will be taken when pouring concrete at foundations, following specific method statements to ensure there is no spillage risk or contamination of soils and vegetation.

5.3 Target Species Management Prescriptions

5.3.1 Translocation of Kidney Vetch to Sustain Small Blue Butterfly Population

5.3.1.1 Background

Kidney vetch is the food plant of small blue butterfly, a Section 7 Priority Species. The small blue butterfly overwinters in the roots of kidney vetch. To maintain the population of small blue butterfly within the Swansea University Bay Campus a translocation of kidney vetch on Site should be undertaken.

Information on small blue butterfly including management practices is provided in Appendix B.

5.3.1.2 Establishment

Small blue butterfly use kidney vetch through all of their life cycle. To reduce impacts on small blue butterfly kidney vetch will be translocated over winter when the small blue butterfly is present in the roots in its larval stage following these actions.

- Identify locations of kidney vetch specimens within the Site. Mark locations with small flags and on a Site plan. Identification is easiest over summer when in flower but as the plant is a perennial identification can be undertaken all year.
- Identify suitable receptor sites to translocate specimens. A combination of sites would be of benefit to create small meta populations of small blue butterfly across the Swansea University Bay Campus. Nutrient poor disturbed ground provides ideal growing conditions for kidney vetch. Any nutrient rich top soil should be removed prior to translocation and subsoil mixed with 50% rubble (crushed lime, railway ballast, road waste (excluding tarmac) etc.)
- Appoint an appropriate landscape management contractor to undertake translocation of specimens and an ecologist to supervise translocation of specimens.
- Translocate specimens at the appropriate time of year when the small blue butterfly larvae are present in the roots. This can be through from October until mid-March. Turfs should be dug around the kidney vetch making sure the whole root is included and no damage to roots occurs.
- Locations of translocated kidney vetch should be clearly marked on a plan and provided to the grounds staff.

5.3.1.3 Management Prescriptions

- Implement suitable management to ensure survival of the specimens. This will be a different regime to that in the semi-improved grassland areas. A small area could be designated for small blue butterfly management within the off-Site mitigation area (this should be clearly marked to avoid potentially damaging management practices) or the kidney vetch receptor sites could be in alternative locations (preferred option). Management will include regular disturbance of ground using hand tools, this should be undertaken bi-annually on a rotational basis (leaving some areas undisturbed each year). As kidney vetch benefits from disturbance, creating habitat in disturbed areas such as alongside footpaths could be an option. Cutting of kidney vetch swards must be avoided.
- Do not use chemical fertilisers and herbicides/ insecticides in these areas.
- Kidney vetch locations must be recorded and included on documents provided to maintenance contractors to avoid mowing.
- Information on small blue butterfly including management practices is provided in Appendix B.

5.3.1.4 Timing

Pre-Translocation

- Identify and mark kidney vetch during flowering season (ideally late spring to early autumn).

Translocation

- October until mid-March.

Subsequent Years

- Ongoing management, avoid cutting.
- Bi-annual rotational disturbance of ground.

5.3.2 Create and Manage Habitats for Invertebrates

5.3.2.1 Background

The existing semi-improved grassland provides habitat for a range of invertebrate species.

Newly created habitats will increase available invertebrate habitat. As the Site is part of a Bug Life B-Line corridor this will be of benefit to local invertebrate conservation.

A dry stone wall should be built around the off-Site mitigation area to surround the 'Flora Industria Garden' this will provide shelter and over wintering habitat for invertebrates using the semi-improved grassland. Log piles should be provided within the 'Flora Industria Garden' to provide shelter and hibernate.

5.3.2.2 Establishment

- Build a low stone wall (e.g. 0.5 m tall) around the 'Flora Industria Garden' this should be non-uniform to provide a variety of sized holes and face in multiple directions to provide a variety of climatic conditions.
- Create at least two log piles within the 'Flora Industria Garden'.

5.3.2.3 Management Prescriptions

- Manage species rich grassland as described in Section 5.2.1. and 5.2.2; this will benefit invertebrates.
- Do not use pesticides or herbicides.

5.3.2.4 Timing

Establishment

- Not constrained by timing

Subsequent Years

- Manage grassland as described in Section 5.2.1. and 5.2.2.
- Rebuild the wall and log piles if they become damaged.

5.3.3 Create and Manage Habitats for Breeding Birds

5.3.3.1 Background

The Site currently provides habitat for breeding birds. Natural habitats for breeding birds will be absent in the new building design. Bird boxes should be provided, boxes for swifts should be provided.

Creating diverse species rich grassland as described in Section 5.2.1 will be beneficial to seed feeding birds.

5.3.3.2 Establishment

Swift Conservation provides advice on design and location of swift boxes, available at <http://www.swift-conservation.org/Nestboxes%26Attraction.htm>

5.3.3.3 Management Prescriptions

- If boxes become damaged, then these will be replaced.

5.3.3.4 Timing

Surveys for swift should be undertaken annually between May and August.

Replacement of damaged swift boxes should be undertaken outside of nesting birds season (replacement between September and end of February).

5.3.4 Create and Manage Habitats for Foraging and Commuting Bats

5.3.4.1 Background

The existing Site provides limited opportunities for foraging bats.

The newly created habitats will benefit foraging bats. Lighting will be designed as to not impact foraging and/or commuting bats.

5.3.4.2 Establishment

Establishment of species rich grassland as detailed in Section 5.2.1 and 5.2.2 will increase invertebrate diversity and benefit foraging bats.

Consultation with the lighting designer has been undertaken. Lighting onto new and existing bat habitats will be limited to 3 Lux.

5.3.4.3 Management Prescriptions

Species rich grassland will be managed as detailed in Section 5.2.1 and 5.2.2.

5.3.4.4 Timing

Timing of works will be as detailed in Section 5.2.1 and 5.2.2.

5.3.5 Ongoing Management and Monitoring

Monitoring of new habitats will be undertaken annually by the Swansea University Biodiversity Officer to monitor uptake of habitats and where ant habitat replacement is required. Monitoring of species will be undertaken by students and/or the Swansea University Biodiversity Officer. This will include monitoring of swift boxes, a small blue butterfly count, invertebrate and botanical surveys in the translocated 'Flora Industria Garden' (off-Site) and species rich grassland (on-site). The frequency of these will be dependent on availability of people and time to undertake these surveys but as a minimum should be undertaken once every 5 years. Records of species will be submitted to the LERC following the survey by the Swansea University Biodiversity Officer.

Results of monitoring surveys will be documented and fed into the Swansea University Biodiversity Action Plan by the University Biodiversity Officer. Results will be provided to the LERC.

5.3.5.1 Monitoring of Habitats

The success of the establishment of translocated 'Flora Industria Garden' (off-Site) and species rich grassland (on-site) will be assessed by monitoring the habitat during the first 1 – 2 years following seeding. Areas of translocated kidney vetch will be monitored during years 1 and 2 to check that these have established. A report will follow the monitoring visit and detail any remedial action, if required, and will be issued to the management team. Remedial action should be taken should any areas not be successfully establishing. This will include dominance of grasses over wildflowers, presence of undesirable weeds such as thistle, nettle and bramble and areas of bare earth. Appropriate remedial actions will follow the monitoring visit if necessary, for example, temporary fencing off an area if excessive trampling is occurring, or re-seeding areas where germination has not been successful). The management team should seek advice from either an ecologist, a landscape specialist or horticulturalist if they are unsure on the appropriate remedial action to take.

Following initial monitoring of establishment, in subsequent years condition of habitats will be monitored and further habitat management including weed control and re-seeding undertaken as required.

5.3.5.2 Species Surveys

The following species surveys should be undertaken at least once every five years. These will take form of informal surveys and will not require specialist surveyors. They can be undertaken during a biodiversity or wellbeing event or undertaken by volunteers.

Botanical Survey

A botanical survey will be undertaken in the 'Flora Industria Garden'. This should be undertaken over summer (April to September) and include an early and late season survey. The survey will take form of a 'Bio-Blitz' survey where

as many species as possible are identified. A specialist survey to include an exhaustive list of species is beyond the scope of this survey. All records will be submitted to the LERC.

Swift Box Survey

The use of the newly installed boxes by swifts will be determined through three monitoring visits undertaken during the breeding season. It is recommended that the surveys are undertaken during the period May to August and separated by a minimum of 2 weeks. Numbers of adult pairs using nest boxes and breeding will be documented. Records should be submitted to the LERC and RSPB swift monitoring project <https://www.swiftsurvey.org/Rspb/Home/SubmitRecord>.

Small Blue Butterfly Count

A survey will be undertaken between mid-May and June. The survey will include the 'Flora Industria Garden' and kidney vetch translocation sites. All adult small blue butterflies will be counted. Results will be documented and submitted to the LERC.

Invertebrate Survey

A minimum of two surveys will be undertaken between April and September. These should be spaced to include an early and late visit. The survey will be undertaken in the 'Flora Industria Garden' and will take form of a 'Bio-Blitz' survey where as many species as possible are identified. A specialist survey to include an exhaustive list of species is beyond the scope of this survey. All records will be submitted to the LERC.

5.3.5.3 Monitoring Timing

- Botanical survey – April-September (include an early and late visit).
- Swift survey May-August
- Small blue butterfly survey mid-May – June.
- Invertebrate survey – April – September (include an early and late visit).
- .

6. Work Programme

6.1 Key Responsibilities

The key responsibilities are:

- LHMP Objectives are met and management actions are carried out;
- Ecology is considered during management decisions which affect the external Site areas; and,
- Management actions described in this document are carried out.

A matrix showing the individuals/organisations responsible for various tasks is outlined in Table 6.1. For each organisation, an individual should be identified and appointed to take on the responsibilities as detailed below.

Table 6.1 Responsibilities for Landscape and Habitat Management

Name of Organisation	Responsibilities	Signature
Appointed contractor	Translocate and create new species rich grassland in mitigation and enhancement areas.	
Swansea University	Manage species rich grassland and soft landscaping.	
Ecologist	Identify kidney vetch and suitable translocation habitats.	
Appointed contractor/ Ecologist	Translocate kidney vetch. Supervised by ecologist.	
Appointed contractor	Create new invertebrate habitats including wall and log piles.	
Appointed contractor/	Install swift boxes.	
Appointed contractor	During construction, follow best practices with regards to pollution prevention and dust control measures.	
Swansea University	Ensure lighting is installed to avoid light spill above 3 Lux. Onto Crymlyn Burrows SSSI.	
Swansea University	Undertake monitoring surveys and submit to South East Wales Biodiversity Records Centre (SEWBRc)	
Swansea University	Monitor success of new habitats, feed results back to the maintenance team and take action if required.	

6.2 Five Year Work Programme

The five year work program outlined in Table 6.2 indicates the actions to be taken annually following project completion. These are summarised and the details provided in the Management Prescriptions (Section 5.2 and 5.3) should be followed.

Ongoing management will be required after the five year period; it is recommended this management plan is used as a basis for the on-going management of the habitats and features on Site. The plan considers 'Year 1' to be establishment of a habitat or feature e.g. sowing seed for the species rich grassland. Annual management from years 2 – 5 will be broadly similar each year and can be used to guide ongoing future management beyond the scope of this management plan.

Colour coding has been used in Table 6.2 to show which actions are classified as Legal Obligations, BREEAM obligations and Enhancing Site Biodiversity.

Key to Table 6.2

Legal Obligations	
BREEAM/NRW/Swansea University BAP Obligations	
Enhancing Site Biodiversity	

Table 6.2 Five Year Work Programme								
Feature and management compartment	Initial Action	Timing	Year 1	Year 2	Year 3	Year 4	Year 5	Subsequent years of management
Whole site	Keep a record of wildlife on Site and submit to SEWBRcC. Feed results into Swansea University Biodiversity Action Plan	During species specific survey season	✓	✓				Continue monitoring on a five year basis
Species Management								
Feature and management compartment	Action Summary (see details in Section 5.3)	Timing	Year 1	Year 2	Year 3	Year 4	Year 5	Subsequent years of management
Kidney Vetch/Small Blue Butterfly	Identify kidney vetch on-site and off-Site receptor areas. Prepare off-Site receptor areas as required	Anytime (ideally summer when in flower)	✓	X	X	X	X	N/A
	Translocate kidney vetch	October-March	✓	X	X	X	X	N/A
	Manage areas for kidney vetch and small blue butterfly	After flowering (October onwards)	✓	✓	✓	✓	✓	Continue management annually
	Monitor small blue butterfly population	mid March and August (excluding early-mid July)	✓	✓	✓	✓	✓	Continue monitoring annually
Invertebrates (General)	Manage species rich grassland to increase invertebrate diversity	March and September/October (all years)	✓	✓	✓	✓	✓	Continue management annually
	Create a stone wall around off-Site mitigation area. Manage/re-create features periodically	Anytime	✓	X	X	X	X	Manage/recreate as required
	Invertebrate survey	April-September (include an early and late visit)	✓	✓	✓	✓	✓	Continue monitoring annually
Breeding Birds	Manage species rich grassland to increase value to seed feeding species	March and September/October (all years)	✓	✓	✓	✓	✓	Continue management annually
	Install swift boxes on building	Anytime	✓	X	X	X	X	Replace boxes if they become damaged
	Monitor swift boxes	May - August	✓	✓	✓	✓	✓	Continue monitoring annually
Bats	Manage species rich grassland to increase invertebrate diversity and value to foraging bats	March and September/October (all years)	✓	✓	✓	✓	✓	Continue management annually

	Work with the lighting engineer to limit lighting onto adjacent habitats	Preconstruction requirement	X	X	X	X	X	N/A
Habitat Management								
Feature and management compartment	Action (see details in Section 5.2)	Timing	Year 1	Year 2	Year 3	Year 4	Year 5	Subsequent years of management
Species Rich Grassland (off-Site)	Prepare off-Site mitigation area	Anytime prior to sowing	✓	X	X	X	X	N/A
	Move soil from 'Flora Industria Garden' to off-Site mitigation area	Anytime prior to sowing	✓	X	X	X	X	N/A
	Sow species rich seed mix in areas which have not established after one growing season	March - November (avoid mid summer)	✓	X	X	X	X	Reseed if areas that do not establish.
	Management of species rich grassland including mowing and control of weeds.	March and May (year 1) March and September/October (all years)	✓	✓	✓	✓	✓	Continue management annually
	Habitat survey – results to be fed into management plan and remedial action undertaken if required.	April-September (include an early and late visit)	✓	✓	✓	✓	✓	Continue monitoring annually
Soft Landscaping (on-site)	Prepare ground and sow native species rich seed mix	March - November (avoid mid summer)	✓	X	X	X	X	Re-plant areas that do not establish
	Management of species rich grassland including mowing and control of weeds.	March and May (year 1) March and September/October (all years)	✓	✓	✓	✓	✓	Continue management annually
Designated Sites								
Feature and management compartment	Action (see details in Section 5.3)	Timing	Year 1	Year 2	Year 3	Year 4	Year 5	Subsequent years of management

Crymlyn Burrows SSSI	Control of pollution and dust during construction	Preconstruction requirement	X	X	X	X	X	N/A
	Work with the lighting engineer to limit lighting onto adjacent habitats	Preconstruction requirement	X	X	X	X	X	N/A
	Weed control within landscaped areas	March-October	✓	✓	✓	✓	✓	Continue management annually

7. References

AECOM (2020) Swansea University Bay Campus Centre for Integrative Semiconductor Materials (CISM) BREEAM Ecology Report.

AECOM (2019) Swansea University Bay Campus Centre for Integrative Semiconductor Materials (CISM) Preliminary Ecological Appraisal (PEA).

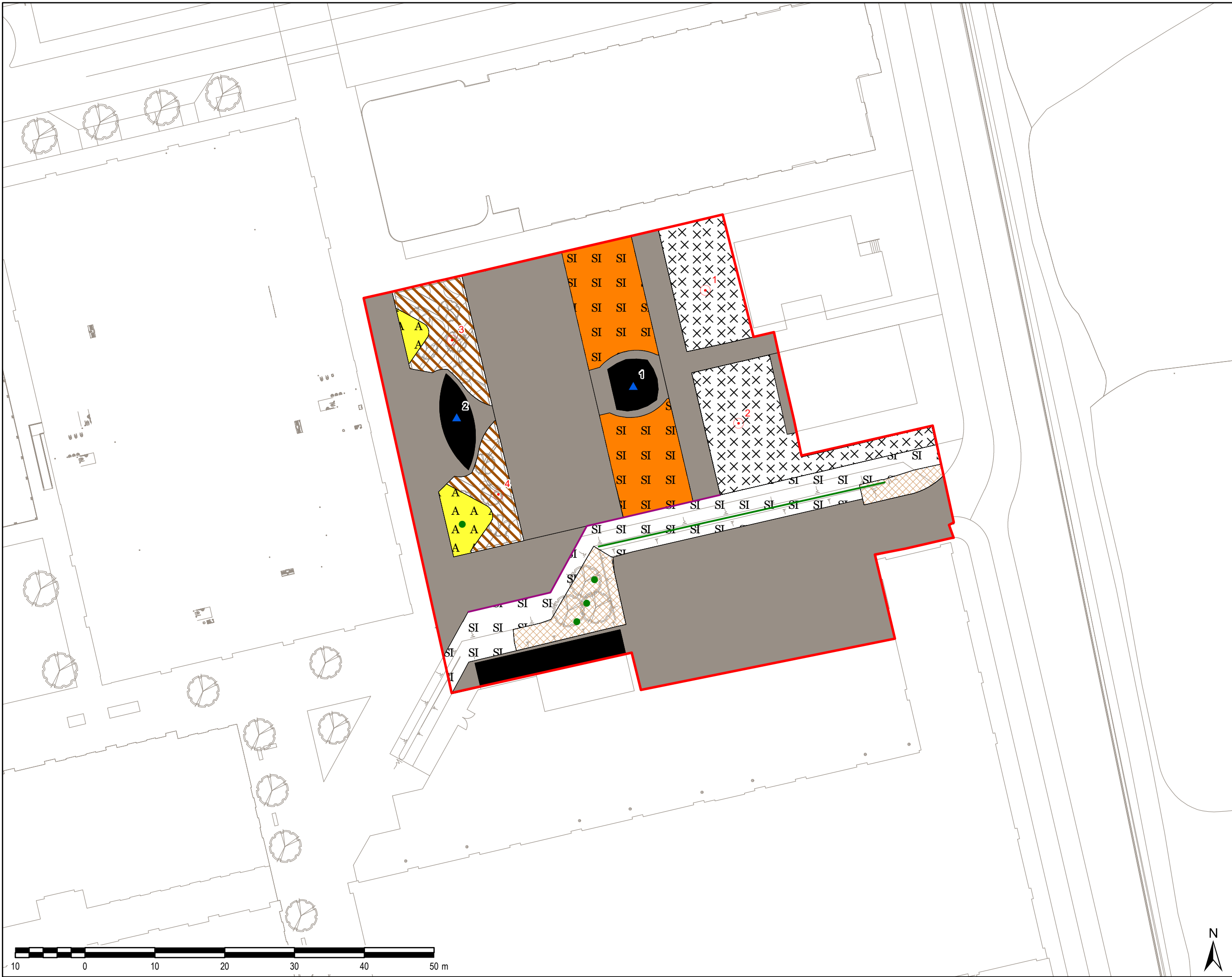
BREEAM UK (2018). BREEAM UK New Construction Non-domestic Buildings (Wales) Technical Manual SD5078: BREEAM UK New Construction 2018 2.0.

CIEEM (2019). Code of Professional Conduct. Chartered Institute of Ecology and Environmental Management (CIEEM) January 2019.

Joint Nature Conservation Committee (JNCC). (2010). Handbook for Phase 1 Habitat Survey – A Technique for Environmental Audit. JNCC. Peterborough.

Swansea University Biodiversity Working Group (2016). Swansea University Biodiversity Action Plan 2016 – 2020.

Figure 1 - Phase 1 Habitat Plan



PRELIMINARY ECOLOGICAL APPRAISAL

SWANSEA UNIVERSITY

LEGEND

Site Boundary

Target Notes

Trees

Bat Roost Potential for

Negligible

Phase 1 Habitat Linear

Intact Hedge - Species-Poor

Wall

Phase 1 Habitat

Neutral Grassland - Semi-Improved

Poor Semi-Improved Grassland

Other Tall Herb and Fern – Ruderal (Native Species Planting)

Cultivated/Disturbed Land - Amenity

Cultivated/Disturbed Land - Ephemeral/Short Perennial

Introduced Shrub

Buildings

Hardstanding

Copyright:

Ordnance Survey data © Crown
copyright and database right 2016.
Supplied by Welsh Assembly
Government.

AECOM Internal Project No:

60605215

Drawing Title:

PHASE 1 HABITAT PLAN

Scale at A3: 1:500

Drawing No:

FIGURE 1

Drawn: Chk'd: App'd: Date:

GM CM LN 05/02/20



Figure 2 - Landscape Outline Plan

LEGEND

- Extent of Site works**
- Proposed paving**
Chacon andover textured concrete setts 200x300mm x 80mm, silver fleck colour laid in stretcher course pattern.
- Proposed concrete**
Impermeable insitu concrete surfacing with stamped pattern to finish, non porous mortar jointing to expansion joints. Build ups to Engineers specifications. Sump and specialised drainage to Engineers specifications.
- Existing concrete replaced and extended**
Concrete surface and build ups to Engineers specifications.
- Existing tarmac replaced and extended**
Tarmac surface dressing and build ups to Engineers specifications.
- Proposed planting**
Refer to drawing no. 152296-XX-00-DR-L-09140
Soft Landscape Plan for details.
- Proposed kerb**
125 x 150 x 915mm concrete kerb.
- Proposed edging**
50mm concrete edging laid flush.
- New and existing tie ins**
New surfacing ties with existing surfacing and levels.
- Proposed anti-climb fence line**
1.8m high, CLD fencing mesh in back colour. Vehicular gates to be included.
- Bench**
Factory Furniture timber hardwood serpentine bench fixed to concrete base, re-used from existing site.
- Bollards**
Fixed. Marshalls polyurethane 'waterside' bollard 1.0m high x 175mm dia, anti-ram version in powder coated black colour with contrasting reflective band.
- Litter Bin**
Furnitubes zenith S55 litter bin, stainless steel fitted with stubbing plate.

S1	P10	06.02.20	For team review
STATUS	REV	DATE	DESCRIPTION
CLIENT	REVISD BY CCM		
Swansea University			CHECKED BY CS
			ORIGINATOR NO 152296

CONSULTANT
STRIDE TREGLOWN
www.stridetreglown.com © Stride Treglown Limited 2019
PROJECT
CISM
SU Bay Campus

DRAWING TITLE
Hard Landscape and External Furniture Plan

SUITABILITY STATUS
S1 : SUITABLE FOR CO-ORDINATION
SCALE
1 : 200 @ A1

PROJECT | ORIGINATOR | ZONE | LEVEL | TYPE | ROLE | CLASS | NUMBER
152296-STL-XX-00-DR-L-ZZZZ-09101
REVISION
P10

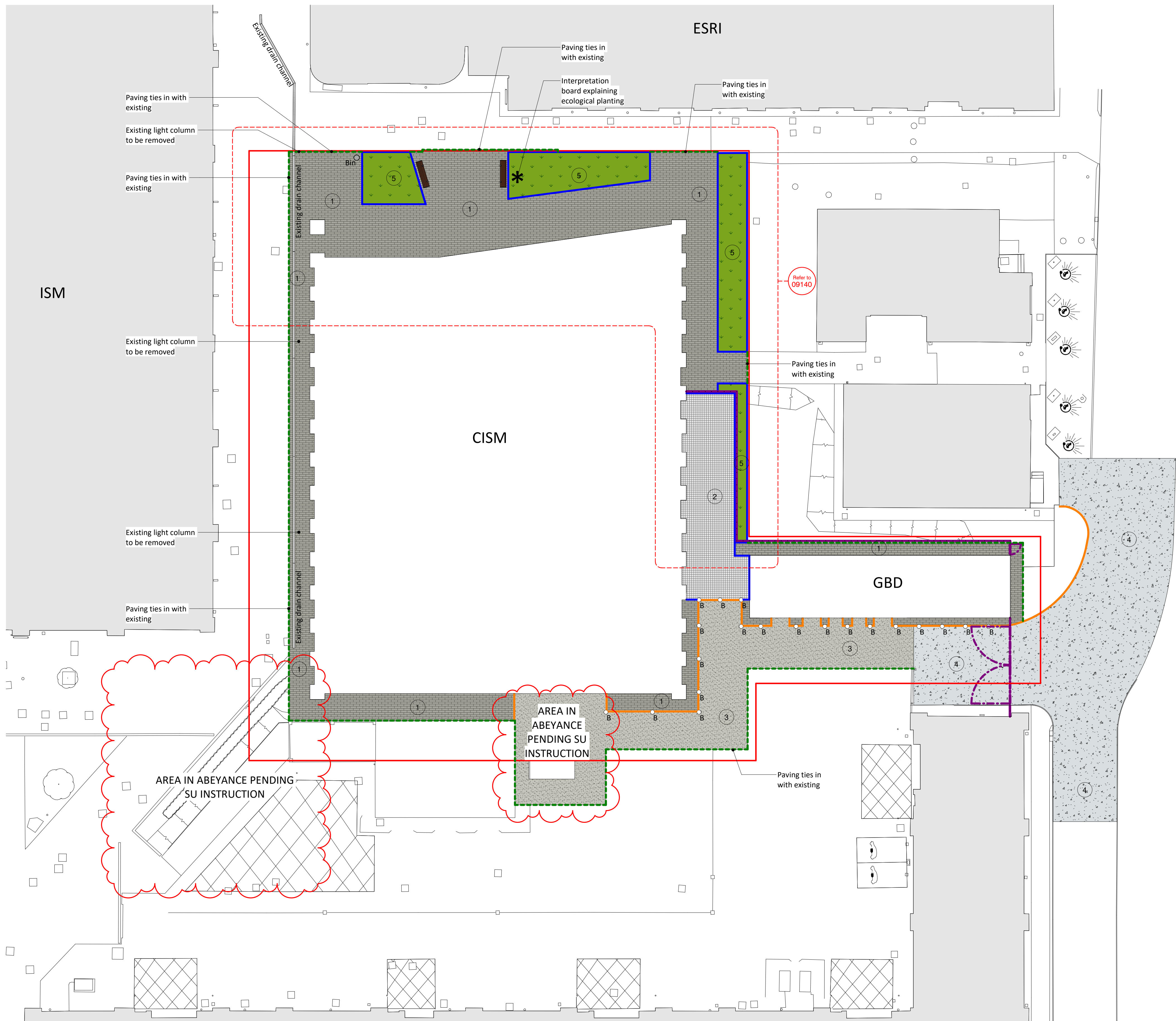
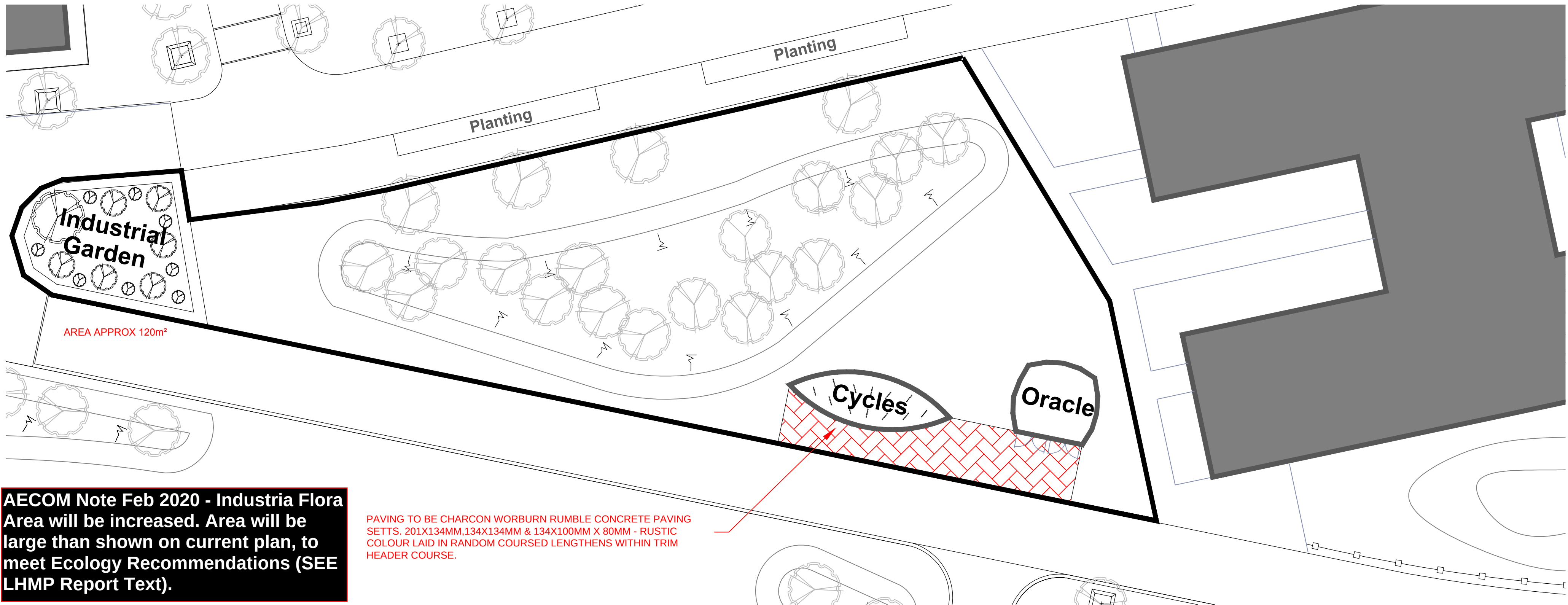
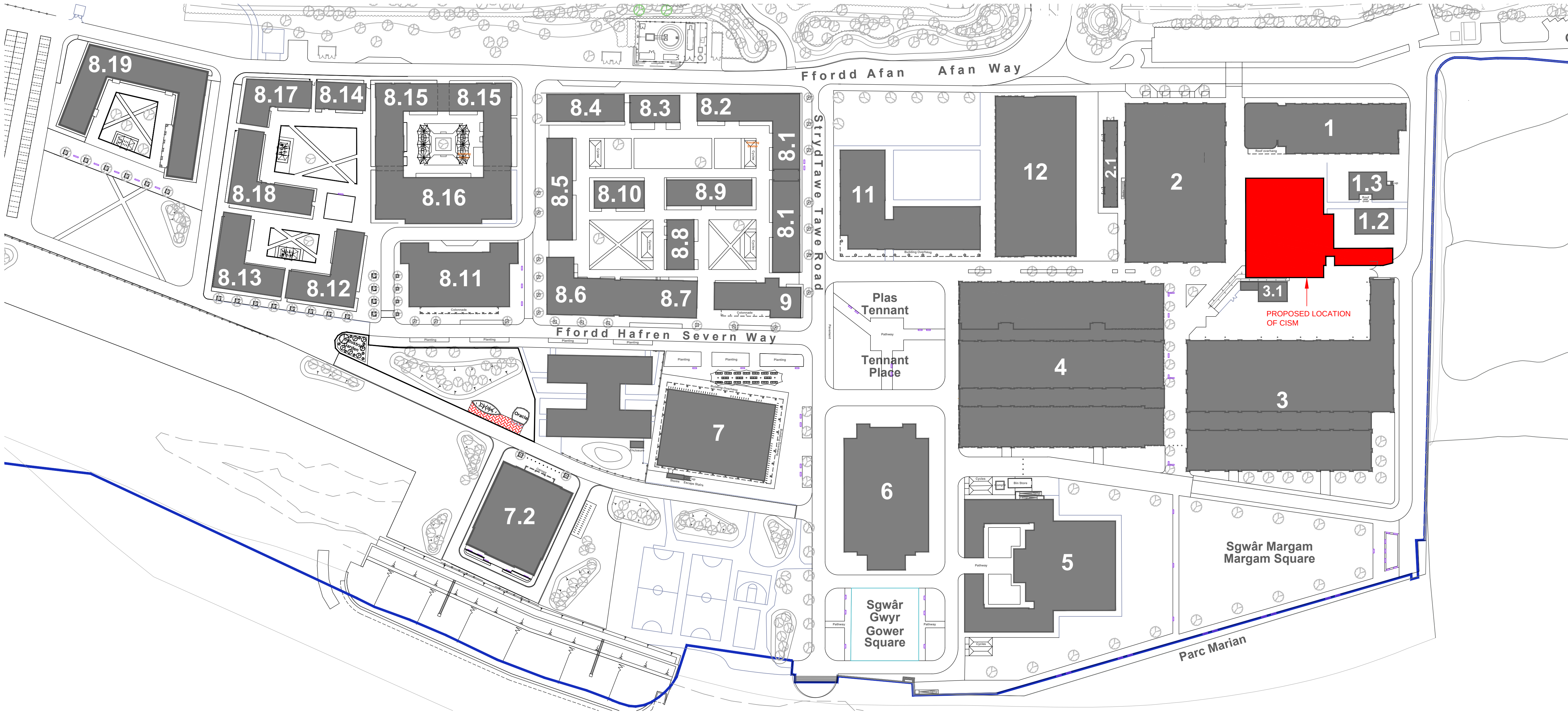


Figure 3 - CISM Relocation of 'Flora Industria Garden'



AECOM Note Feb 2020 - Industria Flora Area will be increased. Area will be large than shown on current plan, to meet Ecology Recommendations (SEE LHMP Report Text).

PAVING TO BE CHARCON WORNBURN RUMBLE CONCRETE PAVING SETTS. 201X134MM,134X134MM & 134X100MM X 80MM - RUSTIC COLOUR LAID IN RANDOM COURSED LENGTHENS WITHIN TRIM HEADER COURSE.

THIS DRAWING IS COPYRIGHT
THIS DRAWING MUST NOT BE SCALED.
PROPOSED AREA TO ACCOMMODATE THE
RELOCATION OF CYCLE SHELTER, ORACLE
AND KEW INDUSTRIAL GARDEN. EXACT
LOCATIONS TBC.

Revision:		Description:	
		Prifysgol Abertawe Swansea University	
Estates Services Department, Singleton Park, Swansea, SA2 8PP Adran Gwasanaethau Ystadau, Parc Singleton, Abertawe, SA2 8PP Tel: +44 (0) 1792 295240 Ffôn: +44 (0) 1792 513476 Fax: +44 (0) 1792 295240 Ffôn: +44 (0) 1792 513476			
Project:		BC-01-03 CISM	
Title:		Existing Building Relocations	
PRELIMINARY			
Scale: AS NOTED	Drawn: --	Checked: --	Rev. A
Date: JULY 2018	Size: A1	Drawing No. --	

Appendix A Boston Seeds Growing and Maintenance Instructions

BS10M Coastal Areas 80/20 Wildflower Meadow

bostonSEEDS

BS10M contains nineteen native British wildflowers and grasses typically found in coastal meadows.

Consisting of 80% grass and 20% wildflowers, BS10M creates a permanent meadow with flowers from May to October. Suitable for creating habitats in coastal areas, sandy or stony loams, calcareous loams and moderately saline soils.

BS10M supports bees, butterflies and other pollinators as 89% of the wildflowers included in this mixture are recommended by the Royal Horticultural Society (RHS) as 'Perfect for Pollinators'.



Mixture Contents:

Common Name	Latin Name	Quantity	Flowers	Height	Type
1 Bedstraw, Lady's	Galium verum	1.2%	Jun - Sep	50 - 80cm	Perennial
2 Campion, Bladder	Silene vulgaris	0.8%	May - Sep	25 - 60cm	Perennial
3 Carrot, Wild	Daucus carota	1.2%	Jun - Oct	30 - 100cm	Perennial
4 Cat's-ear, Common	Hypochaeris radicata	0.4%	Jun - Oct	15 - 50cm	Perennial
5 Clover, Haresfoot	Trifolium arvense	2%	Jul - Sep	10 - 30cm	Annual
6 Daisy, Ox-eye	Leucanthemum vulgare	1.2%	May - Sep	20 - 100cm	Perennial
7 Evening-primrose	Oenothera biennis	1%	Jun - Oct	60 - 100cm	Biennial
8 Goat's-beard	Tragopogon pratensis	1%	Jun - Sep	20 - 60cm	Biennial
9 Knapweed, Common	Centaurea nigra	2%	Jun - Sep	30 - 80cm	Perennial
10 Knapweed, Greater	Centaurea scabiosa	1.2%	Jun - Sep	50 - 90cm	Perennial
11 Marigold, Corn	Chrysanthemum segetum	0.6%	Jun - Oct	30 - 50cm	Annual
12 Poppy, Common	Papaver rhoeas	0.6%	May - Jul	50 - 70cm	Annual
13 St John's-wort, Common	Hypericum perforatum	0.8%	Jun - Sep	30 - 90cm	Perennial
14 Toadflax, Common	Linaria vulgaris	0.8%	Jun - Oct	30 - 90cm	Perennial
15 Trefoil, Bird's-foot	Lotus corniculatus	1.2%	Jun - Aug	10 - 40cm	Perennial
16 Vetch, Kidney	Anthyllis vulneraria	1.6%	May - Oct	15 - 50cm	Perennial
17 Viper's Bugloss	Echium vulgare	0.6%	May - Oct	50 - 100cm	Biennial
18 Yarrow	Achillea millefolium	0.8%	Jun - Oct	20 - 100cm	Perennial
19 Yellow-rattle	Rhinanthus minor	1%	Jun - Sep	25 - 50cm	Annual
Bent, Common	Agrostis castellana	4%		50 - 100cm	Grass
Bent, Creeping	Agrostis stolonifera	4%		40 - 100cm	Grass
Fescue, Sheeps	Festuca ovina	22.4%		15 - 50cm	Grass
Fescue, Slender Creeping Red	Festuca rubra, litoralis	28%		10 - 20cm	Grass
Saltmarsh Grass	Piccinellia maritima	4%		40 - 80cm	Grass
Meadow Grass, Smooth Stalked	Poa pratensis	8%		30 - 90cm	Grass
Timothy, Small Leaved	Phleum pratense ssp Bertolinii	9.6%		50 - 100cm	Grass

Contains:



Sowing Rate: 5g/sqm

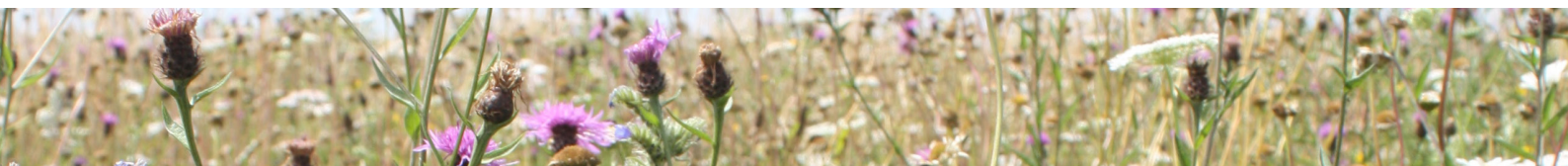
Wildflower seed in Boston Seeds mixtures is of UK native origin.

The definition of UK native seed provided by Natural England is: *British native-origin seed refers to seed originally collected from wild populations in Great Britain (from sites with no known history of sowing of amenity or agricultural varieties) and either sown directly, or grown on as a field crop to provide further seed. It includes seed collected in 'green hay'. It excludes certified amenity or agricultural varieties of native species.*

Boston Seeds UK native wildflower seed is sourced in two ways:

- 1) Seed collections from the wild which are field sown or sown in modules before being field planted as spaced plants. These are then harvested and cleaned to increase seed germination, vigour and purity.
- 2) Meadow collections are taken with owner permission or under license if the meadow is within a registered area. These seeds are then processed to remove excessive admixture and graded so they can be used in measurable amounts in prescribed mixtures.

Contents of wildflower mixtures will vary according to seed and species availability



Prepare the Ground

BS10M Coastal Areas Wildflower Meadow seed mixture performs best in low nutrient soils, which haven't been heavily fertilised in the past. For best results sow into bare soil after clearing all existing plants and weeds from the area.

Cultivate the ground to a depth of 10cm to relieve compaction and create a fine level tilth, free from obstructions (to allow for mowing at a later stage). Finish the seedbed by treading or lightly rolling the area, so that it is firm enough to stand on without leaving indentations.

Where weeds have been prevalent, allow a flush of weeds to germinate and remove these before sowing. In areas of high fertility, it may be necessary to remove the topsoil and sow into the subsoil. High nutrient soils encourage weeds and fast growing grasses which may outcompete the wildflowers in this mixture.

For overseeding into existing grassland, use a pure wildflower seed mixture such as BS10P or BSRE.

Sowing

BS10M should be sown between March and November. Spring and autumn provide ideal conditions as moisture and warmth are in good supply.

Distribute seed with a handheld or pedestrian spreader, at the recommended sowing rate of 5g/sqm. Mix the wildflower seeds with an inert carrier (such as sharp sand), at a ratio of four parts sand to one part seed (by weight). This makes it easier to achieve an even distribution and also provides a visual marker, making it easier to see any missed patches and avoid seeding areas twice.

Regularly mix the seed when sowing, as seeds will naturally separate due to variations in size and weight.

Once sown, ensure good 'seed to soil' contact by lightly raking to a depth of 0.5cm or rolling the area.

It is also possible to broadcast, drill or hydroseed this mixture for larger or hard to reach areas. However, broadcast spreading throws heavier seeds further so this may impact the distribution and when drilling, the seed must not be buried deeper than 0.7cm.

Sowing Rate

The sowing rate of 5g/sqm is designed to produce optimum results. Reducing the sowing rate is likely to result in invasion from weed species. Increasing the sowing rate generally leads to reduced diversity as the more aggressive species will outcompete slower growing plants.

Maintenance First Year

BS10M contains mainly perennial species, which can be slow to establish and are unlikely to flower in the first year. Therefore it is important to control weed and grass growth in year one.

During the first year remove any weeds which grow before they run to seed, either by topping, mowing or by hand for smaller areas. Weed growth is common due to the action of disturbing the ground (rather than being caused by contaminated seed mixtures).

The nurse grasses are the first to grow and require topping or mowing in March and again in May. Remove all clippings to ensure the grass canopy doesn't interfere with the germination and spring growth of the wildflowers.

In September / October cut the area to 10cm using a scythe, strimmer or mower, leaving the cuttings for up to a week before removing. This allows them to dry and shed seeds back into the soil. Mow or graze the re-growth through autumn/ winter and again in early spring if needed.

Second Year

After twelve months the sward should be well established. Simply follow the same cutting pattern (in March and September/October). Avoid cutting from mid spring to summer to ensure best flowering results.

As an ongoing process, observe and remove any weeds which invade the area.

Over time, some species within the mixture may become more dominant due to environmental factors and natural selection. To encourage diversity, simply reduce the number of dominant plants in order to restore the balance. In some areas with more dominant grasses, it may be necessary to overseed occasionally with a pure wildflower mixture such as BS10P or BSRE to ensure the wildflowers remain competitive.



As members of Flora Locale, Boston Seeds follows a strict code of practice to ensure wildflower seed is of UK native origin and is harvested and grown responsibly to aid conservation and help protect native UK wild plants.



In BS10M 89% of the wildflower species included are recognised by the Royal Horticultural Society as supporting many of the 1500 species of pollinating insects across the UK.

Appendix B Small Blue Butterfly Fact Sheet



Cupido minimus

The Wildlife and Countryside Act (1981) specifies that a licence is needed for trading in this species. Fully protected in Northern Ireland.

The Small Blue is single brooded with adults usually flying from mid-May to late June, with a smaller second brood in late July and August. Eggs are laid singly, tucked into young, partially open flower heads of Kidney Vetch; isolated plants or those on the edge of a patch are often selected. Larvae feed on the developing flowers, burrowing into the floret; they are occasionally tended by ants. Although not unusual to find more than one egg, females do not normally lay on flowers where an egg is already present. Only one larva can mature on a single flower head. From mid-July the larvae are the same size as the florets and can be seen on the flower heads, where they bite holes in the base of the flowers to eat the seeds. When fully grown they descend to the ground and pass the winter in soil crevices or under moss. They pupate the following spring also at ground level.

Although some large populations are known, the butterfly typically forms small, discrete colonies (<30 individuals at peak in most years); adults may not be seen every year with the colony confirmed only by the presence of eggs. It is normally highly sedentary, with adults rarely moving more than 40m and males more sedentary than females. However, far longer movements have been recorded, and there is evidence that mobility may be greater and dispersal more frequent during hotter years. The butterfly has also been known to colonise newly created (e.g. road or rail cuttings) or restored sites several kilometres from existing colonies; natural colonisations are more likely and occur more rapidly if the source population is large and there is good connectivity. Numbers at a site can fluctuate greatly from year to year.

The sole foodplant is Kidney Vetch *Anthyllis vulneraria*. The larvae live only in the flower heads where they feed on developing anthers and seed.

The Small Blue relies on grassland habitats that provide shelter for the adults and early successional conditions where Kidney Vetch can flourish. Such habitats include chalk and limestone grassland especially with naturally occurring broken ground, man-made habitats such as quarries, gravel pits, road embankments, disused railways and other brownfield sites as well as coastal grassland and dunes.

[illegible]