Swansea University
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Crymlyn Burrows SSSI Management Plan 2018-2023

A future vision of Crymlyn Burrows

A pocket of wilderness at the heart of Swansea Bay, loved and cherished by the local community. The dunes, saltmarsh and beach are valued by the University as a place for quiet recreation away from the stresses of academic life as well as being used as a living laboratory for teaching and research in a variety of fields. It is a key place for children from local schools to connect with nature and learn about their natural heritage.

Students, staff and local people are involved in the management of the site, both on the ground as volunteers and also engaged in decisions about its future management.

The quality of the habitats improve as management takes effect and invasive species are removed, and the site once again supports thriving populations of fen orchid, field wormwood, sea stock and strandline beetle. In spring the dunes continue to ring with the song of skylarks, and through autumn and winter the beach supports impressive flocks of wading birds.

As the development of the Fabian Way corridor continues, Crymlyn Burrows becomes increasingly important as a place to escape the hustle and bustle of city life as well as a refuge for wildlife. It forms a key link in a coordinated network of thriving wildlife areas to the east of Swansea, linking with Crymlyn Bog, Pant y Sais Fen, the Tennant Canal, Kilvey Hill and the lower Neath Valley, as well as being part of the wider network of sand dune systems across South Wales, with Crymlyn Burrows and Baglan Burrows managed as a single site, linked rather than divided by the Neath Estuary.

Litter, unfortunately, continues to wash ashore along the beach, albeit in smaller quantities, but it is collected by a keen and growing band of volunteers, before being reused or recycled.

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1. Introduction

1.1 Site description, ownership and past management

Crymlyn Burrows comprises 244ha of sand dune, saltmarsh and beach on Swansea Bay between Swansea University's Bay Campus and the Neath River. The whole site lies in the County Borough of Neath Port Talbot. The site was designated as a Site of Special Scientific Interest (SSSI) under the Wildlife and Countryside Act in 1987. The north east corner of the SSSI is in separate ownership (Swansea Bay Golf Club) and is not included in this management plan. Natural Resources Wales (NRW) have identified a list of potentially damaging operations (see Annex 1), that cannot be carried out without written consent. This includes many of the site management actions included in this plan.

Immediately to the west of the SSSI, to the south of the university campus is a small area of sand dune and beach. This area is effectively a continuation of the designated habitats, with no physical boundary or ecological difference and its management is included in this plan (although it does not share the same legislative protection).

The land on which the Bay Campus was built was previously an oil storage facility for British Petroleum (BP) and although Crymlyn Burrows was also in BP's ownership, it was never developed other than the extreme northern edge of the site, where there are a number of disused underground oil and chemical pipelines and active underground services (gas, water mains etc.) running east-west.

The oil storage depots, pipelines, docks and nearby factories were heavily targeted by German bombers during WWII and there is the potential for unexploded ordnance beneath the surface of the site. A desk study was carried out (MACC, 2017) and concluded that there is a significant risk, particularly when drilling or carrying out mechanical excavation. The report should be consulted when carrying out risk assessments for any ground penetrating activities.

Ownership of the SSSI was transferred to St Modwen Developments ltd prior to construction of the Bay Campus, and although still owned by St Modwen (November 2017), it is anticipated that ownership will eventually be transferred to Swansea University. While St Modwen remain the landowner, their approval of risk assessments and method statements must be granted before any activities or management works are undertaken.

An area of sand dunes at Baglan Burrows, lying across the Neath river from Crymlyn Burrows and also in the ownership of St Modwen has been selected for conservation management in compensation for habitat lost to development at the south of the Bay Campus. This "dune compensation area" currently has no legal conservation designation and has its own management plan (Atkins, 2015a). Under a schedule 106 agreement it is required to be managed for wildlife as long as the Bay Campus is in operation. Although the two sites are currently managed under separate plans, they are effectively two parts of a single site and are both overseen by the same committee, ensuring that management is coordinated. This committee comprises representatives of the University, St Modwen, NRW, the local planning authority and since 2017, the Wildlife Trust of South and West Wales (WTSWW) who are employed to manage the Baglan Burrows dune compensation area.

An initial management plan for the SSSI was produced in 2015 (Atkins, 2015b) – this iteration replaces that plan. Since January 2016 there has been a warden in post, employed by the University.

Map 1. Aerial overview of the terrestrial part of the SSSI

Map 2. Crymlyn Burrows management compartments

NB the intertidal area of SSSI continues south to the mean low water mark of spring tides, and to the north east under private ownership. This is a dynamic area and exact boundaries between compartments follow the habitat boundaries rather than fixed lines on a map.

1.2 Ecology and wildlife

The SSSI citation for Crymlyn Burrows (see Annex 1) describes the site as:

> "One of the last remaining sections of the Swansea Bay coastline which has remained substantially unmodified by industrial development. Over the past one hundred and fifty years, parallel sand dune ridges have developed at right angles to the River Neath and these are continuing to accumulate at the present time. Salt water is able to gain access to the system at high tide via the river channel, with the result that the dunes are interspersed by tongues of saltmarsh. These grade westwards into wet dune slacks and carr woodland.
>
> Several plant species with local distribution occur within the site including rock sea lavender *Limonium binervosum*, dittander *Lepidium latifolium*, rock hutchinsia *Hornungia petraea*, round leaved wintergreen *Pyrola rotundifolia*, dutch rush *Equisetum hyemale* and the variegated horsetail *Equisetum variegatum*. The rare fen orchid *Liparis loeselii* is found occasionally within the slacks, whilst the sea stock *Matthiola sinuata* which was re-recorded in 1964 following its earlier disappearance, is widespread along the strandline and in the dunes.
>
> The rare strandline beetle *Eurynebria complanata* has been recorded from the site.
>
> This part of the Neath Estuary is also used by part of the population of small waders overwintering in Swansea Bay."

There have been a number of changes to the site since designation. The lack of management and grazing has led to the stabilisation of the dunes and gradual succession towards scrub and woodland. A number of invasive species are present, notably Japanese rose *Rosa rugosa*, Japanese knotweed, *Falopia japonica*, sea buckthorn *Hippophae rhamnoides*, *Cotoneaster spp*, holm oak *Quercus ilex*, Michaelmas daisy *Aster amellus* and early goldenrod *Solidago juncea*.

Fen orchid has not been recorded since 1995 and the last record of the strandline beetle was in 1997. Sea stock has again almost disappeared from the site, with only one known specimen surviving, and the very rare field wormwood *Artemesia*

campestris which was discovered in the northerly dunes (and successfully propagated in the national collection) has since declined and a trial reintroduction failed, but could be repeated in the future if resources allow.

Rabbits provide the only grazing on site, their distribution is patchy and the population varies widely as a result of disease and weather; areas of scrub provide important protection, especially during periodic outbreaks of myxomatosis.

The strip of foredunes along the top of the beach is a particularly dynamic environment, with rapid changes between accretion and erosion. The general trend in recent years is for accretion at both ends of the beach with erosion of the established dunes in the centre of the site where a depression in the intertidal area has allowed wave action to reach the dunes when high tides coincide with rough seas. There is a general movement of sediment along the beach from west to east, where it encroaches onto the navigation channel of the Neath Estuary and periodic dredging is carried out to maintain the channel.

The importance of Crymlyn Burrows for overwintering waders has increased in recent years, with the high tide roost regularly holding over 1% of the UK's winter population of sanderling as well as good numbers of ringed plover, dunlin and oystercatcher. It is thought that the wader roost has largely moved to Crymlyn Burrows from Blackpill SSSI in recent years, possibly as a result of increased disturbance there by dog walkers (Hipkin, 2016).

Breeding bird surveys have not been carried out, but observations suggest that the dunes are important for ground nesting birds such as skylark and meadow pipit and there is evidence of breeding redshank and shelduck. Other section 7 species present and possibly nesting include ringed plover, linnet, reed bunting, kestrel, cuckoo, grasshopper warbler, dunnock, bullfinch, house sparrow, starling and song thrush.

Mammals known to be using the site include red fox, hedgehog, rabbit, wood mouse, bank vole, common, water and pygmy shrews. Otter and polecat are probable visitors.

Viviparous lizards are widespread through the dunes and some were relocated here during the development of the campus. Despite regular surveys in 2016 and 2017 and during construction of the campus, no other reptile species have been recorded.

The invertebrate assemblage is a feature of the SSSI and includes specialist sand dune species such as the dune tiger beetle and dune chafer.




1.3 Access and use of the site

There are no public rights of way across Crymlyn Burrows SSSI and the area is not designated as open access land, but it is not fenced and has been used for informal recreation for generations. There are two main pedestrian entrances to the SSSI off Fabian Way: from a dedicated 20 space pay and display car park adjacent to the University campus, and alongside a vehicle barrier leading from the Amazon roundabout. A permissive path runs east-west along the north of the site and from the SSSI car park southwards to the beach. Tidal creeks and ditches running from the River Neath largely limit access to the bulk of the site from the north, although a line of old car wheels have been placed as informal stepping stones across the main creek near the Amazon entrance, allowing it to be forded by the brave at low tide. A network of informal permissive paths spread throughout the main body of dunes from the western beach path. Since the construction of the university campus, there is also access along the beach and through the dunes to the west.

Vehicle access is largely prevented by a ditch running parallel to Fabian Way, a barrier next to the Amazon roundabout, a security fence along the SSSI car park and western boundary with the university and a low wall to the south of the campus.

The area is widely used by walkers, especially with dogs and most visitors are on foot, although there is a low level of cycling and horse riding. The beach and estuary are occasionally fished by anglers and bait diggers visit the shore for lugworm, although very infrequently.

Since the university's Bay Campus has been operational there has been very little visible impact on the SSSI, with few staff or students venturing into the main part of the site although there has been an increase in use of the beach, particularly on fine evenings during term time. While recreational use of the beach is encouraged, the localised increase in littering and burning of driftwood as a result of parties on the beach is of concern. To date, most of this activity has been at the western end of the beach and foredunes, outside the SSSI boundary, but with no visible border or ecological difference between the designated and undesignated beach areas, they are managed as a single entity.

The site is regularly used for educational visits, particularly from the Field Studies Council's Margam Field Centre but also others, from as far afield as Pembrokeshire and Hereford, and to a small but increasing degree, Swansea University. The impact of field studies is generally thought to be low and has not been assessed, but does have the potential to cause damage, particularly the unrestricted access of large groups when ground nesting birds are incubating eggs or young and through trampling of sensitive habitats.

Historically there has been a problem with illegal offroading in the dunes, although there has been none in the past two years. Poaching of rabbits has taken place for generations and still continues at a low level, using ferrets and dogs.

1.4 Aims and Objectives

The overall aims of the management plan are:

"to ensure that the features of the SSSI are in favourable condition, with the necessary management in place to keep them that way."

and **"to encourage the enjoyment and use of the site for quiet recreation and as a living laboratory for research and teaching."**

To help achieve these aims, the following objectives have been set:

1. Protect the site from damage and disturbance by visitors (both from the university and wider public).
2. Maintain the extent of key habitats, i.e. intertidal sand and mudflats, strandline, embryo dunes, mobile dunes, dune grassland and saltmarsh (subject to natural change).
3. Improve the quality of the key habitats where practicable.
4. Control the spread, and where appropriate, eradicate invasive non-native species from the site.
5. Remove all anthropogenic litter from the site on a timely basis.
6. Monitor the condition and use of the site and where necessary carry out further research to identify and understand any changes.
7. Encourage the use of Crymlyn Burrows for education, research and quiet recreation and ensure that the site is safe for visitors.

2. Site Management

2.1 Habitat and species management

The lack of grazing and past management has led to the stabilisation of the dunes, the over-dominance in some areas of ferns and rank grasses and an increase in scrub and woodland cover, particularly by invasive non-native species. Scrub and trees are expected components of the stabilised dune habitats and provide important habitat for a range of animals, but without control scrub and woodland have increased in extent to the detriment of the rich diversity of specialist dune flora and the invertebrates they support.

The aim of management should be to limit further succession towards scrub and woodland by targeted removal of trees and shrubs, with a particular focus on invasive non-native species initially and to push back the woodland edge where it is spreading into the dune grassland.

Sea buckthorn, Japanese knotweed, Japanese rose, cotoneaster, buddleia, conifers and holm oak all have the potential to spread widely across the site to the detriment of native dune communities. Of these, holm oak and Japanese rose are the most widespread and will require a long term approach if their control is to succeed. While the general aim is to eradicate these species from the site, isolated large trees and the single large stand of sea buckthorn in the centre of the site do provide some ecological benefit (particularly for birds and rabbits) and while the site is being actively managed to ensure that they do not spread, certain individuals can be allowed to remain. The threat posed from other non-native species can be assessed over time, and if they are found to be spreading, appropriate management techniques developed.

Where key species have been lost or nearly lost from the site (i.e. fen orchid, sea stock, field wormwood, strandline beetle) the aim should be to ensure that the habitats are in suitable condition to allow trial reintroductions or restocking. Sea stock has significant fluctuations in population and is currently down to a single known rosette. Seed has been collected from surviving plants to the south of the campus and will be used to restock suitable areas of the dunes, both by direct seeding and planting propagated plants.

Details of habitat management:

- **Limiting woodland spread** (Map 3) Clearance of trees to the south and east of the main woodland area (B), the wet woodland (C) and adjacent to the northern path where scrub and trees are encroaching into the Dutch rush (A). The focus should be on the removal of saplings plus occasional key mature trees to maintain open glades and prevent further encroachment into priority habitats. Trees should be cut October – March and stumps treated with Roundup ProActive. Cut timber to be removed from site or added to strandline to boost driftwood habitat, and brash to be neatly stacked in habitat piles beneath existing canopy, or burned on tin sheets on site where stacking is not practicable because of a lack of suitable site nearby or potential fire risk. The areas will not be clear felled: trees will be retained where their presence might be considered important to the landscape or biodiversity of the site.

  The potential presence of bats within and lichens of note on any trees will be checked before work would proceed. This would be in order to identify potential new records and minimise any potential impact of the proposed works on these species.

- **Gorse coppicing** (Map 3) Cutting back up to 20% of the long, leggy gorse October – February (d, e and f) and allowing stumps to regrow, managing on a 5 year cycle, to limit the spread of scrub and improve habitat for dune flora, reptiles and invertebrates. Gorse provides useful cover for rabbits and an important nesting and food resource for birds and invertebrates, hence managing its spread rather than attempting to remove it. Cut material to be burned on tin sheets.

  A bird survey will be carried out prior to any scrub control to ensure that any unnecessary disturbance is avoided.

Map 3. Areas for management of woodland (red) and gorse (yellow)

- **Mechanical excavation to remove *Rosa rugosa*, create wet dune slacks and mobile sand** - (see Map 4) It is proposed to carry out the work over the course of two winters, the first in 2017/18 and second in 2019/20. Separate *R.rugosa* by hand from other material and remove from site, the rest of the material to be added to adjacent dune ridges. The two phase approach will allow a small, experimental area to be created initially, and monitored for effectiveness at removing rose, changes to vegetation and hydrography of the wet slacks created. The findings would then be used to inform the second phase, hence the gap between phases. (October-February).

Map 4. Areas for mechanical excavation of *Rosa rugosa* and creating bare sand habitat

- **Annual mowing of dune grassland –** areas which may be mown (probably by tractor, but potentially using hand held equipment) shown on Map 5. Annual cut in the autumn, access along existing tracks and all arisings to be removed from site.

Map 5. Areas where mowing of dune grassland may take place

- **Removing non-native invasive tree species** – Cutting and stump treatment of non-native tree species (principally conifers and holm oak) across the site, prioritising the main dune area initially, where holm oak and conifers are only starting to become established, before moving attention to the northern dunes (less than $5m^3$ in any calendar quarter and not more than 20% of trees in any compartment (as shown within the compartment map) in any season to reduce potential impact on birds). Cut timber to be removed from site or added to strandline to boost driftwood habitat, brash to be neatly stacked in habitat piles beneath remaining canopy or burned on tin sheets on site where stacking is not practicable. In areas where there is little alternative cover, the best trees will be left for wildlife and aesthetic benefits and regular checks made to remove seedlings. (September-March).

  The NPT tree officer will be contacted prior to the clearance of any trees of significant size near the roadside (i.e. not if just scrub).

Map 6. Main areas of search for holm oak (red) and conifers (blue)

- **Spraying with Roundup ProActive using knapsack sprayer by qualified operatives:**
    - ***Rosa rugosa*:** May – September. This species is widespread across the site and will be controlled wherever it is found (main areas shown on Map 7). Spraying will play a part in its control, principally in those stands that are dense enough to minimise drift onto native flora. Priority will be given to controlling smaller, younger stands by hand digging before they become established. Mechanical excavation or use of a weed wiper may be the most effective approach to dealing with large, lower density stands.
    - **Japanese knotweed:** August-September. Known areas are displayed on Map 7 – but if found elsewhere, will be treated in the same way.
    - **Sea buckthorn:** July-September. Stand 1 will have the smaller, spreading outlying plants sprayed to prevent spread, but leaving the larger central stands untreated, as it provides good shelter for a large rabbit warren. Stand 2 and 5 will have all small plants (<1.2m) sprayed, with taller plants cut and stumps treated with glyphosate. Cut material will be removed from site where practicable or burned on tin sheets where removal not practicable. Stands 3 and 4 are small and will be sprayed with Roundup ProActive. Cutting and stump treatment will be carried out in the autumn / winter and spraying of standing plants will be carried out August – September. If other stands are discovered, they will be controlled following the principles above.

Map 7. Main areas of search for *Rosa rugosa, Japanese knotweed and sea buckthorn*. N.B. the latter two species are less widespread and have a better recorded distribution but seedlings and young plants may occur anywhere across the site.

- **Winching out and manually digging young conifers, holm oak, cotoneaster, garden privet, buddleia and some sea buckthorn** – these species are thinly distributed across the whole site. Work will be carried out using hand tools - a hand winch and lifting tripod and spades, forks and mattocks. Work will be carried out all year as plants are young enough not to conceal any nesting birds (checks will always be made).

- **Digging out pampas grass along edge of reedbed**. Removal of plants from site and with the resulting holes left to act as temporary ponds (all are well away from paths and regularly accessed areas). (September-March).

- **The Treatment and removal of other INNS – e.g. goldenrod, Michaelmas daisy, pearly everlasting, *Clematis tangutica*, sweet william**. The spread of these species will be monitored and subject to further discussion with NRW regarding the most effective approach: trial hand pulling or digging, plus strimming of goldenrod and Michaelmas daisy.

2.2 Access management

Access is permitted across the entire site and there is a profusion of permissive paths. It would not be practicable or desirable to maintain all of these routes; instead, a simplified network of the main paths has been identified (Map 8) and will be maintained in a safe and useable condition and promoted to visitors. This will involve the cutting back of encroaching and surface vegetation to a maximum width of 2m and repairing damage to the surface. There is no disabled access at present, but this should be considered for the future.

Cycling and horse riding occur at low levels and are not considered damaging to the site and will continue to be permitted, although this may have to be reviewed in the future if there is a substantial increase. Motorised vehicles are not permitted except where required for site management and are limited to a quad bike and trailer using the main paths only. If other vehicles are required for particular jobs, they will require specific consent from NRW.

As well as the currently small-scale use of the SSSI by the University for teaching, a number of third party field studies providers use Crymlyn Burrows for courses in sand dune and saltmarsh ecology and coastal geomorphology. Field studies are an important way of inspiring young people about the natural world and are vital in training the next generation of environmental scientists but unmanaged, have the potential to impact conservation, particularly ground nesting birds and fragile habitats. There is a need to work directly with providers of field studies to develop a code of conduct and booking system to reduce the potential impact of educational access.

It is important that visitors understand the importance of the site and the part they play in its conservation. This is a key aspect of the site's management and is detailed under communication and interpretation.

Map 8. Main paths to promote and maintain

2.3 Communication and interpretation

Crymlyn Burrows has the potential to be a major asset for the university, both as a living laboratory for teaching and research, as well as a high quality green space where students and staff can unwind from the stresses of university life. Appropriate use of the site should be actively promoted to those living and working on campus. The site also forms a connection between the university and local community. Links should be developed with local schools, youth groups and other community groups to encourage and facilitate visits. A minimum of one public event should be organised annually and as management of the site develops, ways to involve the local community more closely should be explored.

It is crucial that visitors to the site are aware of its protected status and activities that are not permitted as a result. Signs have been erected at the main entrances with these details and will help to reduce reckless or accidental damage to the site. To further encourage enjoyment and appropriate use of the area, additional information will be provided, using a range of methods:

- Interpretation boards will be used to enhance visitors' experience and further encourage appropriate behaviour. Topics that may be covered include seasonal wildlife that might be encountered, site history, coastal processes, site management.
- A code of conduct aimed at residential students will be developed and communicated.
- A series of simple leaflets will be developed, for distributing to students, staff and the local community, focussing on various aspects of the site's natural history e.g. wild flowers, butterflies, summer birds, winter waders, strandline etc.
- Targeted communications to ensure that staff and students living and working at the Bay Campus are aware of the SSSI and to encourage (responsible) use of the site.
- Termly guided walks for staff and students and at least one public event per year.
- Wardening – providing a visible presence and communicating directly with visitors, including out of hours during times of anticipated peak usage.
- Online – develop a dedicated SSSI web page on the university website.

2.4 Wardening and security

A site warden is employed by the university and regular patrols are carried out across the entire site. The university maintains 24hr security coverage at the Bay Campus and contact details are detailed on information boards at the main entrances.

2.5 Volunteering

There is considerable scope to involve volunteers with the management of the site, particularly with beach litter picks, invasive species control, woodland and scrub management, path maintenance and wildlife monitoring. A group of student volunteers, the Crymlyn Burrows Conservation Volunteers (CBCV), has been established with a programme of work for the autumn and spring terms, and links to the Student Sustainability Award. Other student employability programmes including Week of Work (WoW) and SPIN internships have also been used.

Monthly beach cleans are targeted at staff as well as students and there is equipment available for DIY lunchtime litter picks, and bespoke staff volunteer days are organised in addition to the CBCV programme.

Numbers of volunteers have been variable and disappointing at times and it should be a priority to increase the quality and quantity of volunteering, as well as opening volunteering to the wider community.




2.6 Research and monitoring

Crymlyn Burrows is a complex and dynamic site and it is vital that management of the site is based on good evidence. The primary aim of research and monitoring is to detect change, where possible, to identify the cause of any change and inform management of the site.

Under the planning agreement, the university is responsible for ensuring that the development of the Bay Campus does not have a negative impact on the site's qualifying features and other features of ecological importance, allowing appropriate action to be taken if necessary. Following two years of occupation of the site, it is clear that use of the site by students is largely limited to the area of beach and mobile dunes immediately adjacent to the campus. Few students venture beyond, and the main risks observed in this localised area to date are:

- Fire
- Removal of wood from the strandline for fires
- Littering
- Disturbance of the high tide wader roost
- Increased trampling and erosion of the dune vegetation
- Disturbance of ground nesting birds

It should be noted that these threats already existed from visitors to the site and it will be difficult to ascertain whether the additional population is having any further impact. Other potential human impacts are less likely to be caused by the University population and include damage by off-road vehicles, disturbance by dog walkers, poaching of rabbits, fly tipping, bait digging and cockling.

As well as monitoring human impacts, maintenance of the site in favourable conservation status requires good data on the features, either measured directly or by the use of appropriate indicators. An extended phase 1 habitat survey was carried out in 2016 and will be repeated on a 6 yearly basis to identify changes to the extent of broadscale habitats, with interim monitoring of key species, habitats and assemblages. Declines in rare or locally important habitats or species will be the trigger for appropriate management. Surveys will also be used to monitor the effects of management to ensure that it is having the intended result.

As well as the routine monitoring required to manage the site effectively, ownership of the SSSI provides the university with a significant opportunity as a living laboratory for teaching and research. Links have already been developed with several academic colleges but there is the potential to do far more. Appropriate use should be actively encouraged, with a requirement to keep the warden informed of teaching visits and proposed research projects. This will ensure that possible conflicts with conservation objectives are minimised and that consent from NRW is sought when required, and allow a log of academic use to be kept.

3. SSSI Action Plan

3.1 Administration and reporting

Objective 1. To ensure structured, multi-stakeholder management, monitoring and reporting.

Action no.	Action	Compartment	Estimated cost	Target date	Progress
1.1	Publish management plan on Swansea University Website	n/a	n/a	April 2018	
1.2	Hold quarterly meetings of the management committee	n/a	n/a	March, June, September, December	
1.3	Produce minutes of management committee - including progress report and actions for the next three months	n/a	n/a	Within 2 weeks of meeting	
1.4	Produce an annual warden's report, with interim reports for committee meetings	n/a	n/a	Annual: August	
1.5	Carry out an annual review of the management plan, updating action plan as necessary and reporting on implementation (draft for September's management committee)	n/a	n/a	Annual: September	
1.6	Produce a costed annual implementation plan (draft for September's management committee)	n/a	n/a	Annual: September	
1.6	Carry out a full review of the management plan every 6 years	n/a	n/a	August 2023	

3.2 Habitat and invasive species management

Objective 1. Maintain the extent of key habitats (subject to natural change).
Objective 2. Improve the quality of the key habitats where practicable.
Objective 3. Control the spread, and where appropriate, eradicate invasive non-native species.
Objective 4. Remove all anthropogenic litter from the site on a timely basis.

Action no.	Action	Compartment	Estimated cost	Target date	Progress
2.1	Develop and increase volunteer activity	n/a		Ongoing	
2.2	Limit woodland spread and create open glades	4,5,6		Annual: October-March	
2.3	Mow agreed areas of dune grassland (removing arisings from site)	4		Annual: September /October	
2.4	Trial mechanical removal of *R.rugosa* from 2 areas	4		October-March, 2018 and 2020	
2.5	Coppice gorse	4		Annual: 2020 onwards	
2.6	Remove non-native tree species from main dunes	4,6		October-March, 2018 to 2020	
2.7	Remove non-native tree species from northern dunes	5		October-March 2020-2025	
2.8	Dig out pampas grass	7		2018	
2.9	Spray Japanese knotweed with Roundup ProActive	3,4,5		Annual: September	
2.10	Spray *R.rugosa* with Roundup ProActive	4		Annual: May-September	
2.11	Spray sea buckthorn with Roundup ProActive	4,5		Annual: July-September	
2.12	Cut and stump treat larger sea buckthorn	4,5		stand 2 2018, stand 5 2018-2021	
2.13	Dig/pull invasive non-native shrubs and saplings	4,5		as required, all year	
2.14	Strim / hand pull Michaelmas daisy and early goldenrod	4,5,6		August/ September	
2.15	Remove litter from beach / dunes	all		At least monthly	

3.3 Access management, including communication and interpretation

Objective 1. Protect the site from damage and disturbance by visitors
Objective 2. Encourage the use of Crymlyn Burrows for education, research and quiet recreation and ensure that the site is safe for visitors

Action no.	Action	Compartment	Estimated cost	Target date / frequency	Progress
3.1	Monitor the condition of the agreed main path network. Carry out repairs and cut back encroaching vegetation as necessary	all		Monthly	
3.2	Produce interpretation boards highlighting promoted path network and key conservation messages	n/a	£10,000	June 2018	
3.3	Develop a SSSI code of conduct aimed primarily at students living and studying at the Bay Campus	n/a		September 2018	
3.4	Ensure that all students living on campus are aware of the SSSI and code of conduct through targeted communications from arrivals weekend onwards	n/a		Annual: September and ongoing	
3.5	Develop links within all relevant academic colleges to promote the use of the SSSI for research and teaching where this does not conflict with conservation objectives	n/a	n/a	Ongoing	
3.6	Carry out occasional out of hours patrols when heavy use of the site is anticipated (i.e. warm Friday / Saturday evenings towards the end of term, bonfire night)	1,2		As required	
3.7	Work with field studies centres to develop an agreed code of conduct and booking system for use of the SSSI to ensure that field courses do not have an adverse impact on the site's conservation	n/a		January 2019	
3.8	Develop a range of simple leaflets focusing on the ecology and wildlife of the site (general ecology, beachcombing/strandline, wild flowers, shore birds, breeding birds, butterflies etc.)	n/a		3 leaflets by July 2018, then one annually	
3.9	Develop a SSSI web page within the University's website	n/a		September 2018	
3.10	Lead guided walks for staff and students	n/a		Termly	
3.11	Encourage and facilitate visits by schools, youth and other community groups	n/a		As required	
3.12	Deliver an annual awareness-raising public event	n/a		August	

3.4 Research, monitoring and data management

Objective 1. To implement efficient and robust data and information management to ensure that site management is based on the best available information.

Action no.	Action	Compartment	Estimated cost	Target date	Progress
4.1	Implement detailed monitoring plan (table 2)	all	n/a	Ongoing	
4.2	Include monitoring results in quarterly reports	n/a	n/a	Ongoing	
4.3	Identify potential research projects for undergraduate and postgraduate students and promote to relevant academic departments	n/a	n/a	Annual - March?	
4.4	Identify data gaps where further research is required	n/a	n/a	Ongoing	
4.5	Share records with SEWBREC	n/a	n/a	Ongoing	
4.6	Maintain a log of academic use by the University	n/a	n/a	Ongoing	

4. SSSI monitoring plan

4.1 Broadscale habitats

Feature	Attribute	Target	Method	Target date
Sand dune	Extent	No net decrease in extent from the established baseline, subject to natural change	Every 6 years - measured from aerial photography	2022
Saltmarsh	Extent	No net decrease in extent from the established baseline, subject to natural change	Every 6 years - measured from aerial photography	2022
Intertidal area	Extent	No net decrease in extent from the established baseline, subject to natural change	Every 6 years - measured from aerial photography	2022
Woodland	Extent	No increase from baseline	Every 6 years - measured from aerial photography	2022
Scrub	Extent	No increase from baseline	Every 6 years - measured from aerial photography	2022

4.2 Detailed habitats

Feature	Attribute	Target	Method	Target date
Strandline	Extent	Present along entire length of beach except when removed by storm action	Monitored during routine patrols. Any anthropogenic removal recorded.	
Strandine	Quality	Driftwood present along at least 50% of strandline	Biannual walking survey (summer and winter)	July and January
Embryo dune	Extent	Present in front of at least 50% of dune habitat	Biannual walking survey (summer and winter)	July and January
Embryo dune	Species diversity	Presence of a range of typical plant species along strandline	Plant species found along strandline recorded on DAFOR scale annually	July
Mobile yellow dune	Extent	No net decrease in extent from the established baseline, subject to natural change	6 yearly assessment using aerial photography combined with structured walking survey	2022
Mobile yellow dune	Species diversity	Presence of a range of typical plant species. None native species rare	6 yearly assessment using structured walking survey	2022
Fixed dune community	Extent	No net decrease in extent from the established baseline, subject to natural change	6 yearly assessment using aerial photography combined with structured walking survey	2022
Fixed dune community	Species diversity	Presence of a range of typical plant species. None native species rare.	6 yearly assessment using structured walking survey	2022
Bare sand habitats	Extent	There is little bare sand habitat beyond the foredunes - a target will have to be developed	6 yearly assessment from aerial photography	2022
Saltmarsh	Species diversity	Presence of a range of typical plant species. Non-native species rare	6 yearly assessment using structured walking survey	2022
Reedbed	Extent		6 yearly assessment from aerial photography	2022

Notes: strandline and embryo dunes are highly dynamic habitats and may be completely absent at times, as a result of storm events. Any anthropogenic damage should be noted, and continued absence for several years would be a cause for concern and should trigger appropriate intervention.

4.3 Key species and groups

Feature	Attribute	Target	Method	Target date
Strandline beetle	Presence	Adults present during the summer - if none are found for 3 years consider a reintroduction	Monthly seasonal surveys using suitable refugia along strandline	Monthly - June to August
Common lizard	Presence	Widespread across site	Monthly seasonal searches using refugia across site	Monthly - March to October
High tide roost	Number	No long term decline in number of sanderling, ringed plover, dunlin or oystercatcher	Monthly high tide roost counts year round	Monthly
Breeding birds	Species diversity + population of key species	No decline in number of breeding species; no long term decline in number of nesting skylark, meadow pipit, reed bunting, linnet	BTO breeding bird survey methodology	2 visits, April to July
Butterflies	Species diversity + population of key species	No decline in species diversity; no long term decline in number of small blue, small heath, wall, dark green fritillary	Monthly transects, March to September, weather permitting. Long term decline should trigger survey of larval food plants	Monthly - March to September
Sea stock	Presence	Initial target of at least one flowering plant. Longer term, present throughout site in suitable habitats – consider boosting population using plants reared from locally collected seeds	Search and count plants	Annual - summer
Dutch rush	Extent	No decline in extent from initial baseline, no further encroachment of trees and scrub into Dutch rush	Mapping extent every 6 years	2022
Invasive species	Presence and extent	No increase in invasive species cover, detailed targets for control / eradication set for each species in action plan	*Ad hoc* searches and recording. Follow up searches of all treated areas. Detailed survey every 6 years.	2022
Water table	Depth of water table	Develop understanding of hydrographic regime	Monthly measurement at dip wells	Monthly

5. References

ATKINS (2015a) Witford Point Dune Compensation Area Management and Access Plan. Unpublished plan for St Modwen Developments ltd.

ATKINS (2015b) Crymlyn Burrows SSSI Management and Access Plan. Unpublished plan for St Modwen Developments ltd.

Hipkin, M. (2016) Swansea Bay Waterbird Study 2015/2016. Unpublished report for Swansea University.

MACC (2017) Unexploded Ordnance Desk Study T2470, Crymlyn Burrows, Swansea. Unpublished report for Swansea University.