

Appendix i - Contextual Information Document

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Glossary

AA	Anti-Aircraft	POW	Prisoner of War
ALARP	As Low As Reasonably Practicable	QF	Quick Firing
AP	Armour Piercing	RAF	Royal Air Force
APBC	Armour Piercing Ballistic Cap	RFC	Royal Flying Corps
APFSDS	Armour Piercing Fin Stabilised Discarding Sabot	RNAS	Royal Naval Air Service
AP	Anti-Personnel	TNT	Trinitrotoluene
ARP	Air Raid Precautions	RNPF	Royal Navy Propellant Factory
AT	Anti-Tank	ROF	Royal Ordnance Factory
BL	Breech Loading	SAA	Small Arms Ammunition
DA	Delayed Action	SIP	Self-Igniting Phosphorous
EOC	Explosive Ordnance Clearance	UC	Unclassified Bomb
EOD	Explosive Ordnance Disposal	UP	Unrotated Projectile
FP	Fire Pot	USAAF	United States Army Air Force
HAA	Heavy Anti-Aircraft	UXAA	Unexploded Anti-Aircraft
HE	High Explosive	UXB	Unexploded Bomb
HEAT	High Explosive Anti-Tank	UXO	Unexploded Ordnance
PB	Phosphorous Bomb	V1	Flying Bomb
POW	Prisoner of War	V2	Long Range Rocket
QF	Quick Firing	WAAF	Women's Auxiliary Air Force
RAF	Royal Air Force	WWI	World War One
RFC	Royal Flying Corps	WWII	World War Two
RNAS	Royal Naval Air Service	TNT	Trinitrotoluene
PB	Phosphorous Bomb		

1 Background Site Information

1.1 OS Mapping

The ability to determine whether a site may have suffered bomb damage necessarily depends on the makeup of the site during WWII. For example, if the site comprised an area of open, undeveloped ground, damage would not be noticeable within this source. However, if the site was composed of a section of terraced structures, a bomb strike which caused significant damage may result in the clearance of structures, resulting in easily identifiable evidence. Alternatively, a significantly damaged structure may be marked as a 'ruin'.

Every effort has been made to analyse as many large-scale maps as possible, providing the best possible details through which to assess the potential UXO risk on site. Of note is military censorship of military training grounds or airfields, where relevant features will not be identified.

1.2 Historical Aerial Photography

This source is often more useful in identifying potential bomb damage. Like OS mapping, this can often be more difficult in areas of open, undeveloped ground. Dense vegetation growth or ploughed soil may conceal evidence of a UXB strike, although craters with lipped edges, caused by exploded bombs or larger UXBs, can be clearly visible. Alternatively, evidence of minor damage to structures, in the form of light-coloured roofing repairs, can be immediately identifiable, with large areas of structural clearance obvious. Where vertical images may obscure internal damage in a structure, oblique photography, if available, will also be consulted to attempt to gain a more complete view of the site.

Of note is that this source can also be very illuminating when assessing potential Allied/British risk. For example, trench systems not recorded on OS mapping can be more easily identifiable in this source, even if recently infilled. Likewise, an impact area from a mortar/artillery range often leaves clear evidence of its presence in the form of impact craters of varying sizes. Other evidence of military activity, such as scrape marks from an anti-tank range, are also observable in imagery. When paired with LiDAR imagery, a wealth of information can be gleaned from these sources.

2 Introduction to German Air Delivered Weapons

2.1 Background to German Bombing Campaigns over Britain

Timeline of Luftwaffe Campaigns over Britain					
1940	1940-1941	1942	1943	1944	1944-1945
Battle of Britain fought to deny the Luftwaffe air supremacy required prior to Operation Sealion.	London, and other major cities, subjected to Blitzes of indiscriminate bombing.	Baedeker Raids target cultural and historic sites throughout Britain. Bath and Exeter badly damaged.	'Tip and Run' raids launched which utilise low-flying high-speed aircraft. Southern coastal towns targeted.	Operation Steinboch targets southern England and London with 31 raids. Last raids on the capital.	V weapon campaign launched against Britain. V1 launch sites overrun following D-Day.

Knowing that they would require air supremacy before launching Operation Sealion (the planned German invasion of Britain), in the summer and autumn of 1940, the Luftwaffe set about targeting RAF airfields (as well as radar stations and other supporting infrastructure). Many of RAF Fighter Command's key airfields, such as RAF Biggin Hill, were raided repeatedly, with the south-east of England suffering the heaviest raids during this period. Once the Luftwaffe realised that they had failed to achieve air supremacy, their attention turned to the indiscriminate 'Blitz' against London.

In the hope of destroying civilian morale and causing the collapse of the government from within, the heaviest raid of this period marked the end of the London Blitz on 12th May 1941. From 7th September 1940, London had been subject to repeated and intense raids, centred on the City of London and eastern boroughs, where the majority of industry in the city was located. This method was mirrored in other large cities across Britain, such as Glasgow, Plymouth and Liverpool. Notably, the Clydebank Blitz of 13th – 15th March 1941 was targeted at the key shipbuilding and ordnance production areas of Glasgow. Bombing of other areas also occurred during this period, likely due to them being identified as targets of opportunity (if aircraft could not locate their target, or did not jettison their entire bombload over it, secondary targets such as transport infrastructure or industrial structures were identified). Furthermore, anti-aircraft fire and the lack of accurate targeting mechanisms in aircraft at the start of WWII led to many bombs missing their intended targets, sometimes by many miles. Landing with live ordnance on board was also dangerous, so aircraft would often jettison any remaining ordnance over Britain before they flew back to mainland Europe. This resulted in rural, and seemingly insignificant areas, being subject to bomb strikes.

In contrast to the raids targeted at military installations during the Battle of Britain, and to an extent those aimed at industrial areas during the Blitzes, the Baedeker Raids of 1942 targeted areas of cultural importance in some of Britain's most historic cities, such as Canterbury and Exeter. These were followed in 1943 by an identification of British weakness to raids carried out by fighter bomber aircraft conducting high-speed low-level raids which would evade radar; the aircraft would pop up when they reached their target, drop their bombs and return home. The raids were therefore named 'Tip and Run'. Notably, by this time, large amounts of American and Canadian troops were stationed in southern Britain. Utilising their LAA guns, as well as repurposing some British ones located around previously heavily bombed cities, an interlocking series of defences were established on the south coast to deter these raiders.

Switching back to targeting London for the first concentrated raids since the London Blitz, Operation Steinboch comprised 31 large-scale raids over southern England in 1944. However, as aforementioned, the massing of anti-aircraft defences in southern England, coupled with significant rates of attrition of pilots in the Luftwaffe meant that these raids were not successful. As a result, the final concentrated Luftwaffe raid over London occurred in May 1944.

Knowing that they could no longer successfully bomb Britain using piloted aircraft, the V1 pilotless aircraft offered an opportunity to inflict casualties in southern England. Equipped with a 850kg HE warhead, the blast wave was lethal. The same was true of the V2 rocket, with an even larger warhead at just over a ton of HE. These weapons were very large and often garnered public attention. Furthermore, a three fuze system in the V1 was designed so that they would never be examined by British forces. As such, the UXO risk that these items pose is typically very low.

2.2 Most Common German Air Delivered Weapons

It is important that the different characteristics and defining features of WWII-era German air delivered weapons (ADWs) are understood. This allows for an accurate assessment of the hazards that each item poses, which feeds into the assessed UXO risk in this report. The table below outlines the most common types of ordnance dropped on Britain. For a visual representation of the types of ordnance described below, please see **APPENDIX iii**.

Type of ADW	Penetrative Ability	Explosive Hazard	Background Information
HE Bomb	High. Their aerodynamics and weight (sometimes up to 2,000kg) greatly aided ground penetration.	General Purpose variant higher at around 50%. For the semi-armour piercing variant, this could drop to around 30% as a cap was added.	The most commonly dropped by weight over Britain. RSK OM's experience proves that large HE UXB entry holes were sometimes assumed to be caused by the detonation of smaller HE bombs. These ADWs pose the greatest risk to sites nowadays.
Mines	Low. The blast power was derived from their air or ground burst ability.	High explosive hazard, with variants possessing approximately 700kg of explosive fill.	Known to have caused significant damage when employed effectively. Due to their slow descent, they do not pose a significant risk to current construction sites.
Incendiary bombs	1/2kg incendiary bombs had very limited penetrative ability. Larger ones could penetrate to shallow depths in soft soil.	Small bursting charge in small IBs. Large variants, such as the Flam 500, had larger bursting charges.	1/2kg IBs were dropped in quantities often too large to accurately record over wide areas. Small items so could go overlooked in vegetated areas. Bursting charges to increases anti-personnel effect could be a hazard during intrusive works.
Anti-personnel bombs	Very low due to their low weight.	Approximate 225g HE charge.	Like small IBs, these were dropped in containers in batches of up to 108. Descent slowed by design, many were encountered during post-raid checks If they did not explode. Still encountered on construction sites today.

2.3 German ADW Failure Rate

During WWII, Bomb Disposal Units (BDUs) accurately recorded all aspects of their work. Based off of this, it is generally accepted that 10% of bombs dropped by the Luftwaffe failed to explode. There are many reasons for this, including:

- Release of bombs at a low altitude, not allowing enough time for the bombs to arm successfully.
- Failure to successfully arm the bombs in the aircraft, likely due to either human or mechanical error.

- Incorrectly functioning fuze, or gaine, mechanism. Evidence suggest that large-scale sabotage in factories staffed by slave labour contributed heavily to this.

2.4 German ADW Failure Rate

Key to assessing the potential risk that German ADWs pose to a site is the maximum depth to which they may have reasonable penetrated. In making this calculation, several factors are considered:

- Weight and type of bomb.
- Height, angle, and velocity of release.
- Geological makeup of the site.

2.5 The 'J-Curve' Effect

As stated in CIRICA C681, as the velocity of a bomb slows down during its passage though underlying soils, it can curve upwards towards the surface again, creating what is known as the 'J-Curve' effect. This affirmed what many BDUs had experienced during WWII when investigating UXBs. This horizontal offset can sometimes be up to 15m, although was more likely to be around one third of the bomb's maximum penetration depth.

2.6 Bomb Penetration Depth

RSK OM have obtained original WWII-era studies (from The National Archives) conducted by the Ministry of Home Security regarding the average and maximum penetration depths of HE bombs in different geologies. This test comprised studies on 1,328 different bombs encountered by BDUs, with measurements produced by analysing the penetration depths of different sized bombs in different geologies. Below is a table presenting their findings:

Bomb Mass (kg)	Geological Conditions and Penetrative Depth (m)									
	Sand		Gravel		Chalk		Clay		Sandstone	
	Average	Max.	Average	Max.	Average	Max.	Average	Max.	Average	Max.
50	2.8	7.8	2.8	7.8	3.5	7.7	4.0	9.1	2.7	6
250	4.8	13.7	4.8	13.7	6	13.1	6.8	15.8	4.6	10.3
500	6	17.3	6	17.3	7.6	16.4	8.7	19.8	5.8	13.1
1,000	7.6	21.9	7.6	21.9	9.6	20.7	10.9	24.9	7.3	16.4

3 Most Common British Ordnance

For a visual representation of the types of ordnance described below, please see **APPENDIX ii**.

3.1 Mortars

Fired from a tube, mortar bombs are fitted with their own propelling charges (supplementary charges can be added around the base as required) and usually have a fuze in the nose. They are fin stabilised and usually comprise either High Explosive or carrier variants; as with other ordnance, this is usually denoted by coloured markings on the item. WWII 2" mortars are identified by their parallel sides, with larger variants, 3" and 4.2", tear drop shaped.

3.2 Grenades

Capable of being thrown by hand, or fired from a specially designed launcher or from the end of a rifle, grenades offer lethality over a short distance, with a typical explosive range of 15-20m. Like mortars, they either comprise HE or carrier versions, capable of producing smoke. Older variants tend to have a 'pineapple' shape.

3.3 SAA

Typically comprising ordnance fired from small arms up to 12.7mm in calibre, this is the most common type of ordnance encountered on land used by the military. SAA refers to the complete round (comprising the solid shot 'bullet' and cartridge) intended to be fired from varying sized hand-held weapons such as rifles, machine guns and pistols. SAA can include the fired bullets, cartridge cases and primers/caps or once complete ordnance.

3.4 AA Shells

Although large anti-aircraft shells may appear similar in appearance to smaller German HE bombs, a copper driving band around the base can be used to correctly identify the item. As these items were not intended to penetrate the ground, they are often found at shallower depths. Due to the large size of unexploded HAA rounds, they possess a higher Net Explosive Quantity than many items of smaller LSA, such as grenades. Likewise, smaller unexploded LAA rounds pose a lower explosive risk.

3.5 Artillery Shells

Artillery has formed the backbone of modern armies, and played a key role in WWI and WWII. The 18 Pounder was the omnipresent field gun of the British Army in World War I, firing an 84mm shell (notably larger than those used by the French and Germans at the time) up to 11,100 yards by the end of its development. A High Explosive shell held 368g of TNT, with shrapnel, shot, and gas variants also available.

Many howitzers, firing larger and heavier shells, were also used by the British Army during WWI. The 9.2" variant was most commonly used in the heavy counter-battery fire or siege roles. Filled with up to 18kg of TNT or Lyddite, these possess far more lethality, although the guns were more cumbersome.

By World War II, tests on the 18 Pounder had ushered into development the 25 Pounder, known to have been equally feared and admired by the Wehrmacht. The gun had an increased range of 13,400 yards, alongside a greater HE fill (820g of TNT). Again, smoke and chemical versions were available, as was the case with the 18 Pounder. However, developments in anti-tank artillery meant that by the end of WWII, the 25 Pounder could fire a solid shot Armour Piercing Ballistic Capped round using charge super for maximum penetration of enemy armour. This was often done with crews firing open sights due to the short range of such engagements, especially in the dense bocage of Normandy following D-Day.

Modern artillery ammunition used by the British Army typically comprises 105mm (L118 light gun) and 155mm (AS90). These guns and ordnance are based on earlier variants, with greater range and lethality.

4 UXO Risk Mitigation

4.1 Clearance of Items of UXO

Land owned by the military, or formerly used by the military, may be subject to Explosive Ordnance Clearance (EOC) tasks in an effort to remove items of UXO. These tasks may be undertaken to allow the land to be used safely by the public. Alternatively, as construction and redevelopment occurs on military land, they may want to make sure that contractors will be as safe as possible; many training areas require clearance operations to take place prior to any ground intrusions taking place, in certain areas. It must be noted that the efficacy of historic EOC tasks intended to achieve complete clearance has been called into question in the last few decades, where subsequent re-investigations has discovered items of UXO that were not identified previously. Naturally, as technology has improved, so has the effectiveness of EOC tasks. Therefore, it cannot be ruled out that items of UXO may remain in an area that has been searched in an EOC task.

4.2 Post-WWII Construction Works

Many stages of post-WWII redevelopment will also have mitigated a degree of risk on a site, if not entirely. Such works can generally be split into three sections:

- Very shallow works.
- Shallow works.
- Deep works.

For example, shell scrapes at very shallow depths may encounter buried SAA just below the surface, while foundations for a residential structure are more likely to encounter a buried HAA shell. Mass soil excavation for a basement level of a multi-storey car park is most likely to encounter a deep buried HE UXB, although these can also be found at shallower depths.

It must be noted that the risk can only be considered to be mitigated in the exact locations and to the exact depths of any post-WWII redevelopment. Any undisturbed ground down to the maximum bomb penetration depth, even if it remains between post-WWII foundations, must be considered unmitigated.

5 UXO Encounter

5.1 Pathways

If UXO is to be encountered on a site, a pathway between the works and the UXO must be present. A pathway almost certainly includes intrusive works, although UXO can sometimes be found on the surface, particularly on sites with a military history. Generally, the greater the volume of soil that will be disturbed, the greater the likelihood of a UXO encounter.

5.2 Encounter Depths

Encountering German ADWs is more likely at shallow and deep depths, such as when constructing a residential estate or piling deep foundations. This is due to the velocity that such items would have impacted the ground, in conjunction with their greater mass.

Items of LSA/SAA are generally encountered within the top 1m of soil. This is as a result of the usual contamination pathways relating to these items; improper disposal (burial), losing them, or burning them. As was noted above, UXO can sometimes be found on the surface. This is most likely to occur when encountering items of LSA/SAA on military training grounds.

6 UXO Initiation

6.1 German UXO Initiation

An item of ordnance that has remained unexploded for a number of years will almost always require an external influence to begin the sequence of detonation. If a fuze has malfunctioned, there are a number of ways that this can restart, or the HE fill can be detonated, such as:

- Percussive/direct impact effect from a high density object, such as a piling rig. Even if the impact occurs away from where the fuze is located on the bomb, direct impact with the HE fill could cause a detonation if hit with enough force.
- Although the Luftwaffe primarily used mechanical fuzes, as outlined in **Section 4.3**, clockwork fuzes were occasionally employed. The prevailing thinking is that if the clockwork fuze malfunctioned at the time of use, it is unlikely to be initiated again. However, this has been known to happen, and the reader should be aware of this possibility.
- Items of unexploded ordnance, like most other buried objects, degrade over time. Part of this degradation process can include sensitive parts of the bomb, such as the fuze pocket, leaking materials. Over time, these materials can crystallise outside of the bomb, coming into contact, and rubbing against, external features. The friction created can sometimes initiate the sequence of detonation.

6.2 British/Allied UXO Initiation

Unlike German ADW UXBs, if not interfered with, it is very unlikely that an item of LSA/SAA would ever initiate. This may be an acceptable risk on a current military training ground that is unlikely to return to public use. However, this would not be the case for military land due to be sold off. Of note is that SAA is even less likely to be initiated, although this can occur if the firing cap is struck, or items are burned.

6.3 Consequences

Consequences of UXO initiation will differ depending on the receptors in the vicinity. The most significant consequence would be the loss of life on site, or in the vicinity, depending on the nature of the UXO find. Of note is that consequences may extend beyond the potential risk of harm; delays in major construction projects, potentially requiring major transport hubs or roadways to be shut down, or leaving plant hire stranded on site, can have large financial ramifications.

7 Risk of Harm

7.1 Introduction

A risk of encountering UXO does not necessarily equate to a subsequent risk of harm. Although there may be deemed to be an elevated likelihood of encountering 3kg practice bombs whose spotting charges have not functioned on a site, the Net Explosive Quantity (NEQ) of these items is far lower than that of a grenade, for example. An unexploded grenade, if it functioned, has the potential to cause fatal injuries, which would indicate a severe risk of harm associated with this item. However, while the 3kg practice bombs would likely not cause fatal injuries if functioning, they are capable of causing serious injuries.

7.2 Assessed Risk Levels

Therefore, the risk of harm can be split into three risk levels:

1. Tolerable – Unlikely to cause any injuries.
2. Medium – Potential to cause slight and serious injuries
3. Severe – Potential to cause fatal injuries.

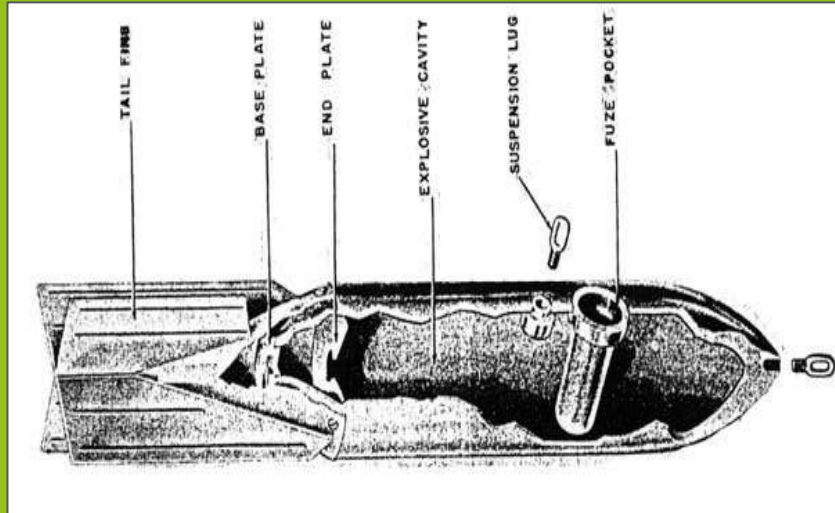
8 Risk Mitigation Methodology

RSK OM have the capability to deliver a wide range of risk mitigation measures. Below is a breakdown of the services we offer. The Executive Summary of this report will detail what specific risk mitigation measures are recommended for your site specific works.

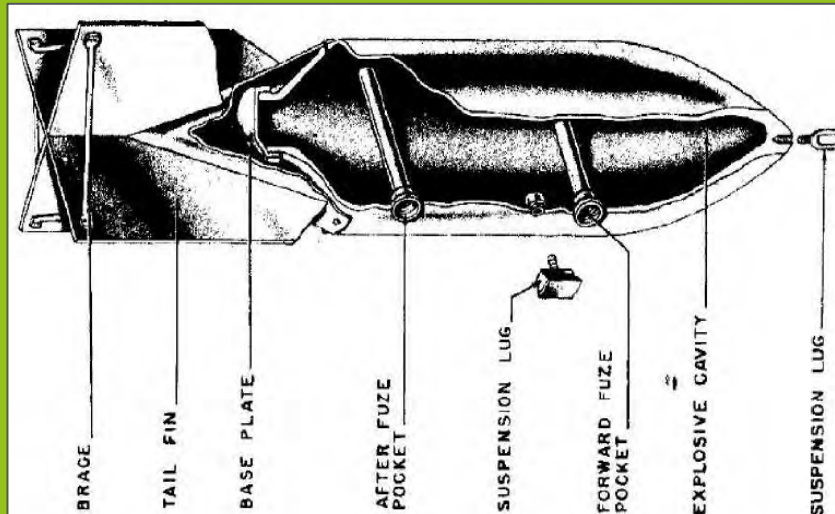
Risk Mitigation Methods	
UXO Safety Awareness Briefings	Recommended for all personnel working on site. The briefings will provide a basic level of knowledge regarding UXO, ensuring workers know what to do when they suspect they may have found an item of UXO. Delivered by a UXO specialist with refresher courses offered at intervals.
UXO Watching Brief	An alternative method to ensure safety on site for when conditions are not appropriate for a non-intrusive survey. A UXO Engineer with a man-portable magnetometer can provide assurances during open excavations to avoid unnecessary timely delays. Allows for borehole clearance and visual identification of potentially items of UXO, avoiding potentially unnecessary evacuations from site.
Non-Intrusive Magnetometer Survey	RSK OM have the capability to deliver non-intrusive surveys via a number of methods; contact our Operations department for specific requirements. A portable magnetometer probe collects data from your site which is then interpreted for evidence of ferrous anomalies. The final stage in this process is a Target Investigation, where any anomalies found can be investigated on site. Note, this survey is only applicable for magnetically clean (i.e. greenfield) ground.
Intrusive Magnetometer Survey	Similarly to non-intrusive magnetometer surveys, RSK OM can deliver an intrusive magnetometer survey in a variety of ways. This survey will successfully clear pile positions to the required bomb penetration depth. Discussion with our Operations team will dictate the best method to deliver this survey once factors such as the site specific geological conditions have been considered.

50kg HE Bomb

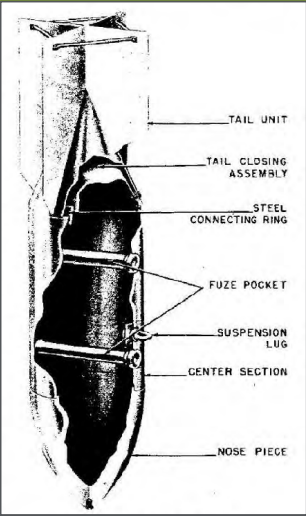
Bomb Weight	54kg
Weight of Explosive Fill	25kg amatol/TNT/trialen
Bomb Dimensions	1090mm x 280mm
Type of Fuze	Impact or electrical time delay
Notes	Most dropped bomb by weight over Britain. Useful against light targets.

**250kg HE Bomb**

Bomb Weight	256kg
Weight of Explosive Fill	130kg amatol/TNT/trialen
Bomb Dimensions	1640mm x 512mm
Type of Fuze	Impact or electrical time delay
Notes	Increased penetrative ability proved useful against sub-terranean targets.



500kg HE Bomb	
Bomb Weight	520kg
Weight of Explosive Fill	220kg amatol/TNT/trialen
Bomb Dimensions	1957mm x 640mm
Type of Fuze	Impact or electrical time delay
Notes	Used against large industrial/military targets, including infrastructure



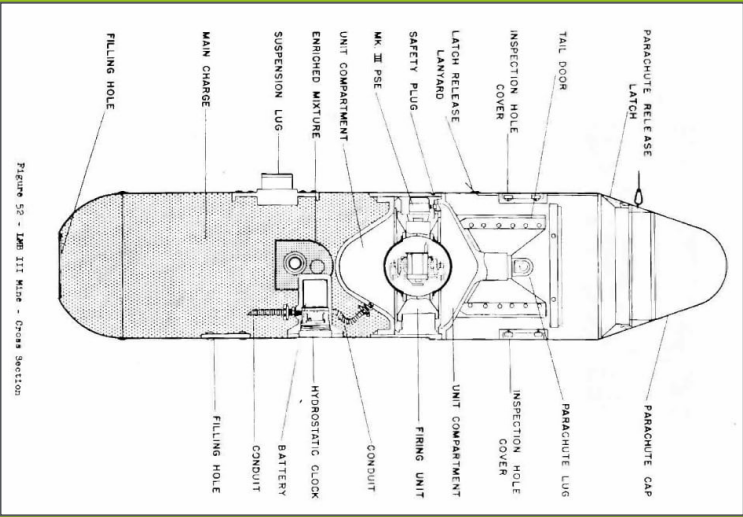
SC 250
MINENBOMBE

Munitions-Lexikon Nr.:
61 100 - 100 - 9

Verwendung: Deutschland, 2. Weltkrieg
Zünder: AZ (25) D, (38), (55), (55)A, L, Z, Z, (17) B und (57)
Gesamtgewicht: 250 + 12 kg
Füllung: 125 kg Fp 60/40 oder Amatol 39 oder Trialen 105
Bemerkung: Wurde später mit Ringleitwerk verwendet

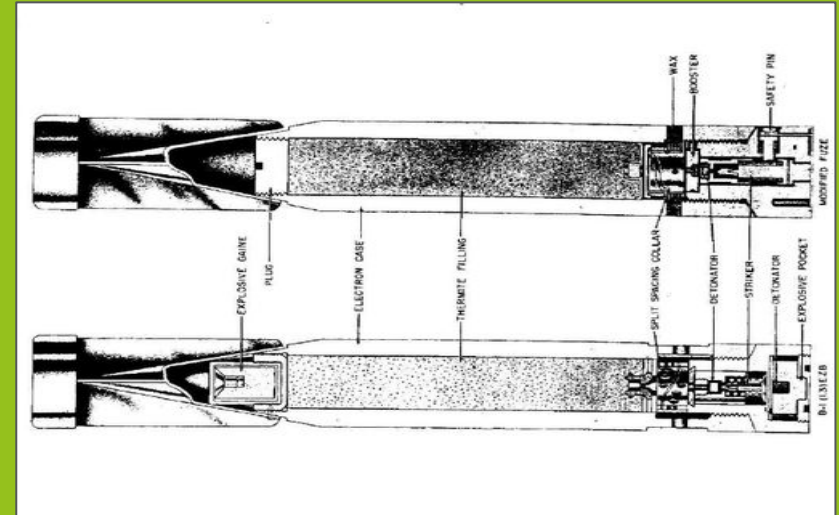
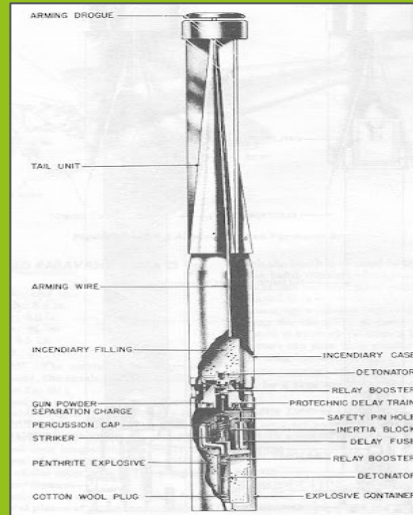
A technical drawing of a 500kg HE Bomb from a side-on perspective. Dimensions are given: overall length 1957, tail section length 1173, and tail diameter 640. A small label '-27-' is in the top right corner.

Parachute Mine (Luftmine B)	
Bomb Weight	1000kg
Weight of Explosive Fill	Approximately 700kg amatol/minol
Bomb Length	2640mm
Type of Fuze	Impact or electrical time delay
Notes	Larger than Luftmine A (500kg). Descent retarded by parachute.

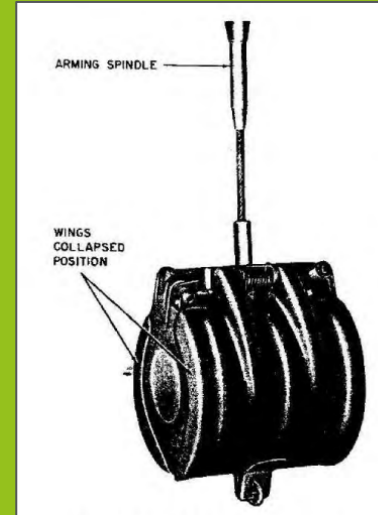
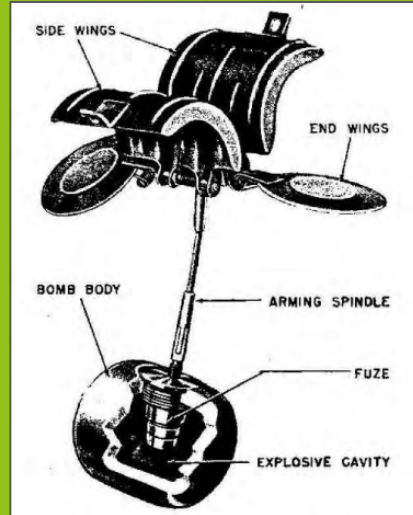


2kg Incendiary Bomb

Bomb Weight	2.2kg
Weight of Explosive Fill	100g HE bursting charge
Bomb Dimensions	311mm x 50mm
Type of Fuze	Electrical impact fuze
Notes	Dropped in container in batches of up to 372. Also had 1kg variant.

**SD2 AP Butterfly Bomb**

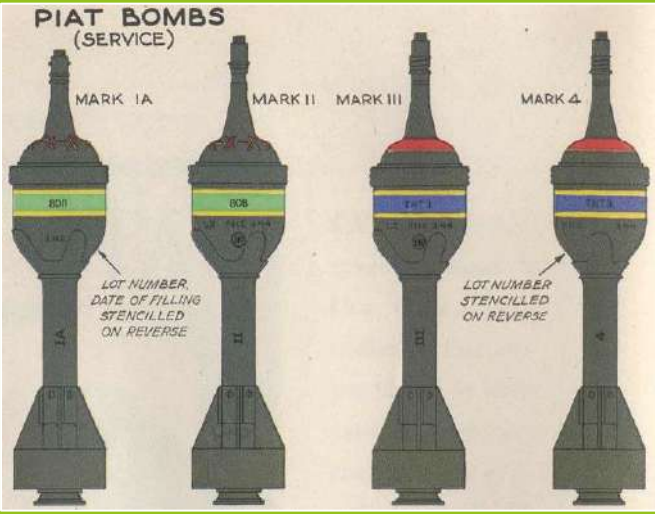
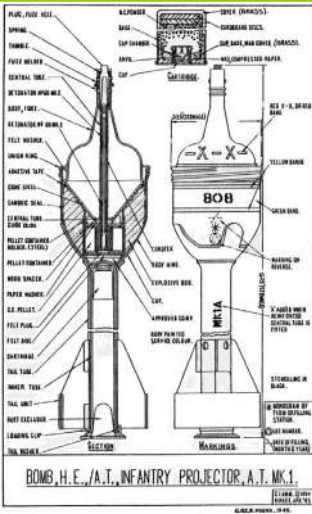
Bomb Weight	2kg
Weight of Explosive Fill	220g amatol
Bomb Diameter	762mm
Type of Fuze	Time delay, anti-handling device
Notes	Fragmentation device. Bomb armed by wings as they spun on descent.



6 Pounder Anti-Tank Gun	
Shell Weight	Approx. 3kg HE shell, 1.42kg APDS
Fill Weight & Fill	HE shell 590g of TNT
Fuze	No.243 percussion
Dimensions	57 x 441mm
Appearance	Later rounds possessed discarding sabot with ballistic cap



PIAT	
Shell Weight	1.1kg
Fill Weight & Fill	570g Nobels 808 PE
Fuze	No.426 Point-Initiating
Dimensions	83 x 407 mm
Appearance	HEAT versions green/brown, practice version white and drill version black



	2" Mortar	3" Mortar	4.2" Mortar
Shell Weight	1.02kg	4.5kg	9.9kg
Fill Weight & Fill	200g TNT	500g amatol	3.6kg TNT
Fuze	No.151 percussion	No.152 direct action	No.152 direct action
Diameter	51mm	81mm	107mm
Appearance	Parallel sides. Red and yellow band on black body often denoted HE.	Tear drop shape. Red or green rings may denote HE.	Tear drop shape. Red or green rings may denote HE.

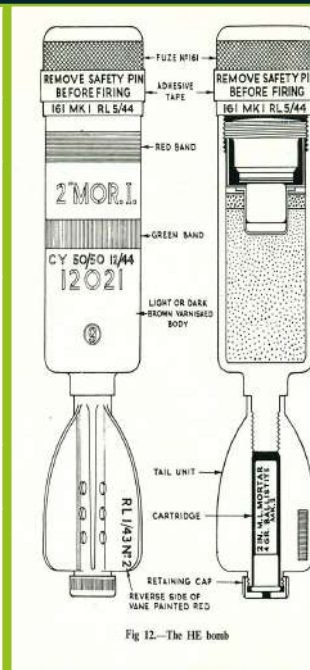
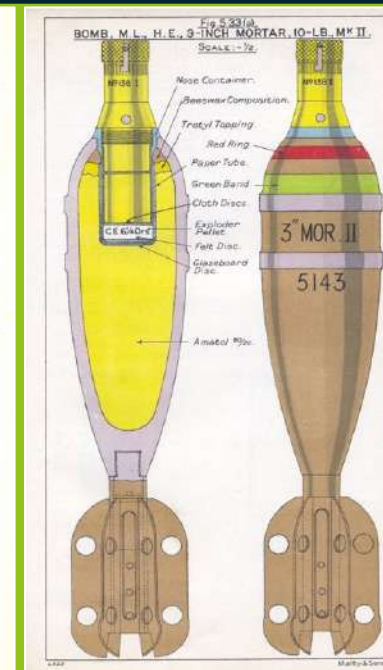
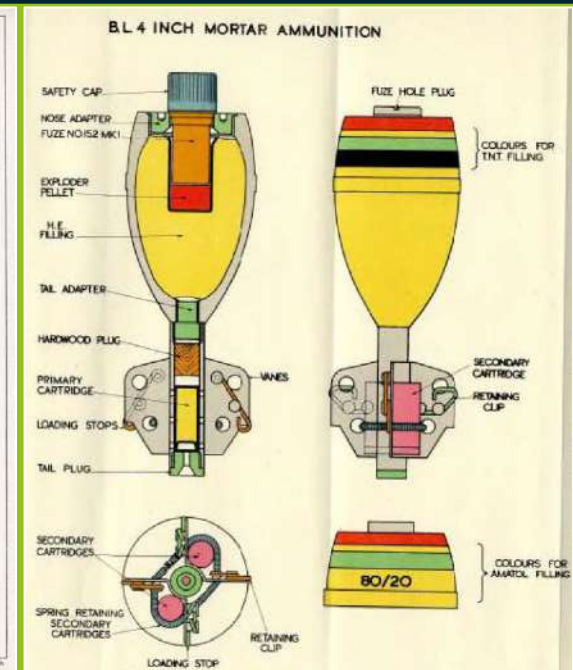


Fig 12.—The HE bomb

HE 2" mortar



HE 3" mortar



HE 4.2" mortar

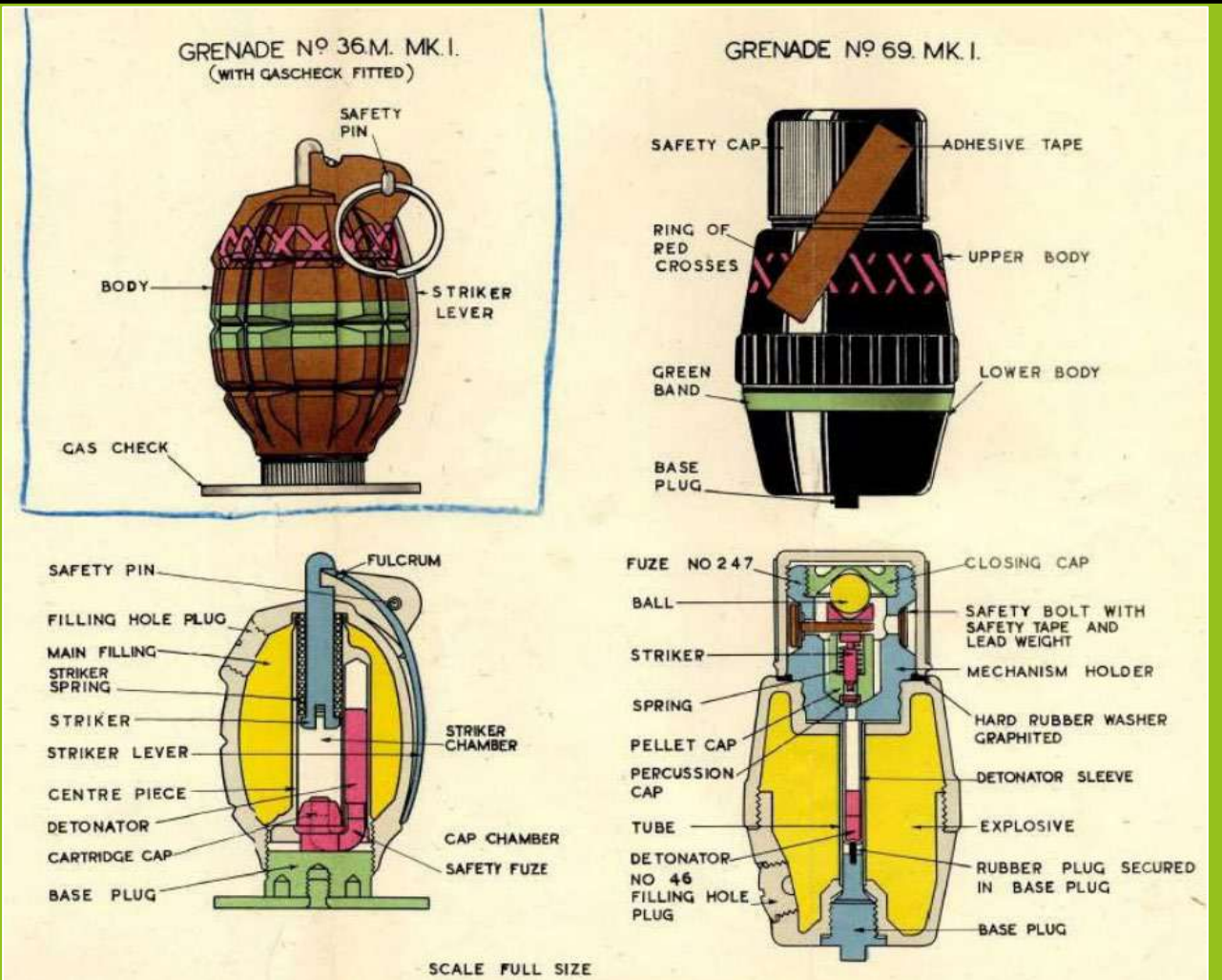
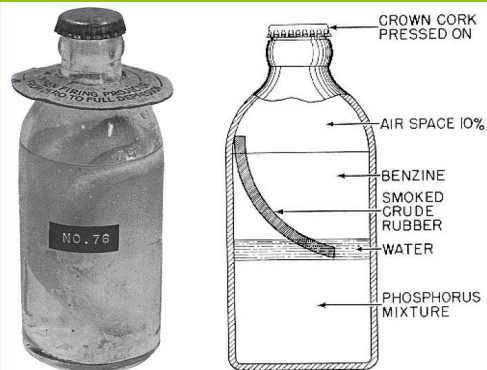


An overview of two 2" mortars, one with tail fin attached, alongside spare nose caps and tail fins. Red and green bands are present on the 2" mortar with the fins.



An unexploded 4.2" mortar found in a garden. Although corroded and dirty, the tail fins, teardrop body shape and No.152 fuse can be identified. Found less commonly than 2" mortars, 4.2" mortars possess a much higher Net Explosive Quantity.

	No.36 Grenade	No.69 Grenade	No.76 Grenade
Weight	765g	383g	530g
Fill Weight & Fill	71g ammonal	93g Lyddite	Benzene and WP
Fuze	Initially seven second fuse, reduced to four	Impact only "all-ways"	n/a
Dimensions	95 x 61mm	15 x 60mm	n/a
Appearance	'Pineapple' ridging, safety pin near top	Largely smooth, filling plug near bottom	Glass bottle with rubber tube in the middle



Left: No.76 grenade Above: No.36 and No.69 grenades

- Bates, H. E., **Flying Bombs over England**, Frogletts Publications Ltd., 1994
- Castle, I., **London 1914-17 The Zeppelin Menace**, Osprey, 2008
- Castle I., **London 1917-18 The Bomber Blitz**, Osprey, 2010
- Clarke, N. J., **Adolf's British Holiday Snaps: Luftwaffe Aerial Reconnaissance Photographs of England, Scotland and Wales**, Fonthill Media Ltd., 2012
- Dobinson, C., **AA Command: Britain's Anti-Aircraft Defences of the Second World War**, Methuen., 2001
- Dobinson, C., **Fields of Deception: Britain's Bombing Decoys of World War II**, Methuen Publishing Ltd, 2013
- Fegan, T., **The 'Baby Killers': German Air Raids on Britain in the First World War**, Leo Cooper Ltd., 200
- Fleischer, W., **German Air-Dropped Weapons to 1945**, Midland Publishing., 2004
- Hogg, I., **The Guns 1939-1945**, MacDonald and Co. Publishers, 1970
- Johnson, C., **Weapons & Warfare of the 21st Century**, Cathay Books
- Morris, J., **German Air Raids on Britain: 1914 – 1918**, The Naval & Military Press., 1993
- Price, A., **Blitz on Britain, The Bomber Attacks on the United Kingdom 1939 – 1945**, Purnell Book Services Ltd., 1977
- Ramsey, W., **The Blitz Then and Now, Volumes 1,2 & 3**, Battle of Britain Prints International Ltd., 1987, 1988 & 1990
- Ramsey, W., **The East End Then and Now**, After the Battle, 1997
- Scofield, J., **Modern Military Matters.**, Council for British Archaeology., 2004
- Stone, K., et al., **Unexploded Ordnance (UXO) A Guide For The Construction Industry (C681).**, CIRIA, 2009
- Whiting, C., **Britain Under Fire: The Bombing of Britain's Cities 1940-1945**, Pen & Sword Books Ltd., 1999



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Technical Note



Ref. ST20879-0001

CLIENT:	TATA Steel UK
PROJECT:	Project EAF
SUBJECT:	Coal Mining Risk Assessment
JOB NO.:	ST20879
DATE:	12 April 2024
PREPARED BY:	Adam Clarke, Engineering Technician
APPROVED BY:	Rebecca Marvell, Technical Director

Introduction

The British Geological Survey (BGS) data indicates that the land beneath the Port Talbot Steel Works site is located on Coal Measures geological formation. A part of the site proposed for redevelopment is described by the Coal Authority (statutory planning consultee for land containing coal) as being a Development High Risk Area. This designation highlights a potential for ground instability, resulting from legacy coal mining operations. A Coal Mining Risk Assessment (CMRA) is a requirement for any planning consultation with such a designation. The CMRA will provide a deeper understanding of the below ground hazards and to allow any proposed redevelopment of the site to be designed in such a way to mitigate against any risk that might be identified.

Coal Measures Summary

The site is underlain by Carboniferous age, Lower and Middle Coal Measures deposits, which range in age from approximately 300 to 360 million years old. These deposits consist primarily of mudstones, siltstones and sandstones, interspersed with bands of coal dipping in a north - east direction. The thickest and most valuable of these coal seams have been given names to help reference and map their mineral value. There are as many as 15 named coal seams which are indicated to subcrop (outcrop beneath soil deposits) within the planning boundary. These named seams are likely to be of mineable thickness, and at least four of these seams are known to have been mined beneath the site. Additional unnamed coal seams are thought to be present but are unlikely to be of sufficient thickness or mineral value to have been mined.

Technical Note

Ref. ST20879-0001

Several geological faults subdivide the stratigraphy at the site. The Kenfig-Tytlwyn Thrust Fault crosses through the site in an approximate east-west direction and offsets (throws) the geological sequence. The offset is such that several named coal seams are thought to subcrop within the site on both sides of the fault. BGS records also describe additional faulting (Giant's Grave fault and Morfa fault) at the site; but without detailed investigation, the conjectured position, and throw of these faults cannot be accurately determined.

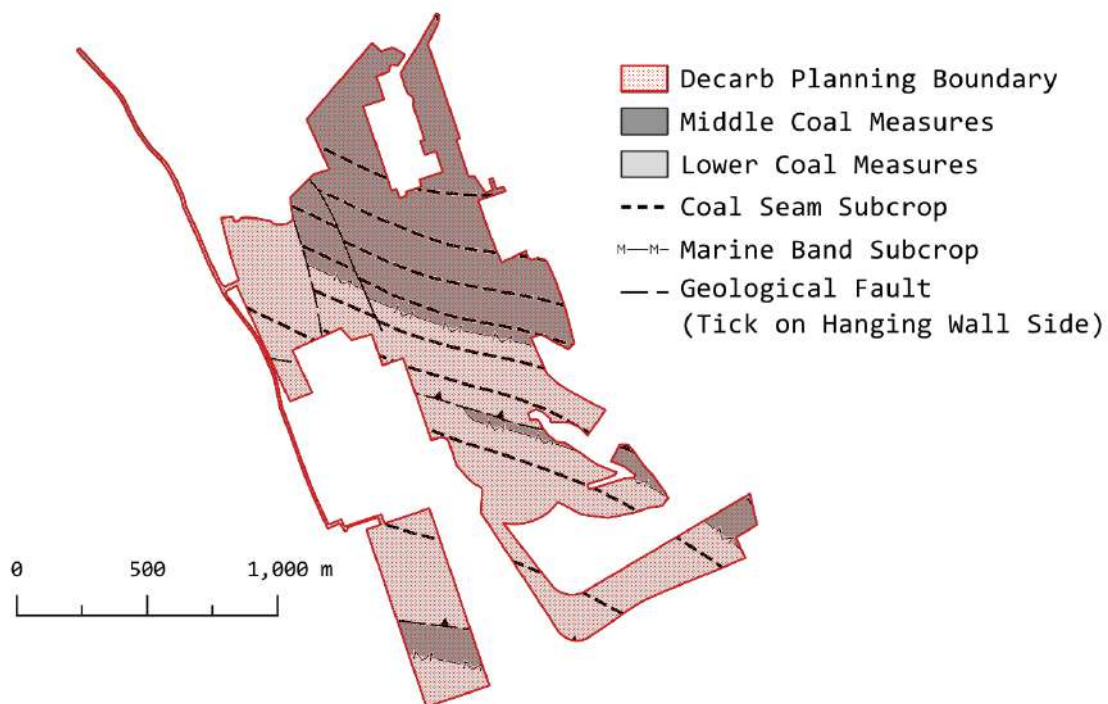


Figure 1 Geological structure within Planning Boundary. Contains British Geological Survey materials © UKRI 2024

Coal mining is known to have historically occurred at the site, most notably associated with the former Morfa Colliery, formerly located at the site. Wardell Armstrong has previously carried out a CMRA on part of the site, identifying only a low to moderate risk to any future development.

Three mine entries are recorded by the Coal Authority within the provided Planning Boundary. Wardell Armstrong has previously carried out physical searches for the three mine entries, physically proving the position of one shaft and providing search records for the other two.

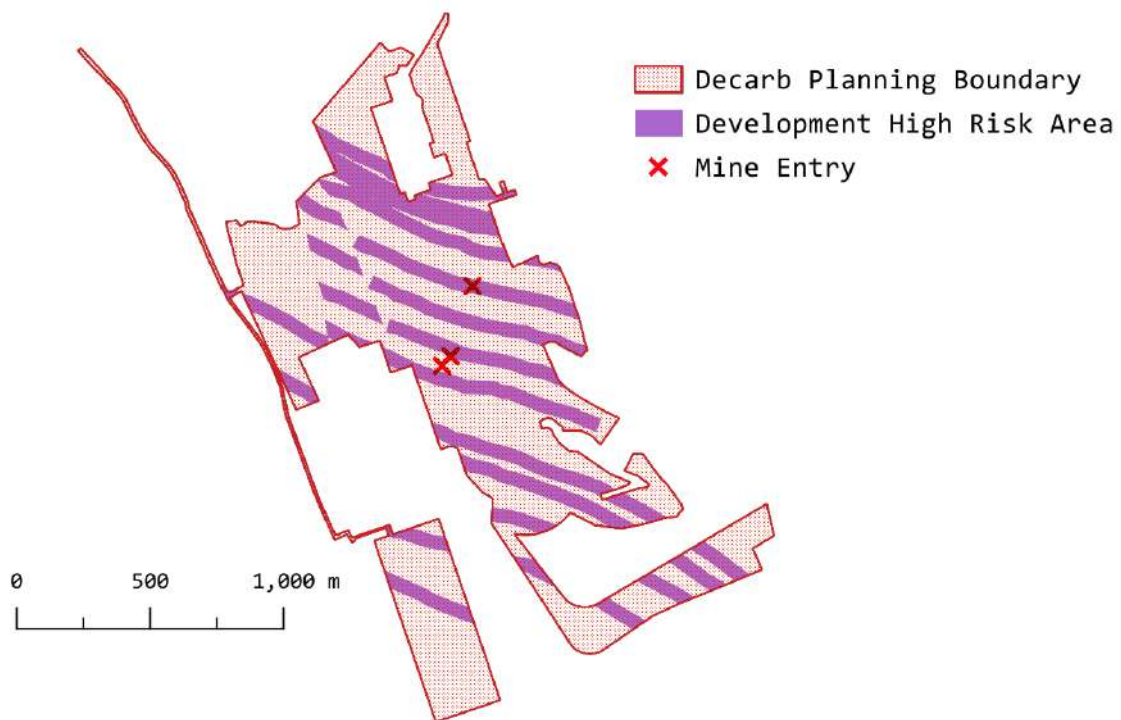


Figure 2 Development High Risk Areas to be revised following CMRA and ground investigation. Coal Authority information © The Coal Authority, 2023

Evidence of possible coal mine workings exists for up to eight of the coal seams beneath the site, and is summarised by each source of the information below:

1. The Coal Authority Consultant Mining Report records workings in the Five Foot, Gellideg, Lower Nine Foot Top Leaf and Garw Vein coal seams.
2. Available Morfa Colliery abandoned mine plans describe workings in the Four Feet (L 4 FT) and Nine Feet (U 9 FT and/or L 9 FT).
3. The North of England Institute of Mining and Mechanical Engineers - Forster Collection, records workings in the Nine Feet (U 9 FT and/or L 9 FT) and Garw Vein.
4. The Northern Mining Research Society website reports the "Morfa colliery worked the North Fawr, South Fawr, Six-Feet, Three-Feet, Nine-Feet, Five-Quarter and Cribbwr seams; and worked the Clay seam between 1854 and 1865".

Several of the seam names can be corroborated between sources, with evidence for the Nine Feet and Gawr Vein seams reported as worked in three of the above searches. The most recent date of recorded mine workings at the site is 1913, in the Gawr Vein seam, from the

Coal Authority Consultant Mining Report. The likelihood of subsidence or significant ground collapse resulting from recorded mine workings of this age and at the depths is very low. The possibility for historical unrecorded workings at a shallower depth cannot be discounted. Further understanding of the location of any workings, and the depth, age and mineable thickness of each of the coal seam contributions to site risk will be determined by the Coal Mining Risk Assessment.

Coal Mining Risk Assessment

The CMRA as a planning document is divided into sections to reflect each hazard and typically presented in a tabular format with risks, potential consequences and mitigations measures discussed. The specific hazards considered are as follows:

- Past recorded underground mining;
- Past unrecorded underground mining;
- Present and future surface mining;
- Present and future underground mining;
- Mine entries;
- Mine gases; and,
- Geological features – Faults, fissures and breaklines.

Risk Assessment Conclusions

Based on available data, there are coal mining related hazards at the Project EAF development site. A series of coal seams from the Lower and Middle Coal Measures; geological faulting of the Coal Measures; recorded mine workings within several coal seams; and three mine entries are the identified hazards within the site. The current proposed layout for the site redevelopment is understood to have taken into consideration the position of the known mine entries and any sensitive plant and built structures have been kept away from these positions. While scale of the risk has yet to be fully determined, the outline understanding is that the risks to any proposed development are low to moderate. None of the risks identified thus far are considered unsurmountable by design or remediation techniques, in line with the recommendations of the Coal Authority, and industry standard guidance (CIRIA C758 – Abandoned Mine Workings Manual). Pending detailed review of the background information, the CMRA will likely recommend that a phase of ground investigation be carried out to help further quantify the risks.

APPENDIX D

TECHNICAL BACKGROUND

C 1. Desk Study

Aquifer designation and Source protection zones (England and Wales)

Principal aquifer: layers of rock or drift deposit that have high intergranular and/or fracture permeability (usually providing a high level of water storage). They may support water supply and/or river base flow on a strategic scale.

Secondary A aquifer: permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

Secondary B aquifer: predominantly lower permeability layers that may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.

Secondary undifferentiated aquifer: it has not been possible to attribute either a category A or B to a rock type. In most cases this means that it was previously designated as both a minor and non-aquifer in different locations owing to the variable characteristics.

Unproductive' strata: low permeability with negligible significance for water supply or river base flow.

The EA generally adopts a three-fold classification of source protection zones (SPZ) surround abstractions for public water supply. The Site is situated in an area defined as follows:

- Zone 1 or the 'inner protection zone' is located immediately adjacent to the groundwater source and is based on a 50-day travel time from any point below the water table to the source. It is designed to protect against the effects of human activity and biological/chemical contaminants that may have an immediate effect on the source
- Zone 2 or the 'outer protection zone' is defined by a 400-day travel time from a point below the water table to the source. The travel time is designed to provide delay and attenuation of slowly degrading pollutants
- Zone 3 or the 'total catchment' is the area around the source within which all groundwater recharge is presumed to be discharged at the source.

Preliminary risk assessment methodology

LCRM outlines the framework to be followed for risk assessment in the UK. The framework is designed to be consistent with UK legislation and policies including planning. An outline conceptual model should be formed at the preliminary risk assessment stage that collates all the existing information pertaining to a site in text, tabular or diagrammatic form. The outline conceptual model identifies potentially complete (termed possible) contaminant linkages (contaminant–pathway–receptor) and is used as the basis for the design of the site investigation. The outline conceptual model is updated as further information becomes available, for example as a result of the site investigation.

Production of a conceptual model requires an assessment of risk to be made. Risk is a combination of the likelihood of an event occurring and the magnitude of its consequences. Therefore, both the

likelihood and the consequences of an event must be taken into account when assessing risk. RSK has adopted guidance provided in CIRIA C552 for use in the production of conceptual models.

The likelihood of an event can be classified on a four-point system using the following terms and definitions based on CIRIA C552:

- highly likely: the event appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution
- likely: it is probable that an event will occur or circumstances are such that the event is not inevitable, but possible in the short term and likely over the long term
- low likelihood: circumstances are possible under which an event could occur, but it is not certain even in the long term that an event would occur and it is less likely in the short term
- unlikely: circumstances are such that it is improbable the event would occur even in the long term.

RSK also adopt a 'very unlikely' probability to account for where there may be increased certainty over whether an event is probable in the long term.

The severity can be classified using a similar system also based on CIRIA C552. The terms and definitions relating to severity are:

- severe: short term (acute) risk to human health likely to result in 'significant harm' as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resources. Catastrophic damage to buildings or property. Short-term risk to an ecosystem or organism forming part of that ecosystem (note definition of ecosystem in 'Draft Circular on Contaminated Land', DETR 2000)
- medium: chronic damage to human health ('significant harm' as defined in 'Draft Circular on Contaminated Land', DETR 2000), pollution of sensitive water resources, significant change in an ecosystem or organism forming part of that ecosystem
- mild: pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ('significant harm' as defined in 'Draft Circular on Contaminated Land', DETR 2000). Damage to sensitive buildings, structures or the environment
- minor: harm, not necessarily significant, but that could result in financial loss or expenditure to resolve. Non-permanent human health effects easily prevented by use of personal protective clothing. Easily repairable damage to buildings, structures and services.

Once the probability of an event occurring and its consequences have been classified, a risk category can be assigned according to the following table.

		Consequences			
		Severe	Medium	Mild	Minor
Probability	Highly likely	Very high	High	Moderate	Moderate/low
	Likely	High	Moderate	Moderate/low	Low
	Low likelihood	Moderate	Moderate/low	Low	Very low

	Unlikely	Moderate/low	Low	Very low	Very low
	Very Unlikely	Low	Very Low	Negligible	Negligible

Definitions of these risk categories are as follows together with an assessment of the further work that may be required:

- very high: there is a high probability that severe harm could occur or there is evidence that severe harm is currently happening. This risk, if realised, could result in substantial liability; urgent investigation and remediation are likely to be required
- high: harm is likely to occur. Realisation of the risk is likely to present a substantial liability. Urgent investigation is required. Remedial works may be necessary in the short term and are likely over the long term
- moderate: it is possible that harm could arise, but it is unlikely that the harm would be severe and it is more likely that the harm would be relatively mild. Investigation is normally required to clarify the risk and determine the liability. Some remedial works may be required in the longer term
- low: it is possible that harm could occur, but it is likely that if realised this harm would at worst normally be mild
- very low: there is a low possibility that harm could occur and if realised the harm is unlikely to be severe.

C Greenfield Runoff Rates

Calculated by:	faye tomalin
Site name:	P Fields
Site location:	Tata Steel

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.56110° N
Longitude:	3.7663° W
Reference:	137477977
Date:	Aug 05 2024 17:04

Runoff estimation approach

FEH Statistical

Site characteristics

Total site area (ha):	2.7
-----------------------	-----

Methodology

Q _{MED} estimation method:	Calculate from BFI and SAAR
BFI and SPR method:	Specify BFI manually
HOST class:	N/A
BFI / BFIHOST:	0.788
Q _{MED} (l/s):	
Q _{BAR} / Q _{MED} factor:	1.08

Hydrological characteristics

	Default	Edited
SAAR (mm):	1129	1123
Hydrological region:	9	9
Growth curve factor 1 year:	0.88	0.88
Growth curve factor 30 years:	1.78	1.78
Growth curve factor 100 years:	2.18	2.18
Growth curve factor 200 years:	2.46	2.46

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

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MORE INFO

By clicking the Accept button, you agree to us doing Greenfield runoff rates

Default

Edited

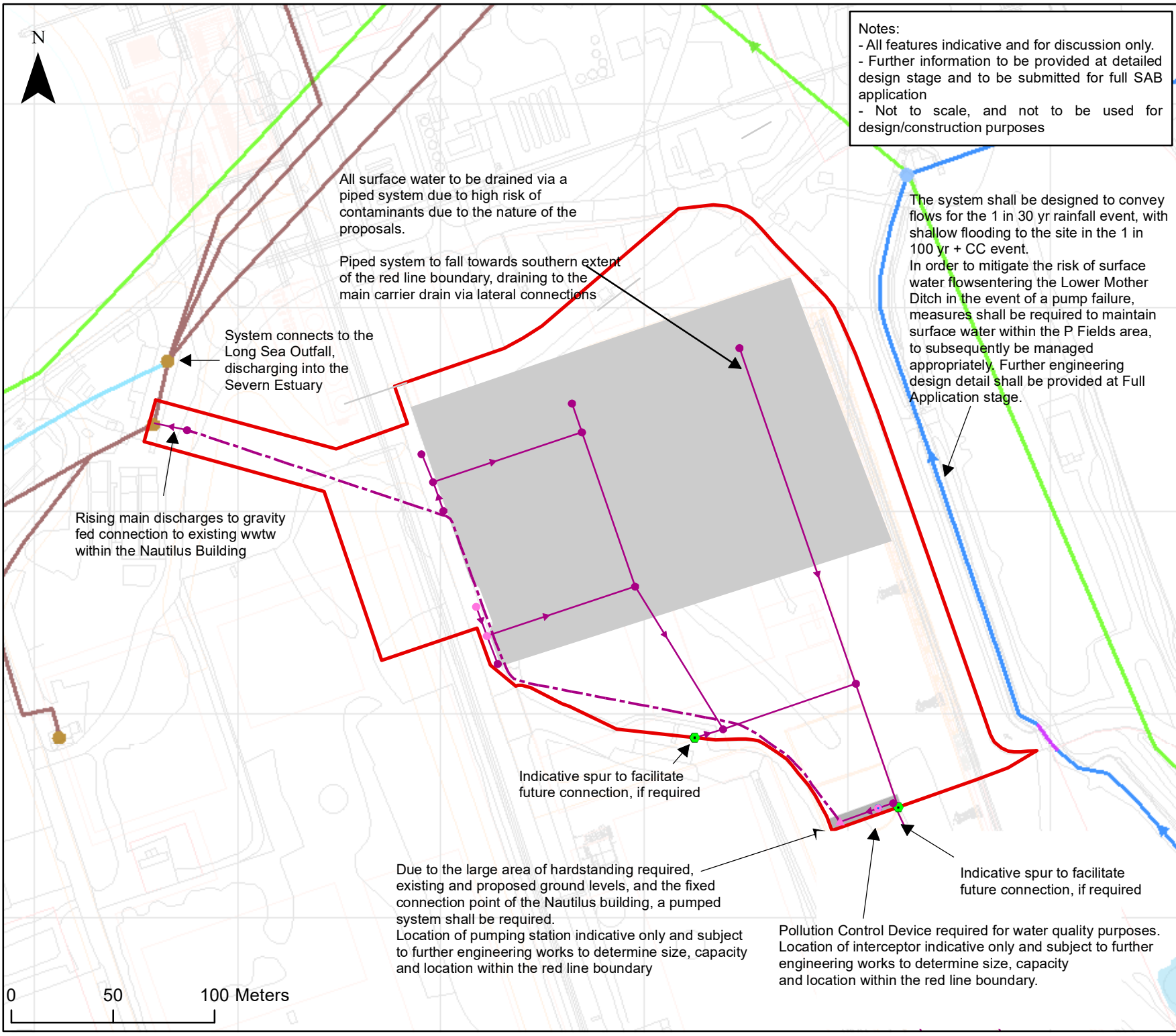
Q_{BAR} (l/s):		7.45
1 in 1 year (l/s):		6.56
1 in 30 years (l/s):		13.26
1 in 100 year (l/s):		16.24
1 in 200 years (l/s):		18.33

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

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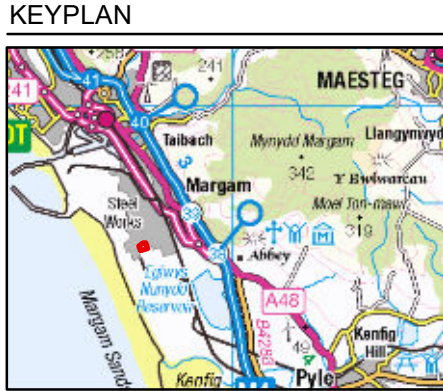
By clicking the Accept button, you agree to us doing so.

D Outline Drainage Strategy



Notes:

- All features indicative and for discussion only.
- Further information to be provided at detailed design stage and to be submitted for full SAB application
- Not to scale, and not to be used for design/construction purposes



Legend	
	Planning Boundary
	Junctions (Surface Water)
	Ordinary Watercourse
	Culvert
	Existing Surface water network
	Waterbody
	Existing Process line
	Process Systems
	Indicative pumping station location
	Area of hardstanding
	Proposed Nautilus Connection
	Proposed Interceptor
	Proposed Pumping Station
	Access Chamber
	Proposed Rising Main
	Proposed Lateral Drain (gravity)
	Future Connection



P Fields

Outline Drainage Strategy

Rev G

October 2024

Drawn by:	Reviewed by:	Approved by:
Charlotte	Faye	George
Lickman	Tomalin	Baker
07/10/2024	07/10/2024	07/10/2024

E Margam Moors Feasibility Study, 2008



Neath Port Talbot
Castell-nedd Port Talbot

County Borough Council Cyngor Bwrdeistref Sirol

MARGAM MOORS WETLAND PROJECT FEASIBILITY STUDY

LOOKING AT OPPORTUNITIES TO:

- **CREATE NEW HABITATS**
- **ENHANCE EXISTING HABITATS**
- **ENRICH BIODIVERSITY**
- **IMPLEMENT BIODIVERSITY ACTION PLANS**

May 2008

Barry Stewart & Associates
Consultant Ecologists

*36 Pencaeacrwyn Road, Penyrheol, Gorseinon, Swansea SA4 4FU
Tel/Fax 01792 539447. Email: moonmoths@sky.com*



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SUMMARY

The rationale behind this study has developed following a study on breeding Lapwing carried out in the Neath Port Talbot area from 2006 to 2008, , this being a 'Species of Principal Importance for Conservation of Biological Diversity in Wales under section 74 of the Countryside and Rights of Way Act 2000'. The study highlighted the precarious existence of the Lapwing in the county and the urgent need for action in order to restore the population to a sustainable level.

Several sites were put forward as having potential for habitat creation/enhancement projects, but Margam Moors offers by far the best possibilities for the creation and/or enhancement of wetland habitats in order to provide long-term breeding opportunities for breeding Lapwing. Additionally, other Biodiversity Action Plan (BAP) habitats and species could benefit from a carefully designed scheme at this site and a significant contribution could be made to the NPTBAP process.

The 140ha field and ditch system of Margam Moors is part of a much larger area of land that is owned by the Corus steel manufacturing company. A large part of the moors (111ha) was designated as a Site of Special Scientific Interest (SSSI) in 1985 following on from the threat of industrial development during the early 1980s. The remaining 29ha of similar habitat lies outside of the SSSI lies on the northern side of the east-west access road.

This study has shown that there is considerable opportunity for implementing habitat creation / enhancement in areas where there is limited ecological value without significantly altering the character and use of the land. The main constraint to any changes in land use or management in this area should be that the hydrology or management of the ditch system should not be altered.

Without compromising the ecological attributes of the SSSI and adjacent grazing land to the north, the total area of land identified as having potential for habitat creation / enhancement is 38ha, with 23ha in the SSSI and 15ha immediately to the north of the SSSI, as illustrated by the black pecked line on Figure 4 on page 26.

Two methods of wetland creation are considered most appropriate for the site and indicative layout options are illustrated on Figure 6 on page 32. The main principle behind these options is that the habitat is not fragmented and that the design provides the opportunity for the project to develop in a piecemeal fashion rather than having to commit to a large project from the outset.

Option 1 equates to 1.4ha of permanent flooded scrape and 3.6ha of seasonally flooded ground and does not affect the SSSI.

Option 4, the largest indicative layout, equates to 19.7ha, with 3.1ha being permanent flooded scrape, 11.5ha seasonally flooded pasture and 5.1ha reedbed, though in practice a scheme of any size could be designed around any of the fields identified as having limited ecological value.

Whilst the character of the fields would be modified by the project, the operational management would remain the same as management would require a similar grazing regime to that currently practiced at the site.

Captured rainwater would be the principle source of water for shallow flooding of the fields. In order to keep fields topped up during dry winter periods, though consideration could be given to the installation of a wind pump, this method having been used successfully at similar sites. Approximate volumes

of water required for flooding if using the indicative layouts presented at figure 4 would range from 4,000m³ (summer) / 10,000m³ (winter) for option 1, to 10,000m³ (summer) / 40,000m³ (winter) for option 4.

Approximate costs for implementation of the project would range from £4000 for option 1 to £16000 for option 4

1. INTRODUCTION

- 1.1. The rationale behind this study has developed following the production of results of a study on breeding Lapwing *Vanellus vanellus* (a 'Species of Principal Importance for Conservation of Biological Diversity in Wales under section 74 of the Countryside and Rights of Way Act 2000') carried out in the Neath Port Talbot area during 2006 (Stewart, 2006). The study highlighted the precarious existence of the Lapwing in the county and the urgent need for action in order to restore the population to a sustainable level.

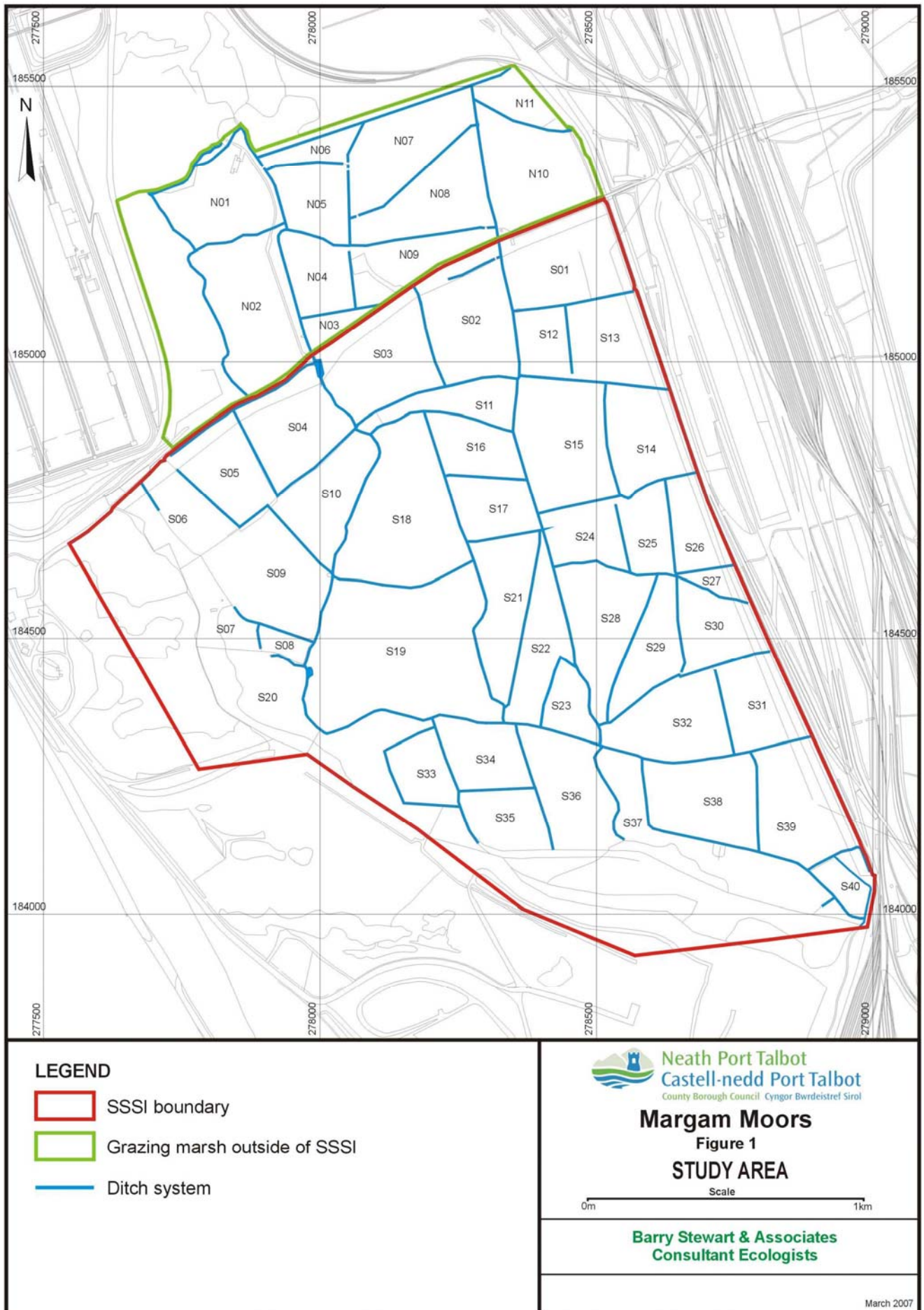


Plate 1. Lapwing on nest at Baglan 2006.

- 1.2. During presentations of results of the 2006 and 2007 Lapwing study at the Neath Port Talbot (NPT) Biodiversity Forum on 23 November 2006 and 22 May 2008, several sites were put forward as having potential for habitat creation/enhancement projects, including:
- BP Baglan (industrial site)
 - Baglan Moors (industrial site)
 - BP Llandarcy (industrial site)
 - Cadoxton grazing marsh (intertidal)
 - Crymlyn saltmarsh (intertidal)
 - Crymlyn Bog grazing meadows
 - Llandarcy saltmarsh (intertidal)
 - Margam Moors
 - Neath Abbey grazing marsh (intertidal)
- 1.3. From this list it was concluded that Margam Moors offered by far the best possibilities for the creation and/or enhancement of wetland habitats in order to provide long-term breeding opportunities for breeding Lapwing. However, additional to the Lapwing, it was also suggested that a whole range of other Biodiversity Action Plan (BAP) habitats and species could benefit from a

carefully designed scheme at this site and that a significant contribution could be made to the NPTBAP.

- 1.4. The main reasons that Margam Moors were considered to be the most suitable option was the open field system (Figure 1), this being an extensive area of grazing marsh with considerable scope for wetland creation / enhancement on agricultural land, parts of which have only limited ecological value.
- 1.5. The *Draft Local Biodiversity Action Plan for Neath-Port Talbot 2008-2012* lists targets and actions for most of the key habitats and species that occur within the county. In addition to providing details on a variety of options for habitat creation / enhancement at Margam Moors, this report identifies the targets and actions in the NPTBAP that could be implemented through a scheme at the site.
- 1.6. Field surveys were carried out during 2007 to enable an assessment of the current ecological status of the site. This included the field and ditch system north of the road as well as those within the SSSI.
- 1.7. It is intended that this report will provide sufficient information to enable key parties, notably Corus, CCW, EA, NPTCBC, and other statutory and non-statutory consultees and potential partners to make objective decisions with regard to the possible advancement of this or a similar project.



2. BASELINE CONDITIONS

2.1. SITE DESCRIPTION

- 2.2. The 140ha field and ditch system of Margam Moors is part of a much larger area of land that is owned by the Corus steel manufacturing company. A large part of the moors (111ha) was designated as a Site of Special Scientific Interest (SSSI) in 1985 following on from the threat of industrial development during the early 1980s. The remaining 29ha outside of the SSSI lies on the northern side of the east-west access road that runs from the railway line to the tip area as shown by the green boundary on Figure 1.
- 2.3. The SSSI citation states that Margam Moors are '*The last remaining example of the once extensive coastal levels in West Glamorgan. Bounded to the seaward by dunes and to the landward by high ground, the meadows provide an agriculturally-managed freshwater habitat which hosts many species of plant on the edge of their geographical range, and nationally important invertebrates*'. Another important feature of the site is that it is a constituent part of a complex series of coastal grassland and wetland habitats along the coastal fringe of Neath Port Talbot.
- 2.4. As indicated, the land is managed agriculturally, with five tenant farmers grazing mostly cattle and cutting for hay.

2.5. SITE OF SPECIAL SCIENTIFIC INTEREST (SSSI) KEY FEATURES:

- 2.6. The key features of the Margam Moors SSSI are the areas of mesotrophic marsh, fen meadow and ditch communities which support the following (NB Those included in the SSSI citation are shown in bold and NPTBAP species are indicated by ➔). The distributions of key species at Margm Moors are shown by figures 2a to 2g:

Plants:

Plant species on the edge of their geographical range:

Arrowhead (*Sagittaria sagittifolia*) see Figure 2c

Brown Sedge (*Carex disticha*)

Cyperus Sedge (*Carex pseudocyperus*) see Figure 2d

Flowering Rush (*Butomus umbellatus*) see Figure 2b

Frogbit (*Hydrocharis morsus-ranae*) see Figure 2a

Plant species of local interest:

Blunt-flowered Rush (*Juncus subnodulosus*)

Lesser Water-plantain (*Baldellia ranunculoides*)

Mare's-tail (*Hippuris vulgaris*) see Figure 2f

Marsh Helleborine (*Epipactis palustris*)

Tubular Water-dropwort (*Oenanthe fistulosa*)

Unbranched bur-reed (*Sparganium emersum*) see Figure 2e

Invertebrates:

Significant invertebrate species:

Mollusca

Common Whorl Snail (*Vertigo pygmaea*)
Shiny Glass Snail (*Zonitoides nitidus*)

Orthoptera

Great Green Bush Cricket (*Tettigonia viridissima*)
Slender Ground Hopper (*Tetrix subulata*)

Odonata

Ruddy Darter (*Sympetrum sanguineum*)

Hemiptera

Corixa panzeri (a water boatman) [Nationally Scarce]

Coleoptera

Acupalpus parvulus (a ground beetle) [Nationally Scarce]
Agabus didymus (a water beetle) [Nationally Scarce]
Agonum piceum (a ground beetle) [Nationally Scarce]
Agrypnus murinus (a click beetle) [Nationally Scarce]
Anacaena bipustulata (a scavenger water beetle) [Nationally Scarce]
Brooklime Gall Weevil (*Gymnetron veronicae*) [Nationally Scarce]
Brooklime Leaf Beetle (*Prasocuris junci*) [Nationally Scarce]
Cantharis pallida (a soldier beetle) [Nationally Scarce]
Cercyon ustulatus (a scavenger water beetle) [Nationally Scarce]
Cidnopus aeruginosus (a click beetle) [Nationally Scarce]
Copelatus haemorrhoidalis (a water beetle) [Nationally Scarce]
Cymbiodyta marginella (a scavenger water beetle) [Nationally Scarce]
Donacia marginata (a leaf beetle) [Nationally Scarce]
Donacia simplex (a leaf beetle) [Nationally Scarce]
Fleabane Tortoise Beetle (*Cassida murraea*) [Nationally Scarce]
Haliphus flavicollis (a crawling water beetle) [Nationally Scarce]
Haliphus mucronatus (a crawling water beetle) [Nationally Scarce Na]
Haliphus obliquus (a crawling water beetle) [Nationally Scarce]
Haliphus wehnckeii (a crawling water beetle) [Nationally Scarce]
Helochares lividus (a scavenger water beetle) [Nationally Scarce]
Hydroporus striola (a water beetle) [Nationally Scarce]
Hypera pollux (a weevil) [Nationally Scarce]
Georissus crenulatus (a scavenger water beetle) [Nationally Scarce Na]
Graptodytes pictus (a water beetle) [Nationally Scarce]
Gymnetron labile (a weevil) [Nationally Scarce]
Gyrinus caspius (a whirligig) [Nationally Scarce]
Iris Flea Beetle (*Aphthona nonstriata*) [Nationally Scarce]
Laccobius minutus (a scavenger water beetle) [Nationally Scarce]
Laccobius striatulus (a scavenger water beetle) [Nationally Scarce]
Laccophilus minutus (a water beetle) [Nationally Scarce]
Leiodes rufipennis (a round fungus beetle) [Nationally Scarce]
Limnebius nitidus (a small water beetle) [Nationally Scarce]
Limnichus pygmaeus (a tiny marsh beetle) [Nationally Scarce Na]
Noterus clavicornis (the larger Noterus) [Nationally Scarce]
Ochthebius bicolon (a small water beetle) [Nationally Scarce]
Ochthebius dilatatus (a small water beetle) [Nationally Scarce]
Odacantha melanura (a ground beetle) [Nationally Scarce]
Paederus riparius (a rove beetle) [Nationally Scarce]
Plateumaris sericea (a leaf beetle) [Nationally Scarce]
Porhydrus lineatus (a water beetle) [Nationally Scarce]
Rhantus suturalis (a water beetle) [Nationally Scarce]
Silis ruficollis (a soldier beetle) [Nationally Scarce]

Stenus cicindeloides (a rove beetle) [Nationally Scarce]
Strawberry Rhynchites (*Rhynchites germanicus*) [Nationally Scarce]
Thinodromus arcuatus (a rove beetle) [Nationally Scarce]
Water Ladybird (*Anisosticta novemdecimpunctata*) [Nationally Scarce]

Hymenoptera

Ametastegia glabrata (a sawfly) [Nationally Scarce]
Andrena barbilabris (a mining bee) [Nationally Scarce]
Anoplius infuscatus (a spider-hunter wasp) [Nationally Scarce]
Auplopus carbonarius (a spider-hunter wasp) [Nationally Scarce]
Bee Wolf (*Philantus triangulum*) [Vulnerable]
➔ Brown-banded Carder-bee (*Bombus humilis*) [**BAP Priority**, Nat. Scarce]
Evagetes crassicornis (a spider-hunter wasp) [Nationally Scarce]
Priocnemis perturbator (a spider-hunter wasp) [Nationally Scarce]
Red Banded Sand Wasp (*Ammophila sabulosa*) [Nationally Scarce]
Red Legged Spider Wasp (*Episyron rufipes*) [Nationally Scarce]
➔ Shrill Carder-bee (*Bombus sylvarum*) [**BAP Priority**, Nationally Scarce]
Sphecodes monilicornis (a cuckoo bee) [Nationally Scarce]
Tachysphex pompiliformis (a digger wasp) [Nationally Scarce]

Diptera

Anasimyia contracta (a hover fly) [Nationally Scarce]
Anthomyza elbergi (a fly) [Nationally Scarce]
Argyra argyria (a dolichopodid fly) [Nationally Scarce]
Calliopum elisae (a fly) [Nationally Scarce]
Anasimyia contracta (a hover fly) [Nationally Scarce]
Cleigastra apicalis (a dung fly) [Nationally Scarce]
Dialineura anilis (a stiletto fly) [Rare]
Dysmachus trigonus (a robber fly) [Nationally Scarce]
Dolichopus brevipennis (a dolichopodid fly) [Nationally Scarce]
Dolichopus longitarsis (a dolichopodid fly) [Nationally Scarce]
Elgiva cucularia (a snail-killing fly) [Nationally Scarce]
Erioptera squalida (a crane fly) [Nationally Scarce]
Gymnopternus assimilis (a dolichopodid fly) [Nationally Scarce]
Helina obscurata (a muscid fly) [Nationally Scarce]
Hemerodromia raptoria (a dance fly) [Nationally Scarce]
Hilara subpollinosa (a dance fly) [Nationally Scarce]
Hydrophorus balticus (a dolichopodid fly) [Nationally Scarce]
Lasiopogon cinctus (a robber fly) [Nationally Scarce]
Limnophora tigrina (a muscid fly) [Nationally Scarce]
Micropeza corrigiolata (a stilt fly) [Nationally Scarce]
Nemotelus pantherinus (a soldier fly) [Nationally Scarce]
Neoascia tenur (a hover fly) [Nationally Scarce]
Nigrotipula nigra (a crane fly) [Nationally Scarce]
Oplodontha viridula (a soldier fly) [Nationally Scarce]
Pamponerus germanicus (a robber fly) [Rare]
Phaonia atriceps (a muscid fly) [Nationally Scarce]
Platypalpus pallidicornis (a dance fly) [Nationally Scarce]
Psacadina verbekei (a snail-killing fly) [Nationally Scarce]
Pherbellia dorsata (a snail-killing fly) [Nationally Scarce]
Pherbellia schoenherri (a snail-killing fly) [Nationally Scarce]
Platycheirus rosarum (a hover fly) [Nationally Scarce]
Ptychoptera contaminata (a fly) [Nationally Scarce]
Sapromyza opaca (a fly) [Nationally Scarce]
Scathophaga scybalaria (a dung fly) [Nationally Scarce]

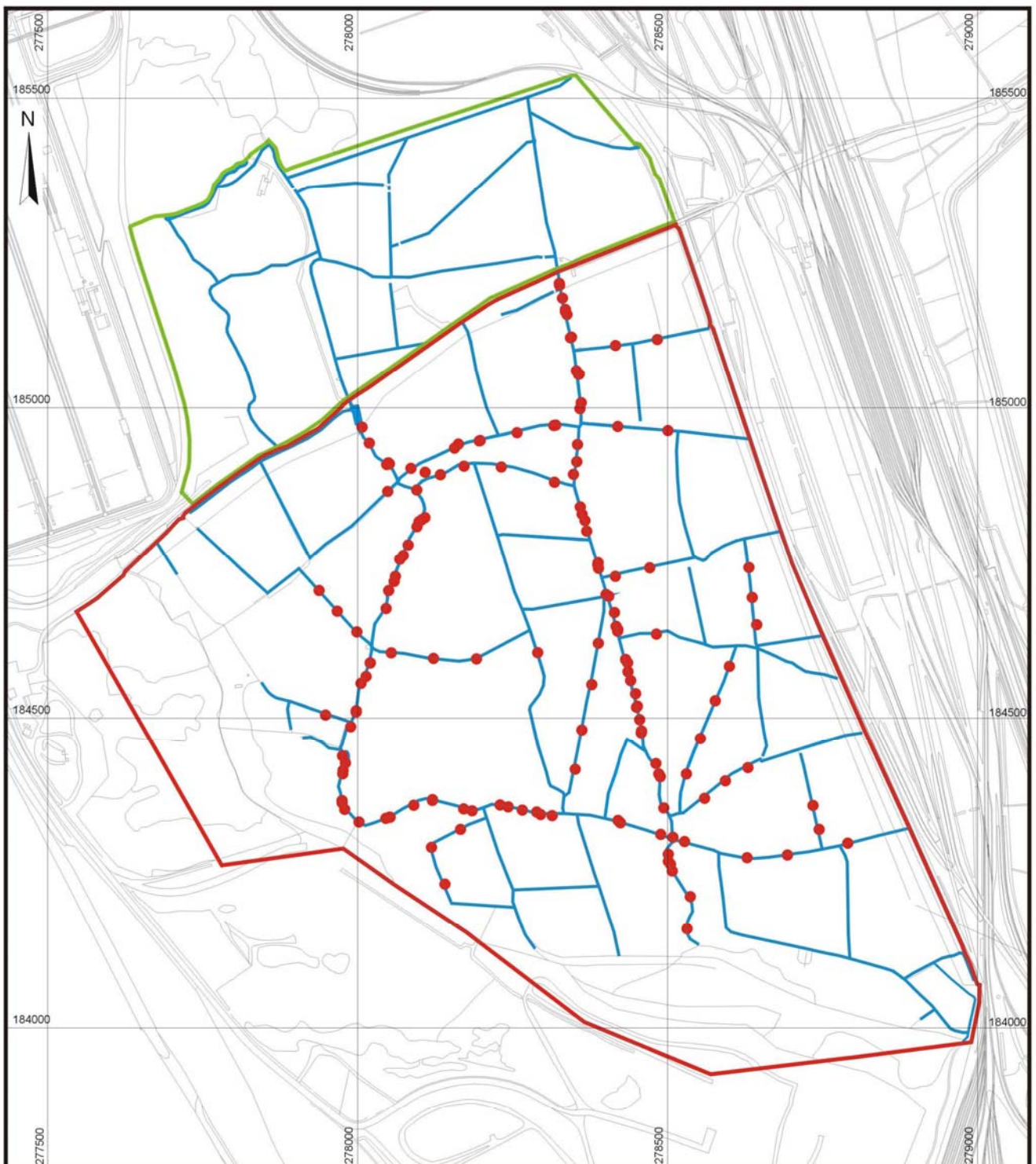
Sepedon spegea (a snail-killing fly) [Nationally Scarce]
Sepedon spinipes (a snail-killing fly) [Nationally Scarce]
Sicus ferrugineus (a conopid fly) [Nationally Scarce]
Sphaerophoria interrupta (a hover fly) [Nationally Scarce]
Sphenella marginata (a gall fly) [Nationally Scarce]
Syntormon denticulatum (a dolichopodid fly) [Nationally Scarce]
Syntormon pumilus (a dolichopodid fly) [Nationally Scarce]
Tetanocera punctifrons (a snail-killing fly) [Nationally Scarce]
Teuchophorus spinigerellus (a dolichopodid fly) [Nationally Scarce]
Themira superba (a lesser dung fly) [Nationally Scarce]

Vertebrates:

There appears to have been little recorded in the way of mammals, birds, reptiles and amphibians. Consultation with various parties has provided an indication of the likely status of the following key species:

Mammals

- ➔ Otter (*Lutra lutra*) [**BAP Priority**] Present (Dan Forman pers. comm.)
- ➔ Water Vole (*Arvicola terrestris*) [**BAP Priority**] No known populations within at least 2km (Dan Forman pers. comm.)



LEGEND

- SSSI boundary
- Grazing marsh outside of SSSI
- Ditch system



Neath Port Talbot
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Margam Moors

Figure 2a

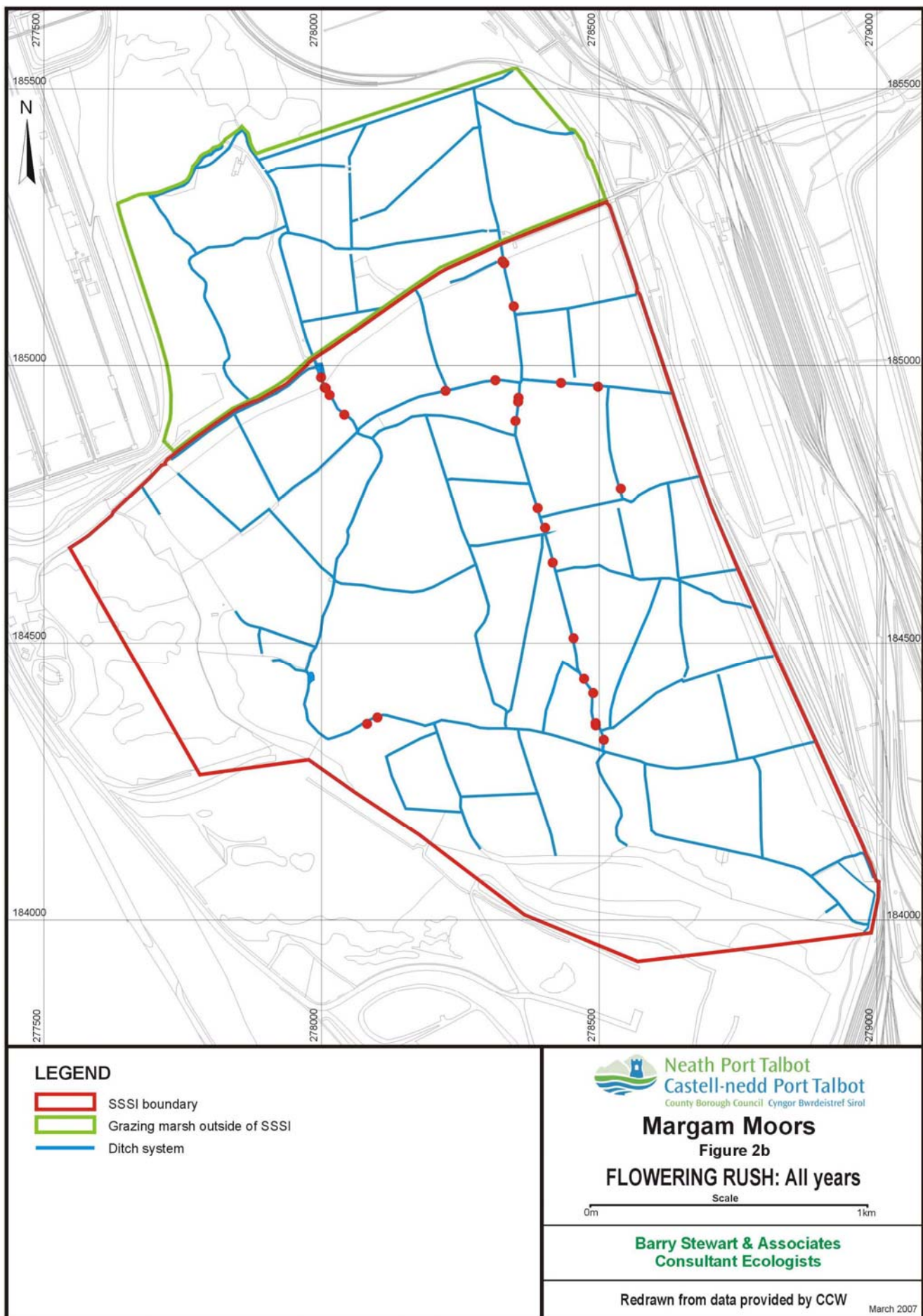
FROGBIT: All years

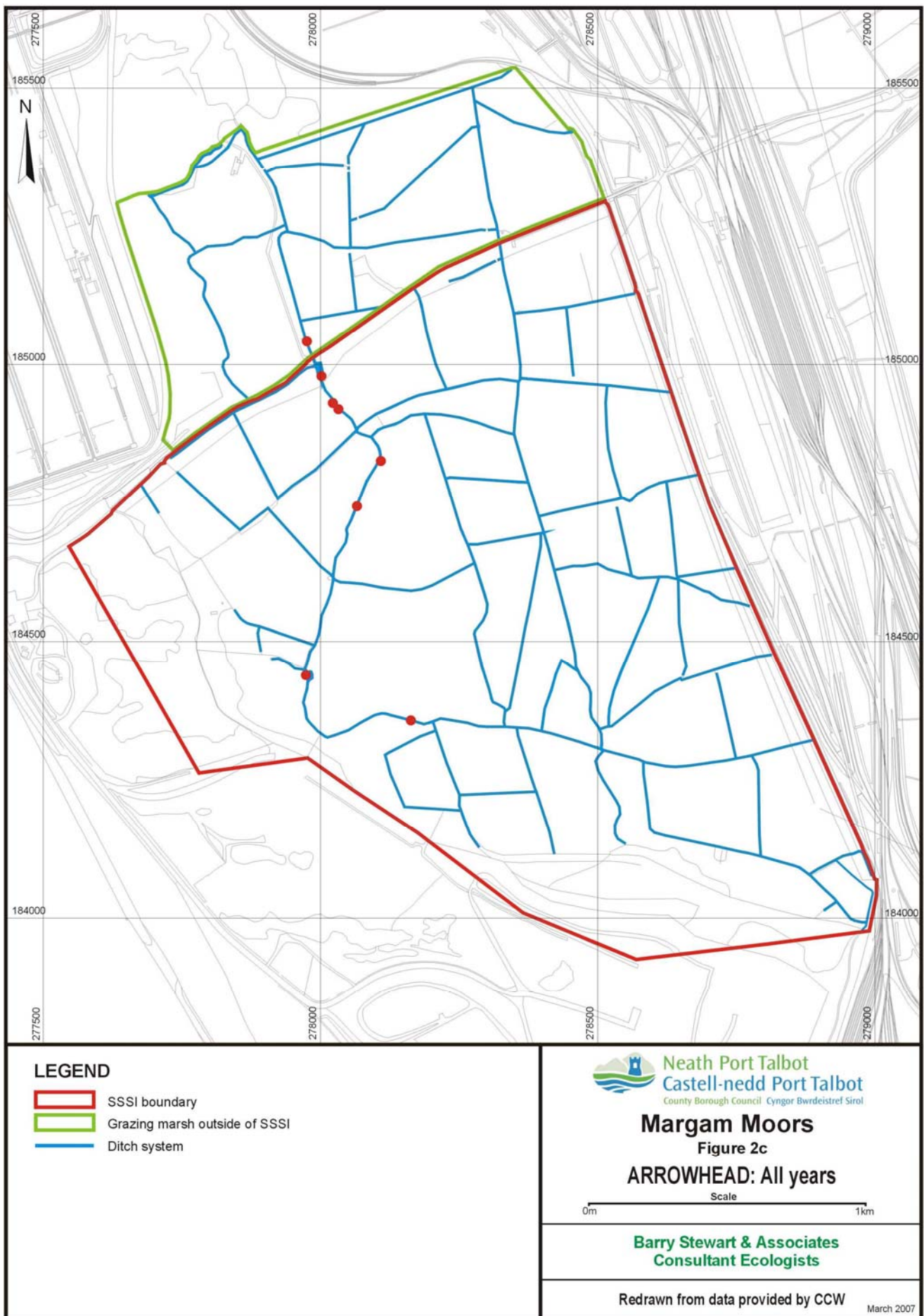
Scale 0m 1km

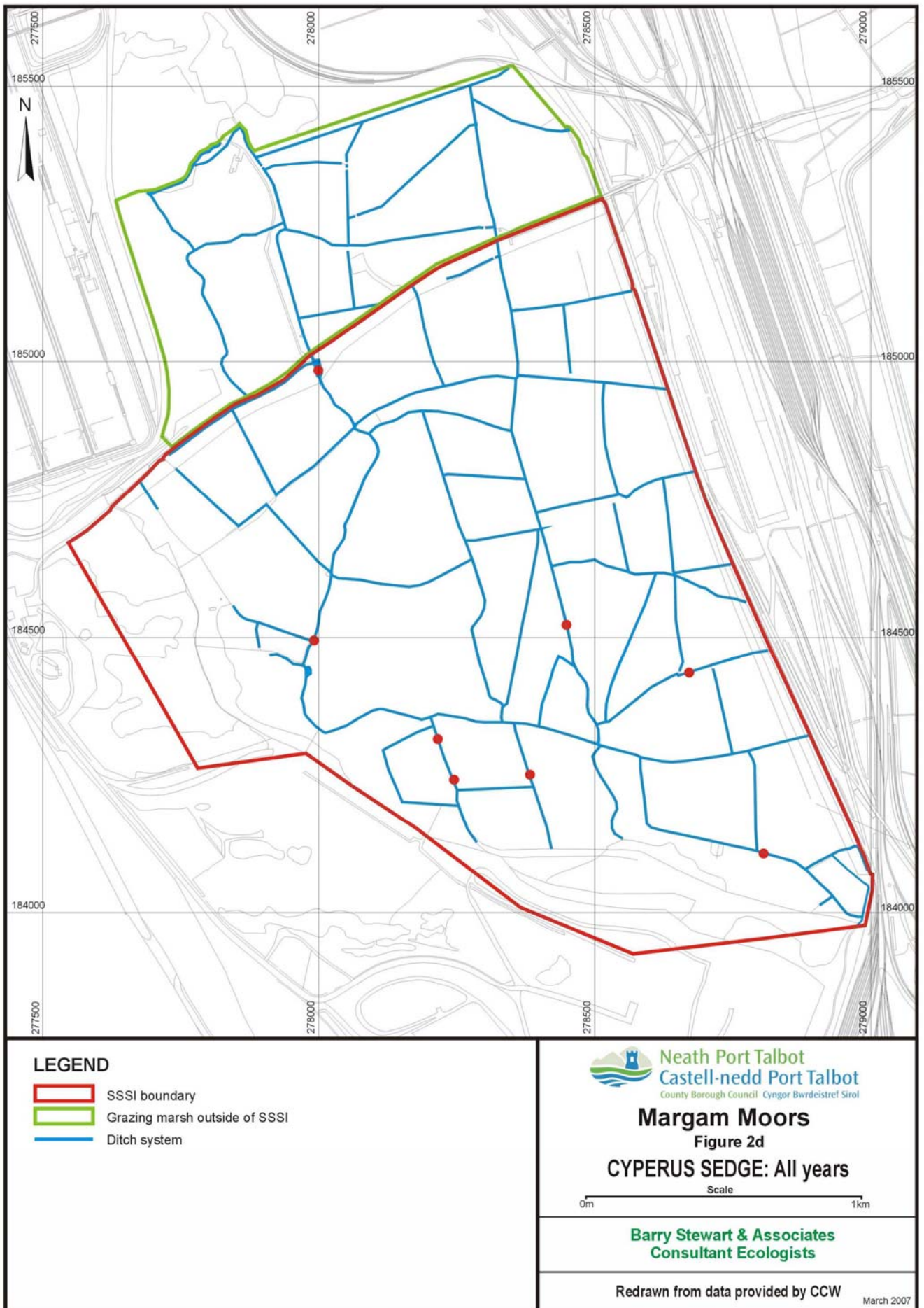
Barry Stewart & Associates
 Consultant Ecologists

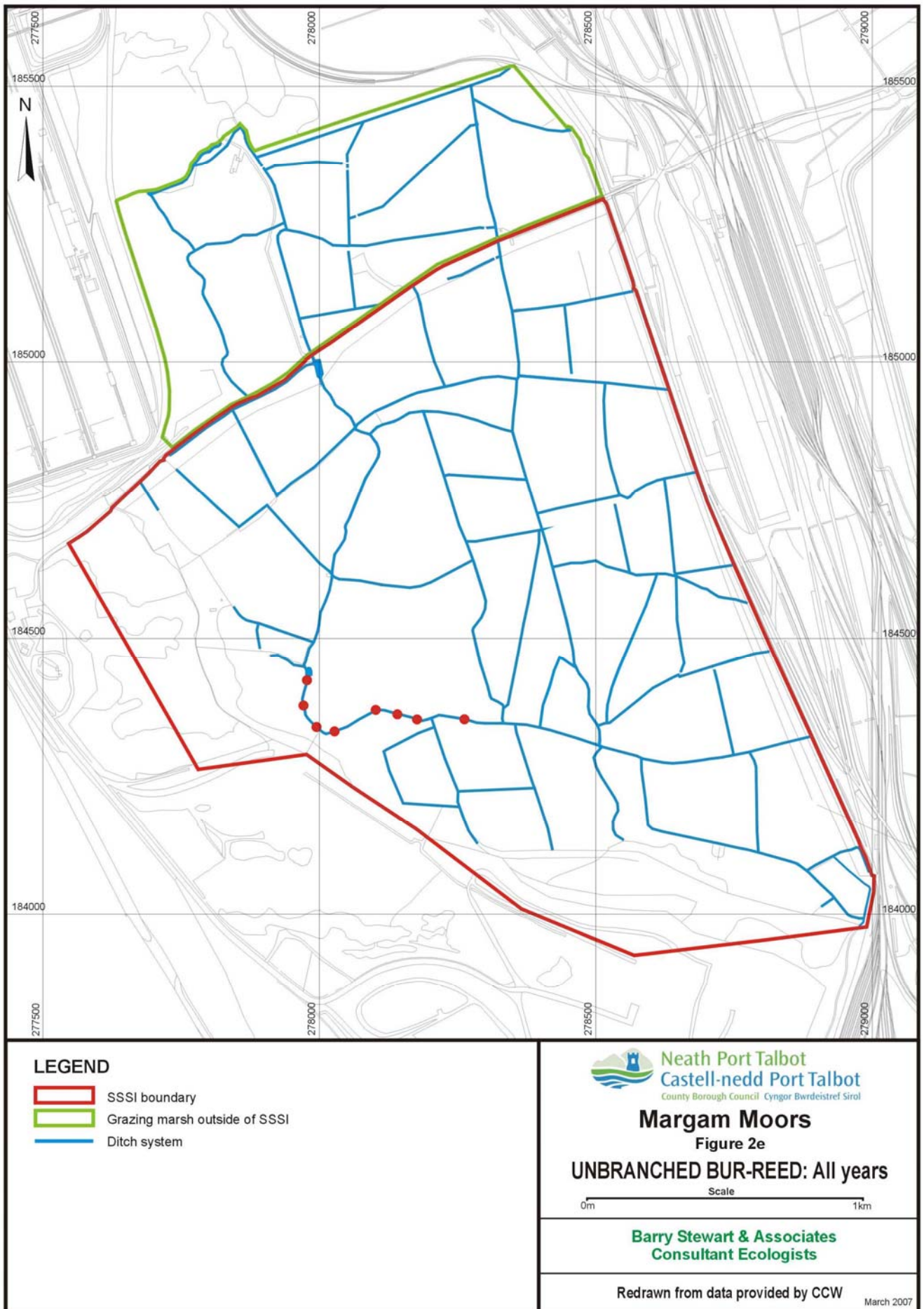
Redrawn from data provided by CCW

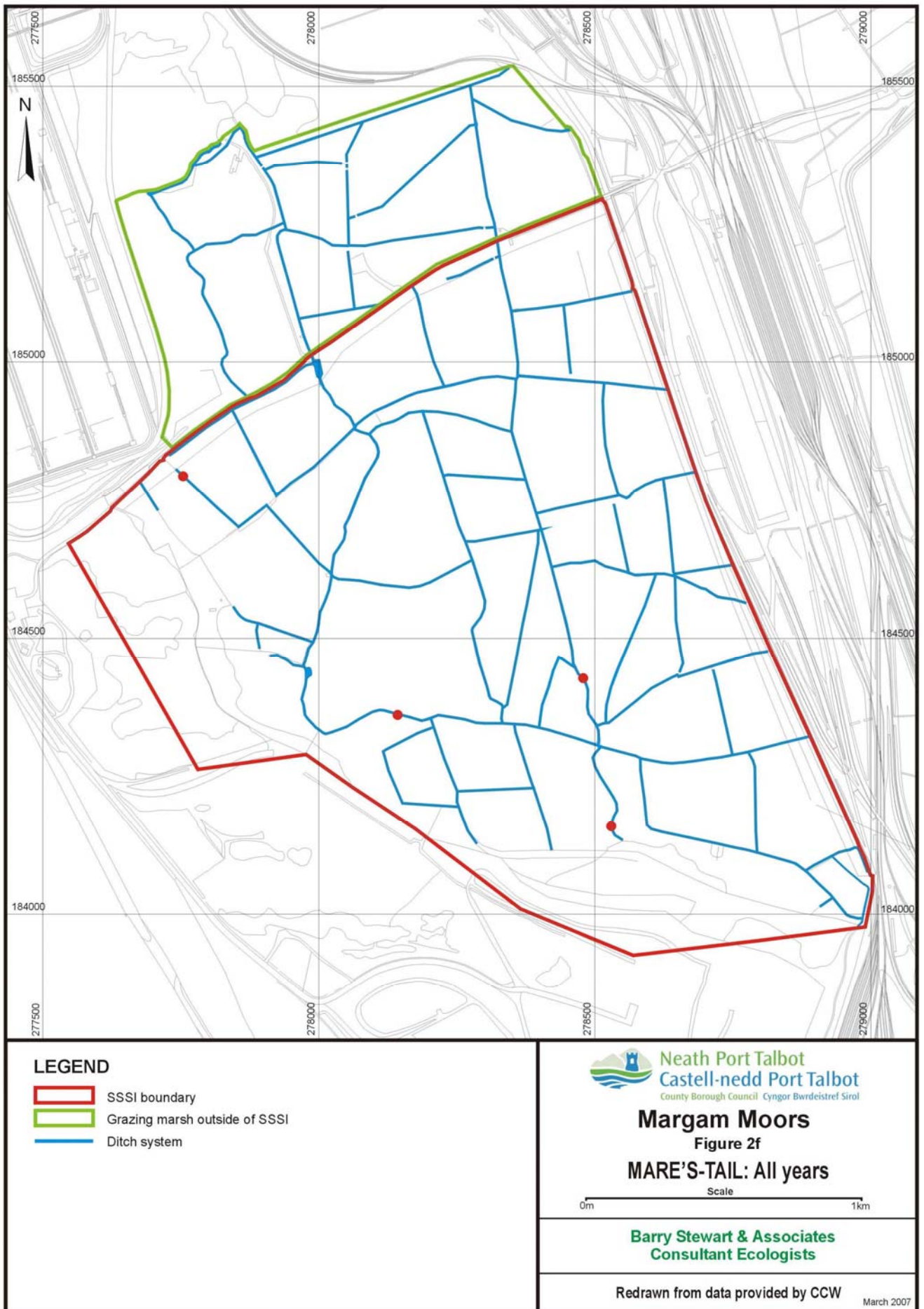
March 2007

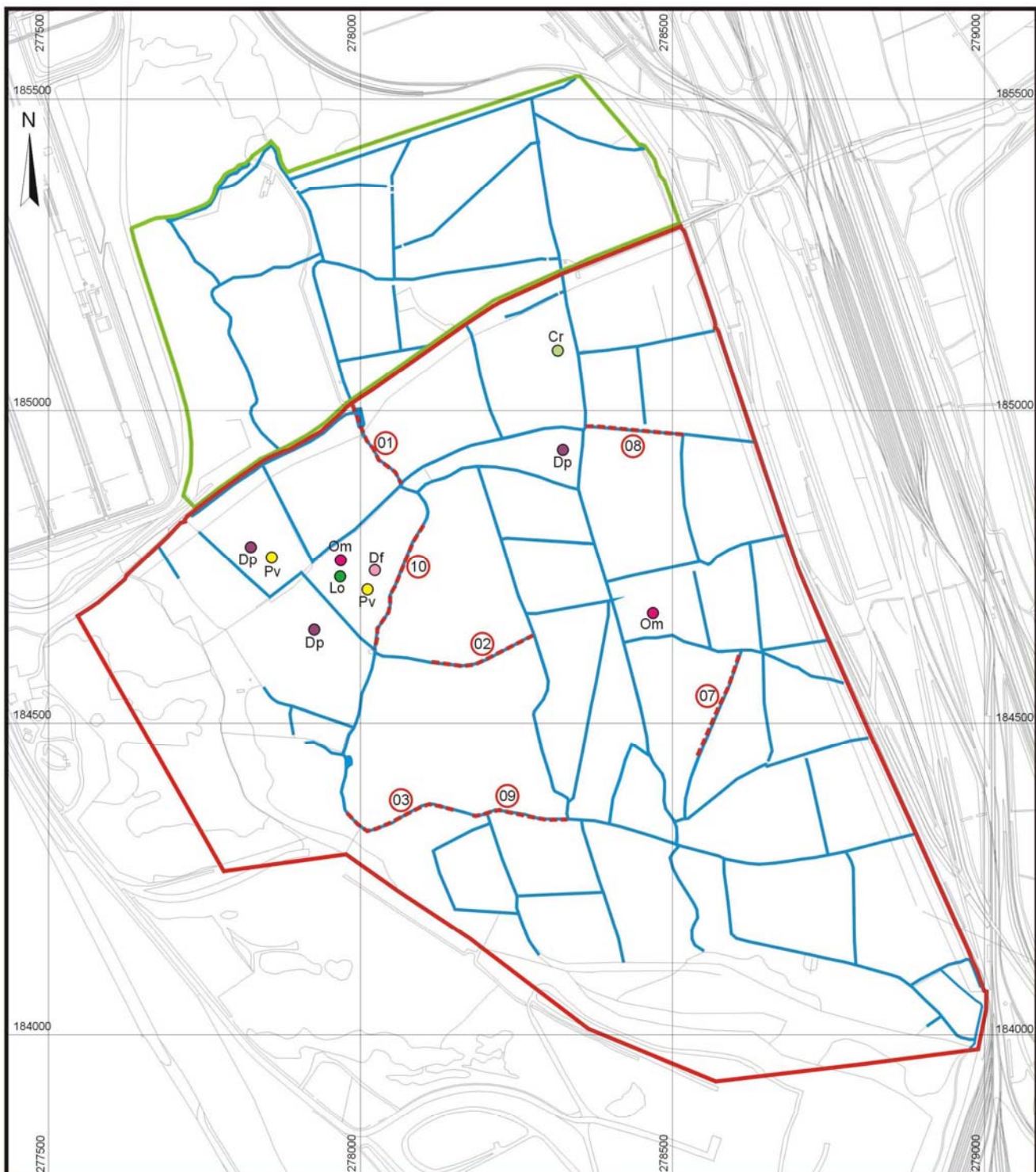












LEGEND

- SSSI boundary
- Grazing marsh outside of SSSI
- Ditch system
- Invertebrate-rich ditch (limited sampling; many ditches likely to qualify)
- Dp Southern Marsh-orchid (*Dactylorhiza praetermissa*)
- Df Common / Heath Spotted-orchid (*Dactylorhiza fuchsii/maculata*)
- Om Green-winged Orchid (*Orchis morio*)
- Lo Common Twayblade (*Listera ovata*)
- Pv Cowslip (*Primula veris*)
- Cr Greater Pond-sedge (*Carex riparia*)

Data taken from Jones (1986), Spencer *et al* (1991), Anon (1998) & Pavett (1999)



Neath Port Talbot
Castell-nedd Port Talbot
County Borough Council Cyngor Bwrdeistref Sirol

Margam Moors

Figure 2g

MISCELLANEOUS PLANTS AND INVERTEBRATE-RICH DITCHES: All years

Barry Stewart & Associates
Consultant Ecologists

Redrawn from data provided by CCW

March 2007

2.7. **BIODIVERSITY ACTION PLANS:**

- 2.8. The following habitat action plans (HAPs) and species action plans (SAPs) have been prepared for Neath Port Talbot county borough. Appendix 1 provides a list of BAP targets and actions that could be implemented by the project:

Habitats for which action plans have been prepared

BAP habitats not found at Margam Moors:

Priority Habitats	Ancient and/or species-rich hedgerows
Priority Habitats	Coastal and floodplain grazing marsh
Priority Habitats	Coastal sand dunes
Priority Habitats	Fens
Priority Habitats	Lowland meadows
Priority Habitats	Reedbeds

Species for which action plans have been prepared

BAP species known to occur at Margam Moors:

Bees/wasps	Carder Bumblebee (<i>Bombus humilis</i>)
Bees/wasps	Shrill Carder Bee (<i>Bombus sylvarum</i>)
Birds	Bittern (<i>Botaurus stellaris</i>)
Birds	Bullfinch (<i>Pyrrhula pyrrhula</i>)
Birds	Linnet (<i>Carduelis cannabina</i>)
Birds	Reed Bunting (<i>Emberiza schoeniclus</i>)
Birds	Skylark (<i>Alauda arvensis</i>)
Birds	Song Thrush (<i>Turdus philomelos</i>)
Local species	Kingfisher (<i>Alcedo atthis</i>)
Local species	Lapwing (<i>Vanellus vanellus</i>)
Local species	Bats – all species

BAP species not known from Margam Moors, but with potential to occur there include:

Amphibians	Great Crested Newt (<i>Triturus cristatus</i>)
Flies	Hornet robberfly (<i>Asilus crabroniformis</i>)
Local species	Sharp Rush (<i>Juncus acutus</i>)
Local species	Fen Raft Spider (<i>Dolomedes plantarius</i>)
Local species	Badger (<i>Meles meles</i>)
Local species	Curlew (<i>Numenius arquata</i>)
Local species	Yellow Bartsia (<i>Parentucellia viscosa</i>)
Local species	Round Headed Club Rush (<i>Scirpus holoschoenus</i>)
Local species	Barn Owl (<i>Tyto alba</i>)
Mammals	Brown Hare (<i>Lepus europaeus</i>)
Mammals	Water Vole (<i>Arvicola terrestris</i>)
Mammals	Otter (<i>Lutra lutra</i>)

2.9. **HABITATS:**

- 2.10. A series of surveys were carried out during the 1980s and 1990s as part of the baseline data collection used for site designation as SSSI (Smith,1981) and for ongoing monitoring (Jones (1986), CCW (1987), CCW (1998), Spencer et al (1991), CCW (1995)). The results of these studies show that the key areas of interest on the SSSI are principally associated with the ditch system and the wetland areas around the southern and western margins. The study conducted by Smith (1981) provides considerable detail of the vegetation found in these habitats and sampled 46 points in key areas as part of the study. However, much of the neutral grassland in the north east of the SSSI was not surveyed as these were "*considered to be of relatively little interest*". Those fields that were surveyed were S02, S03, S04 and S19 though no National Vegetation Classification (NVC) was attributed at this time.
- 2.11. Generally the emphasis of monitoring has been placed on the flora of the ditch systems which support a range of species on the edge of their geographical ranges and other species of local interest (as detailed in paragraph 2.6. and Figures 2a to 2g).
- 2.12. Detail of drier habitats, most notably the mesotrophic grasslands found in many of the fields in the central, eastern and northern parts of the SSSI, was provided by a study carried out by the Nature Conservancy Council (NCC,1987), This survey was repeated again eight years later (CCW, 1995) and provides the basis of Figure 3, which shows the distribution of NVC communities identified during these studies.
- 2.13. In order to provide an update of the communities present within the northern part of the SSSI and to identify the communities present north of the road a field and ditch survey was carried out during 2007. The data obtained from this study are reproduced at Appendix 2 and a list of communities identified is shown below at Table 2.1.

Table 2.1. dominant National Vegetation Classification communities

	Dry areas (ridge)	Wet areas (furrow)
Field N01	MG7C	MG10c
Field N02	MG7C	MG10c
Field N03	MG6b	MG10c
Field N04	MG7C	MG10c
Field N05	MG7C	MG10c
Field N06	MG7C	MG10c
Field N07	MG7C	MG10c
Field N08	MG7C	MG10c
Field N09	MG6b	MG10c
Field N10	MG6b	MG10c
Field S01	MG7	MG10c
Field S02	MG6b	MG10c
Field S03	MG6b	MG10c
Field S04	MG6b	MG10c
Field S12	MG7	MG10c
Field S13	MG7	MG10c
Field S14	MG6b	MG10c
Field S15	MG6b	MG10c

Field S18	MG9b	MG10c
Field S19	MG9b	MG10c

Key to NVC communities:

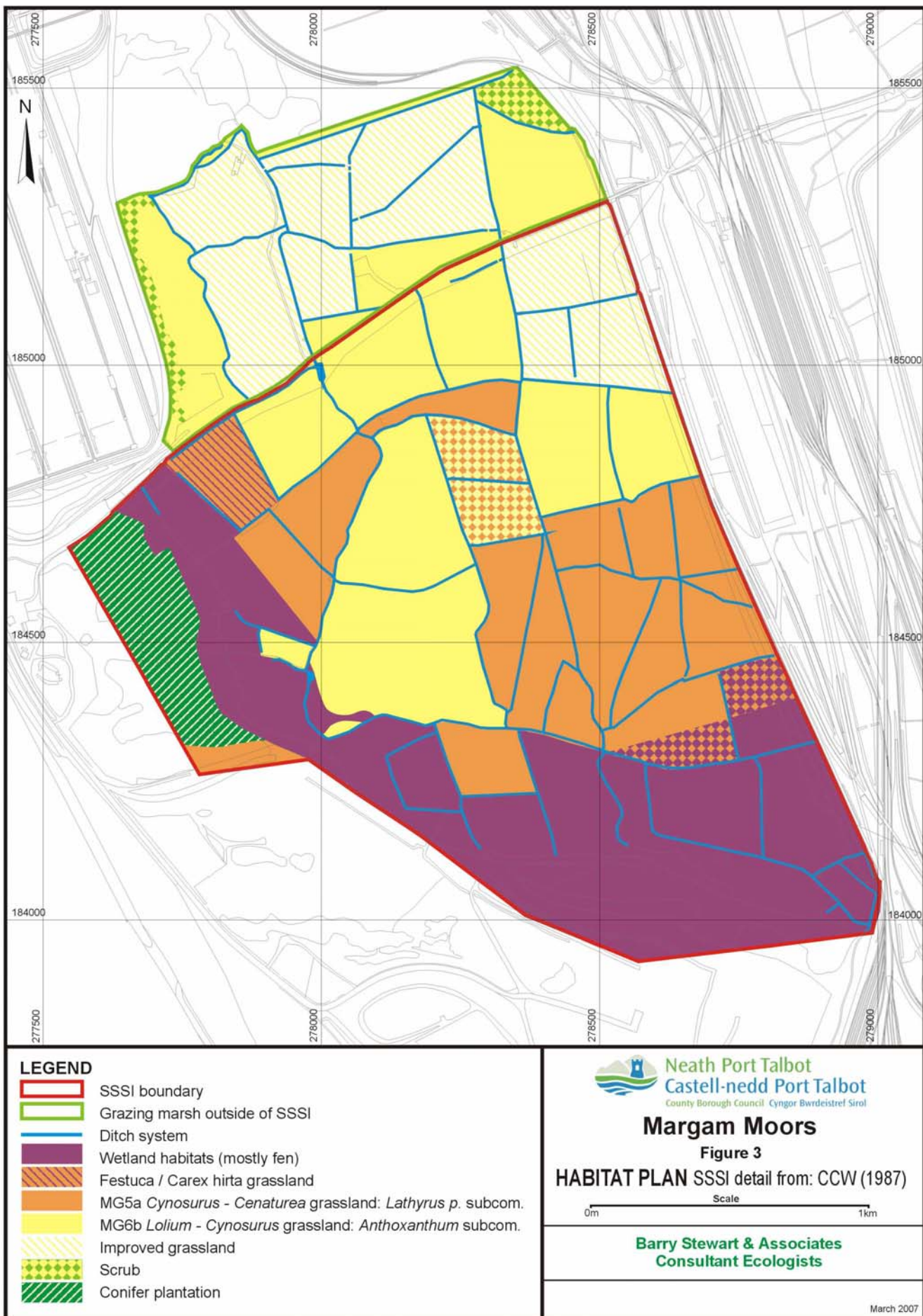
MG6 *Lolium perenne* – *Cynosurus cristatus* pasture
MG7 *Lolium perenne* – *Plantago lanceolatum* grassland
MG7C *Lolium perenne* - *Alopecurus pratensis* - *Festuca pratensis* flood-pasture
MG9b *Holcus lanatus* – *Deschampsia cespitosa* grassland: *Arrhenatherum elatius* subc.
MG10c *Holcus lanatus* - *Juncus effusus* rush pasture: *Iris pseudacorus* subc.

2.13. **BIRDS:**

- 2.14. A desktop study indicated that there has been no previous systematic bird surveys of the site and no significant records have been identified in the *Gower Birds* annual reports (Grenfell *et al.*, 2006, and previous).

2.15. **MAMMALS:**

The county mammal recorder, Dan Forman (pers. comm.), indicated that he was unaware of any species specific surveys that have been carried out at Margam Moors.



2.16. **ASSESSMENT OF ECOLOGICAL VALUE:**

2.17. **Assessment criteria**

Ecological Value

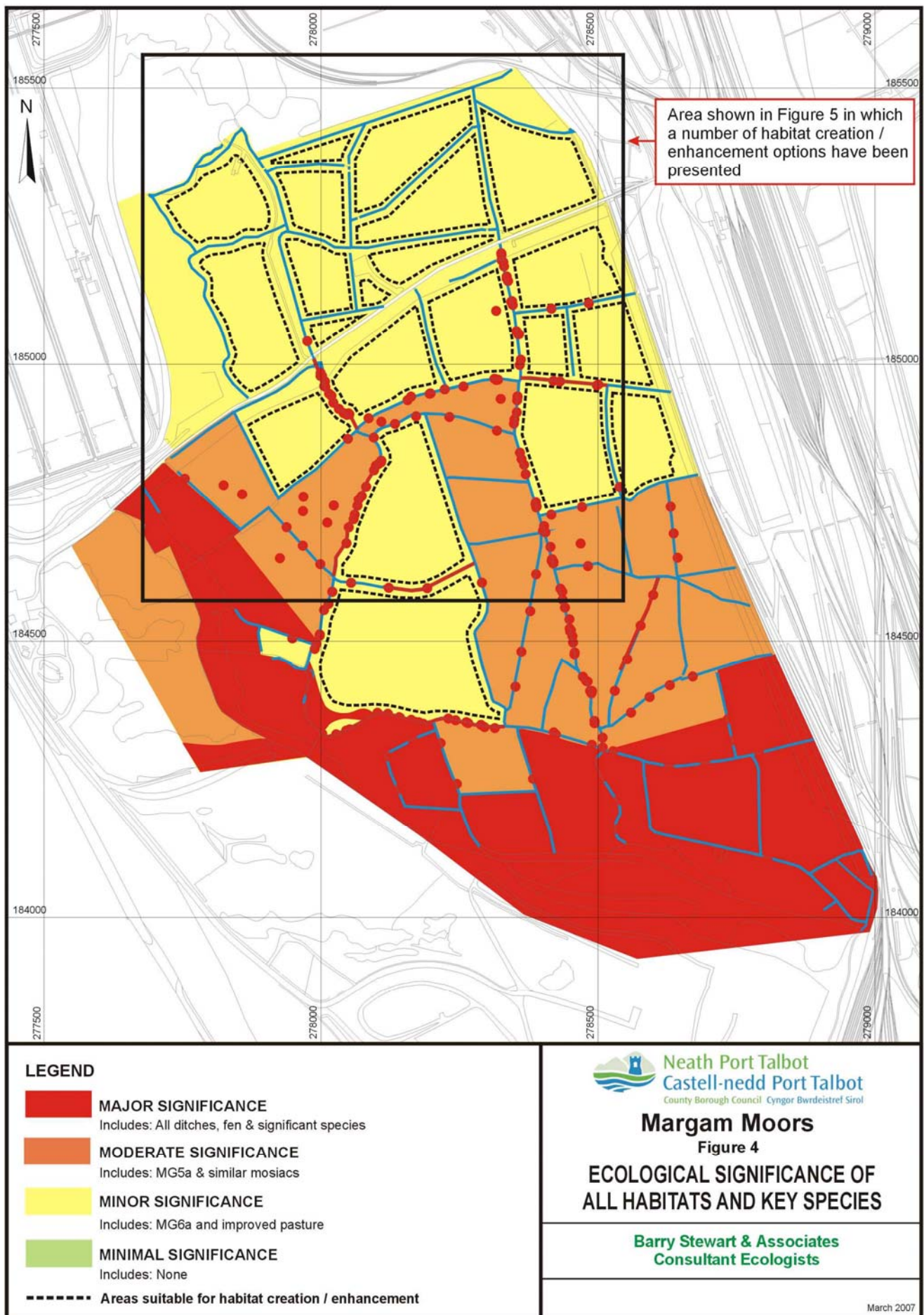
Each feature has been classified according to its nature conservation value using the examples provided in Table 4.1.

Table 2.1. Assessment of Ecological Value

Value	Examples
International Colour Code: RED	Internationally designated or proposed sites such as Ramsar Sites, Special Protection Areas, Biosphere Reserves and Special Areas of Conservation, or otherwise meeting criteria for international designation. Sites supporting populations of internationally important species.
National Colour Code: RED	Relevant parts of nationally designated sites such as Sites of Special Scientific Interest (SSSIs), or non-designated sites meeting SSSI selection criteria, National Nature Reserves (NNRs), Nature Conservancy Review (NCR) Grade 1 sites, viable areas of key habitats within the UK Biodiversity Action Plan. Sites supporting viable breeding populations of Red Data Book (RDB) species (excluding scarce species), or supplying critical elements of their habitat requirements.
Regional Colour Code: RED	Viable areas of threatened habitats listed in a regional Biodiversity Action Plan, comfortably exceeding Site of Importance for Nature Conservation (SINC) criteria, but not meeting SSSI selection criteria. Sites supporting viable populations of Nationally Scarce species or those included in the Regional Biodiversity Action Plan on account of their rarity, or supplying critical elements of their habitat requirements.
High Local Colour Code: RED	Areas meeting the criteria for a county or metropolitan area designation (such as SINC), which may include amenity and educational criteria in urban areas. Ancient semi-natural woodland. Designated Local Nature Reserves. Sites containing viable areas of any key habitat type identified in the Local Biodiversity Action Plan (LBAP). Areas supporting viable breeding populations of species known to be county/metropolitan rarities e.g. featuring in county 'red data book' or LBAP, or supplying critical elements of their habitat requirements.
Moderate Local Colour Code: ORANGE	Undesignated sites, or features considered appreciably to enrich the habitat resource within the context of the Borough or District, or included in the Borough or District LBAP. Amenity and educational functions will be recognised in urban areas. Sites with viable breeding populations of species listed as rare in the District or

	Borough LBAP or supplying critical elements of their habitat requirements.
Low Local Colour Code: YELLOW	Undesignated sites, or features considered appreciably enriching the habitat resource within the context of the Parish or neighbourhood (e.g. a species-rich hedgerow).
Negligible Colour Code: GREEN	Low-grade and widespread habitats

- 2.18. A visual representation of the ecological value of all habitats, significant plant and invertebrate species (where known) has been mapped on Figure 4 using the criteria given in Table 2.1. This shows that although key species are represented in many of the ditches right across the study area, there is a gradient in the ecological value of the field mosaic, with important habitats being located in the from south-west with considerably less biological interest in the north-east. Our surveys of the field system to the north of the SSSI show that these fields are of similar character to those found in the north-eastern part of the SSSI and thus are mapped as being of Minor ecological significance value.



3. OPTIONS FOR HABITAT CREATION / ENHANCEMENT

3.1. IDENTIFYING THE AREA OF MINIMAL IMPACT

- 3.2. Figure 4 clearly shows that there is considerable opportunity for implementing habitat creation / enhancement in areas where there is limited ecological value. The main constraint to any changes in land use or management in this area should be that the hydrology or management of the ditch system should not be negatively affected. In order to ensure that ditches remain unaffected it is proposed that a 7m buffer is left so that machinery and animals can navigate the field edges during any season.
- 3.3. By excluding all land that is of Major or Moderate ecological significance and allowing for a 7m buffer around all ditches, the following areas have been identified as having potential for habitat creation / enhancement without compromising the ecological attributes of the SSSI and adjacent grazing land to the north. These are illustrated by the black pecked line on Figure 4 and the field numbers used on Figure 1:

Table 3.1. Potential areas for habitat creation / enhancement

Field N01 – 17,430 m ²
Field N02 – 25,448 m ²
Field N03 – 1,799 m ²
Field N04 – 10,821 m ²
Field N05 – 11,040 m ²
Field N06 – 2,979 m ²
Field N07 – 21,152 m ²
Field N08 – 19,502 m ²
Field N09 – 9,251 m ²
Field N10 – 25,604 m ²
Field S01 – 18,053 m ²
Field S02 – 21,146 m ²
Field S03 – 18,761 m ²
Field S04 – 16,666 m ²
Field S12 – 7,109 m ²
Field S13 – 14,612 m ²
Field S14 – 14,823 m ²
Field S15 – 27,654 m ²
Field S18 – 36,950 m ²
Field S19 – 54,000 m ²

- 3.4. The total potential for habitat creation / enhancement is 38ha, with 23ha, in the SSSI and 15ha immediately to the north of the SSSI.

3.5. **OPTIONS**

- 3.6. Two methods of wetland creation are presented here as these are considered those most appropriate for the site, however, there is a range of other possibilities that could also be implemented to provide periods where the ground conditions become waterlogged.
- 3.7. Using these two methods (described below), the following options, illustrated on Figure 6 are proposed. The main principle behind the indicative expansive layout is to show that the habitat is not fragmented as the benefits of one large system are likely to be much greater than those of one which is of a similar sized but fragmented. The design also provides the opportunity for the project to develop in a piecemeal fashion rather than having to commit to a large project from the outset. However, it should be stressed that larger areas of habitat tend to attract a disproportionately larger number of birds than smaller areas and the true benefits may not be realised until a large part of the project is completed.

Option 1 (Figure 6a)

Field N08: Bunded area = 2.0 ha, with permanent scrape covering ~70% of this

Field N07: Bunded area = 2.1 ha.

Field N09: Bunded area = 0.9 ha

Total area = 5.0 ha (1.4 ha permanent scrape, 3.6 ha seasonally flooded)

SSSI not affected

Option 2 (Figure 6b)

Option 1 +

Field N04: Bunded area = 1.1 ha, with semi-permanent scrape covering 100%

Field N03: Bunded area = 0.8 ha.

Field N05: Bunded area = 1.1 ha.

Field N10: Bunded area = 2.6 ha.

Total area = 10.6 ha (3.1 ha permanent scrape, 7.5 ha seasonally flooded)

SSSI not affected

Option 3 (Figure 6c)

Option 1 +

Option 2 +

Field S02: Bunded area = 2.1 ha.

Field S03: Bunded area = 1.9 ha.

Total area = 14.6 ha (3.1 ha permanent scrape, 11.5 ha seasonally flooded)

4.0ha of SSSI affected

Option 4 (Figure 6d)

Option 1 +

Option 2 +

Option 3 +

Field N01: Bunded area = 1.7 ha, with reedbed scrape covering 100%

Field N02: Bunded area = 2.5 ha, with reedbed scrape covering 100%

Field N06: Bunded area = 0.9 ha, with reedbed scrape covering 100%

Total area = 19.7 ha (3.1 ha permanent scrape, 11.5 ha seasonally flooded,
5.1 ha reedbed)

4.0ha of SSSI affected

Further options

Even with option 4, a further 18.3 ha of land of limited ecological value remains available for possible creation / enhancement, all of which is within the SSSI.

3.8. Scrapes

Scraping is generally used to create areas of permanently or near-permanently flooded ground. The main benefits include:

- The provision of a permanent refuge and focal point for water birds.
- The provision of muddy edges around the drawdown zone.

In order to provide a permanent, year-round wetland feature that will help to hold a core population of Lapwing, at least one sizeable pond should be scraped. These should ideally be in an open situation with no adjacent tall hedgerows, such as fields N04 and N08 on the indicative plan shown at Figure 6. The depth of such scrapes should be variable, but only made up of gentle undulations. The minimum deepest point would need to be 1m to reduce the risk of the scrape completely drying out, however, a greater depth, up to 2m would be more desirable.

Scraping requires agricultural practices continue so that the land can be managed beneficially for wildlife, though agricultural output is likely to be significantly reduced in those areas where there is standing water for more than 6 months of the year.

3.9. Bunds

Bunding is used to hold back water that would otherwise drain off the land, the main aim being to create semi-flooded conditions during the winter. The water level is then allowed to fall gradually during the spring providing ideal feeding conditions for wading birds. By mid-summer the land is then dry enough to enable grazing or hay-cutting to be carried out.

Bunding requires that agricultural practices continue so the land can be managed beneficially for wildlife. Agricultural output is only likely to be slightly reduced.

- 3.10. A 20 ton excavator with wide bucket, or similar, would be used to construct a bund in a rolling operation using material obtained within arms reach of the excavator. This way the vehicle will track only on the bund itself. Before each section of bund is constructed, turf will be stripped, then immediately following

construction of each bund section, will be relayed and tracked to consolidate. The result is a level bund and borrow pit construction that follows the outline shown on Figure 6a.

- 3.11. A 3-4m wide burrow pit running parallel to bund on the inside edge provides the deepest water and added security for ground nesting birds in the central part of the site. The installation of a flexipipe at the lowest point can be used for controlling water levels (see below).
- 3.12. The area of land that can potentially be flooded or impounded within the bunds is shown in Table 3.1. In reality, there will be numerous high spots within these areas that will never flood, particularly in fields where there is still evidence of the ridge and furrow system. The result will be shallow wetland system with ridges of dry land as is shown on Figure 6. These ridges will provide ample nesting opportunities for Lapwings and other potential ground-nesting colonizers, such as Redshank (*tringa totanus*) and possibly Avocet (*Recurvisrostra avosetta*). Appropriate control of water levels will be managed by means of a flexipipe control mechanism (or sluice boards). It is proposed that flood levels will be set at the following heights:
- Winter: Highest level, covering 70-80% of the impoundment area. This will be beneficial for waterfowl dabbling for seed. Winter grazers, notably Wigeon, which will utilise the 20-30% of 'dry' ground dominated by grasses.
 - Autumn / Spring: Mid level, covering 40% of the impoundment area. This will be beneficial for breeding and passage birds and is principally intended to attract waders and waterfowl. Conditions will be particularly suitable to attract breeding waders, with Lapwing and Redshank the most likely species to colonize.
 - Summer: Low level, covering 0-5% of the impoundment area. This will be beneficial for the development of fen communities and will allow grazing or hay-cutting to take place.
- 3.13. In the event that the project should ever be considered inappropriate, the bunds could be broken to allow vegetation to revert back to its original state. Note that the structure of the soils over the greater part of the site would not be affected.
- 3.14. A levels survey will be required in order to allow the preparation of a technical plan. However, Figure 6 shows an indicative profile of field S03 (see Figure 5d for location of cross-section). The maximum depth of water shown during the highest period of inundation is around 50cm.
- 3.15. Note that the bund will be landward of the Environment Agency's minimum working distance of 7m from all ditches.
- 3.16. **Operational management**
- 3.17. Grazing
Management would be required to continue using a similar grazing regime to that currently practiced at the site.
- 3.18. Control of water levels

Captured rainwater would be the principle source of water for shallow flooding of the fields. In order to keep fields topped up during dry winter periods consideration could be given to the installation of a wind pump, this method having been used successfully at similar sites. Approximate volumes of water required for flooding if using the example layouts presented at figure 4 below would be:

Figure 4 Approximate volumes of water required (m³):

	Summer	Winter
Option 1	4,000	10,000
Option 2	10,000	20,000
Option 3	10,000	26,000
Option 4	10,000	40,000

3.19. **APPROXIMATE COSTS**

Bund construction:

Topographic survey £1500.00

Bund construction:

Based on hire of 20 ton excavator and 20 ton bulldozer, each at £300 per day +£300 delivery & pick up

Option 1 Bulldozer (1 day) Excavator (3 days)	£1800.00
Option 2 Bulldozer (2 day) Excavator (6 days)	£3000.00
Option 3 Bulldozer (2 day) Excavator (8 days)	£3600.00
Option 4 Bulldozer (2 day) Excavator (8 days)	£4200.00

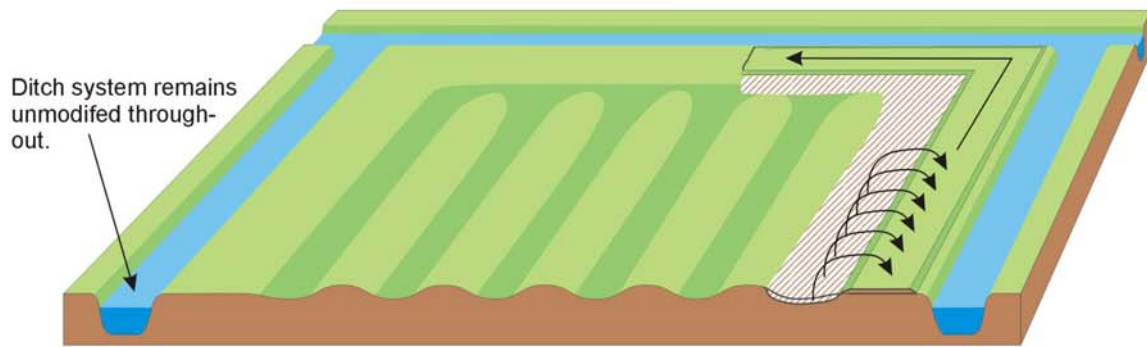
Windpump:

GB Windpumps have provided a quote for a typical borehole pump option for 1.8 metre unit (complete installation) £8,200.00

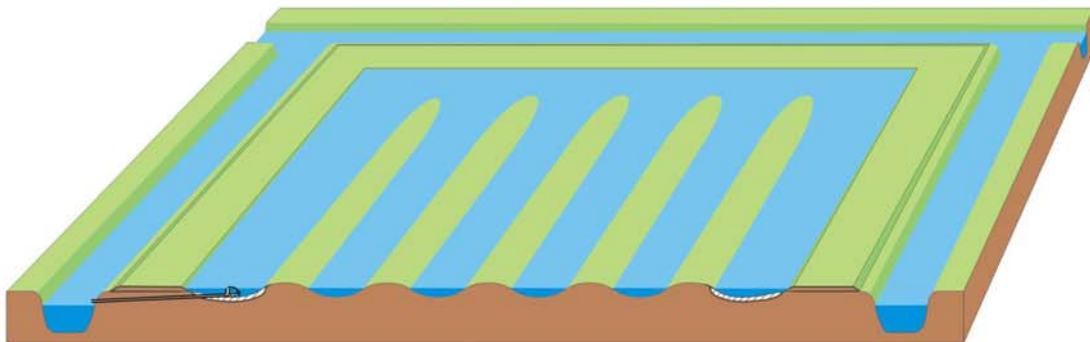
Project management: £2000.00



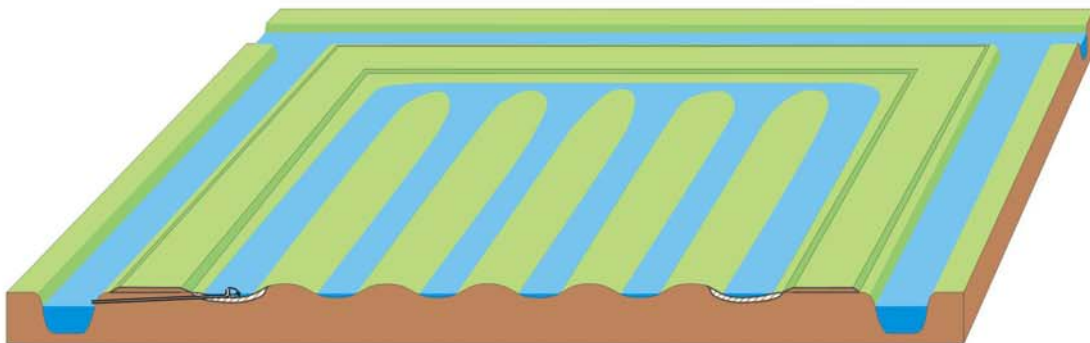
Figure 6: Cross section showing creation of bund and water management.



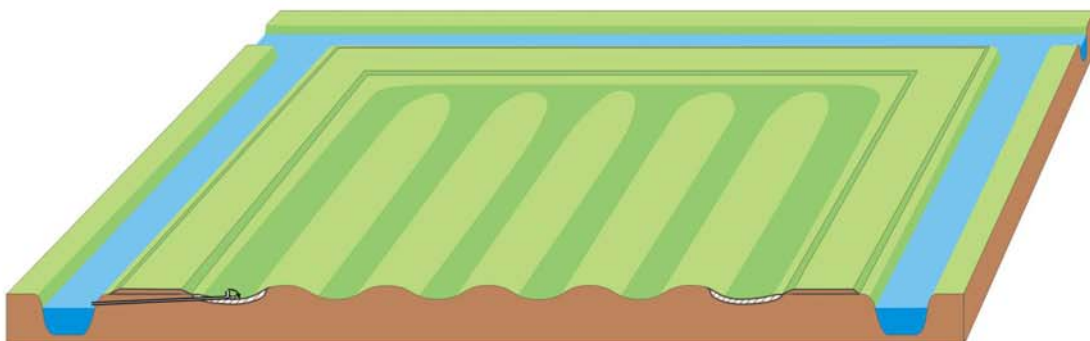
a Construction of ~30cm high bund (cut and fill using excavator)



b Water level at maximum height (winter-level); height controlled via flexi-pipe.
NB. Water source from rainwater, so level dependant on weather (but see option for wind pump)



c Water level at medium height (March-April); height controlled via flexi-pipe.
NB Flexi-pipe can be used to lower water, even during a very wet spring.



d Water level from mid-May through to October; height controlled via flexi-pipe.
Grazing or hay cut required. This management regime should help restore more marshy grassland and fen components.

4. PREDICTED CHANGES

- 4.1. Although not quantifiable, there is a high level of confidence that the implementation of the options outlined would provide a hugely improved resource for wetland birds at Margam Moors, in particular by providing excellent breeding habitat for Lapwings, that can be managed indefinitely. This action would not only help the viability of the local Lapwing population, but would also prove to be highly beneficial for other species and habitats. An indication of the likely benefits to all groups is provided below:

4.2. Vegetation

- 4.3. The effect of winter flooding on areas which currently support either improved or species-poor semi-improved pasture would be a change of community type from pasture to fen. Summer grazing and/or cutting for hay would prevent the establishment of reed in areas where it is not desired and help create poached margins favoured by a wide variety of bird species, including Lapwing.

Table 3. Predicted changes to composition of grassland communities following implementation of proposals (after 10 years).

Community	Predicted change
Improved grassland	↓↓↓
MG6a	↓↓↓
Fen	↑↑↑↑
Reedbed	↑↑↑?
Open water (summer)	↑↑
Open water (equinox)	↑↑↑
Open water (winter)	↑↑↑↑

4.4. Birds

- 4.5. Breeding species likely to benefit include Lapwing *Vanellus vanellus* a Section 74 species under the CROW Act), Redshank *Tringa totanus* (a Red Data Bird in Britain and an Amber List species) and Reed Bunting *Emberiza scheoniclus* (a Section 74 species under the CROW Act, Amber List species and BTO High Alert species). It is considered that the site could support approximately 10 to 30 pairs of Lapwing (depending upon the option selected) and 5 to 20 pairs of Redshank. Wintering species likely to benefit would be duck such as Wigeon *Anas penelope* and Teal *A. crecca* and waders such as Lapwing, Golden Plover *Pluvialis apricaria*, Snipe *Gallinago gallinago*, Black-tailed Godwit *Limosa limosa* and Redshank. The site would also be of enormous benefit to a whole suite of passage birds that are dependant upon wet transitional freshmarsh habitats.

4.6. Mammals

- 4.7. The site is poorly studied for this group, though it is likely that habitat enhancements would prove beneficial for bats and Otter. It is considered likely that Water Voles no longer occur at this site, however, it is perhaps the best location for the implementation of a reintroduction programme for this highly threatened species.

4.8. Invertebrates

- 4.9. The existing ditch system is well studied and supports a diverse range of species including numerous scarce species. The proposals will provide a new range of niches which would further increase diversity, but perhaps more importantly a huge increase in the overall biomass of invertebrates was detected and it was this that provides the attraction to wetland birds.

5. **REFERENCES:**

- Countryside Council for Wales (1987) *WFU Wales Lowland Grassland Survey: Margam Moors SSSI*, Unpublished Report, Countryside Council for Wales, Swansea.
- Countryside Council for Wales (1995) *WFU Wales Lowland Grassland Survey: Margam Moors SSSI*, Unpublished Report, Countryside Council for Wales, Swansea.
- Countryside Council for Wales (1998) *Ditch monitoring report: Margam Moors SSSI 1998*, Unpublished Report, Countryside Council for Wales, Swansea.
- Fowles, A. (2001) Site report of invertebrates at Margam Moors, Unpublished Report. CCW Swansea
- Gilbert, G., Gibbons, D.W. & Evans, J. (1998) *Bird Monitoring Methods: a manual of techniques for key UK species*, Royal Society for the Protection of Birds.
- Grenfell, H.E., Howells, R.J., Randall, G., Tallack, R.E. & Taylor, R.H.A. (annual reports from 1970 to 2006) *Gower Birds, an annual report on the birds of the City and County of Swansea and Neath Port Talbot County Borough Council*, Vol.1 (No.3) to Vol.8 (No.4), The Gower Ornithological Society.
- Jones, A. (1986) *Margam Moors ditch survey*, Nature Conservancy Council
- Morgan, I.K. & Pavett, P.M. (1993) *Recent collecting of aculeates in south and south-west Wales. A draft list*. Unpublished Report. Countryside Council for Wales Llandeilo.
- Neath Port Talbot Biodiversity Forum (2001), *Local Biodiversity Action Plan for Neath Port Talbot: 2001 - 2006*, Neath Port Talbot County Borough Council.
- Pavett, P.M. (1999) *Invertebrate survey of Reens at Margam Moors 1999*, Unpublished Report. National Museum of Wales.
- Smith, I.R. (1981) *Wales Field Unit: A Botanical Survey of Margam Moors*, Unpublished Report, Project W80-4/2 , Countryside Council for Wales, Swansea.
- Spencer, J., Jones, R., Barneveld, J. & Hamley, S. (1991) *Re-monitoring of drainage ditches on Margam Moors SSSI 1991*, Nature Conservancy Council
- Stewart, B. (2006), *Neath Port Talbot Lapwing Survey: 2006*, unpublished report for Neath Port Talbot County Borough Council.
- Stewart, B. (2007), *Neath Port Talbot Lapwing Survey: 2007*, unpublished report for Neath Port Talbot County Borough Council.

Appendix 1.
NPT Biodiversity Action Plan 'targets' and 'actions' that could be achieved through a carefully designed Margam Moors project:

HAP Coastal floodplain grazing marsh and saltmarsh

Targets

- CFS01ME Maintain extent of coastal floodplain grazing marsh and saltmarsh in Neath Port Talbot
- CFS02AC Achieve favourable or recovering condition of coastal floodplain grazing marsh and saltmarsh in Neath Port Talbot

Actions

- CFS01RA Raise awareness about the importance and value of Coastal Floodplain and Grazing Marsh through the production of an interpretation panel.
- CFS02AC Undertake monitoring of the condition of some of the inter-tidal habitats including Coastal Floodplain and Grazing Marsh and Saltmarsh in Neath Port Talbot by undertaking a repeat inter-tidal survey
- CFS04AC Ensure appropriate management of the Coastal Floodplain and Grazing Marsh habitat at Margam Moors SSSI to reach favourable condition.
- CFS05AC Manage land surrounding Margam Moors SSSI to improve condition of Flood Plain and Grazing Marsh habitat and to provide habitat for birds. This can be achieved through temporary flooding.
- CFS08ME Protect Coastal floodplain and grazing marsh at Margam Moors SSSI.

HAP Fens and Reedbeds

Targets

- FENRB01ME Maintain extent of Fens and Reedbeds in Neath Port Talbot
- FENRB02AC Achieve favourable or recovering condition of Fens and Reedbeds in Neath Port Talbot
- FENRB03EX Create at least one reedbed area in Neath Port Talbot, as part of infrastructure schemes.

Actions

- FENRB11EX Create areas of reedbed within infrastructure scheme in the Port Talbot coastal strip. (Subject to obtaining resources/funding).
- FENRB12ME Protect fen habitat at Margam Moors SSSI (under management of CCW)
- FENRB13AC Undertaken appropriate management of Fen habitat at Margam Moors SSSI to achieve favourable condition.

HAP Lowland Hay Meadow (and Old Pasture)

Targets

- LHM01ME Maintain the current extent of Lowland Hay Meadows in Neath Port Talbot
- LHM02AC Achieve favourable or recovering condition for an area of Lowland Hay Meadow in Neath Port Talbot.
- LHM03RE Restore an area of Lowland Hay Meadow in Neath Port Talbot.

Actions

- LHM09RE Identify an area of land suitable for restoration to Lowland Hay Meadow
- LHM10EX Create an area of Lowland Hay Meadow in Neath Port Talbot. (Subject to obtaining resources/funding).

HAP Purple moor-grass and rush pasture

Targets

PMGRP01ME Maintain the current extent of Purple Moor-grass and Rush Pastures in Neath Port Talbot.

PMGRP02AC Achieve favourable or recovering condition of Purple Moor-grass and Rush Pastures in Neath Port Talbot.

PMGRP03RE Restore an area of Purple Moor Grass and Rush Pasture in Neath Port Talbot.

Actions

PMGRP09AC Ensure that appropriate management is put in place to achieve favourable condition for all examples of PMGRP in SSSIs in Neath Port Talbot.

SAP Barn Owl

Targets

BO01PS Protect Barn Owls from harm and loss from sites in Neath Port Talbot

Actions

BO02PS Encourage farmers to be Barn Owl friendly by leaving rough grass margins to fields and ditches and to put nest boxes up though the production of an advisory leaflet

SAP Bats all species

Targets

BAT01PS Protect all bat species from harm, disturbance or loss from sites in Neath Port Talbot.

SAP Brown Hare

Targets

BH01PS Protect Brown Hare from harm and loss from sites in Neath Port Talbot.

SAP Bumblebees

Targets

BB01PS Monitor the Bumblebee populations in Neath Port Talbot

BB03PS Protect rare Bumblebee species from harm or loss from sites in Neath Port Talbot

Actions

BB01PS Survey the coastal strip of Port Talbot for Bumblebees

SAP Common Toad

Targets

CT01PS Protect Common Toads from harm or loss from sites in Neath Port Talbot.

SAP FUNGI

Targets

FU01PS Maintain the current population size of key fungi species within each (BAP) habitat in Neath Port Talbot

Actions

FU01PS Gather baseline data of fungi populations in key habitats/threatened locations

SAP Kingfisher

Targets

KF01PS Protect Kingfisher populations from harm and loss from sites in Neath Port Talbot

SAP Lapwing

Targets

LW01PS Protect Lapwings from harm and loss from sites in Neath Port Talbot
LW02PS Continue monitoring Lapwing population size and distribution at known breeding sites.

Actions

LW02PS Research and develop a draft scheme for Local Wildlife Sites to protect Lapwing breeding sites.
LW03PS Raise awareness of habitat management and agriculture practices that would benefit Lapwing. Targetting all farmers in Neath Port Talbot.
LW06PS Ensure continued monitoring of Lapwing breeding sites in Neath Port Talbot.
LW07PS Raise awareness of the importance of Lapwing as a species in decline.

SAP Linnet

Targets

LINN01PS Protect Linnet populations from harm and loss from sites in Neath Port Talbot

SAP Otter

Targets

OT01PS Protect Otters from harm, disturbance and loss from rivers in Neath Port Talbot.

SAP Reed Bunting

Targets

RB01PS Protect existing populations of Reed bunting from harm or loss from sites in Neath Port Talbot

SAP Skylark

Targets

SKY01PS Protect existing populations of Skylark from harm or loss from sites in Neath Port Talbot

SAP Song thrush

Targets

ST01PS Protect Song Thrush populations from harm or loss from sites in Neath Port Talbot

SAP Water Vole

Targets

WV01PS Protect Water Vole from harm or loss from sites in Neath Port Talbot where they have been recorded.
WV02RNG Investigate the possibility of carrying out a reintroduction project of Water Vole in Neath Port Talbot

Appendix 2.

Vegetation data for each field collected during 2007 field surveys:

Margam Moors (Field N01) SS778853, surveyed 09-Jul-07

ridges

Amphibious Bistort	<i>Persicaria amphibia</i>	occasional
Cock's-foot	<i>Dactylis glomerata</i>	frequent
Common Bent	<i>Agrostis capillaris</i>	frequent
Common Knapweed	<i>Centaurea nigra</i>	occasional
Common Mouse-ear	<i>Cerastium fontanum</i>	occasional
Common Nettle	<i>Urtica dioica</i>	occasional
Common Sorrel	<i>Rumex acetosa</i>	occasional
Creeping Bent	<i>Agrostis stolonifera</i>	occasional
Creeping Buttercup	<i>Ranunculus repens</i>	frequent
Creeping Thistle	<i>Cirsium arvense</i>	abundant
Curled Dock	<i>Rumex crispus</i>	occasional
Cut-leaved Crane's-bill	<i>Geranium dissectum</i>	rare
Dandelion	<i>Taraxacum aggregate</i>	rare
False Oat-Grass	<i>Arrhenatherum elatius</i>	occasional
Field Horsetail	<i>Equisetum arvense</i>	occasional
Marsh Thistle	<i>Cirsium palustre</i>	occasional
Meadow Buttercup	<i>Ranunculus acris</i>	occasional
Meadow Foxtail	<i>Alopecurus pratensis</i>	occasional
Meadow Vetchling	<i>Lathyrus pratensis</i>	rare
Red Clover	<i>Trifolium pratense</i>	rare
Redshank	<i>Persicaria maculosa</i>	rare
Ribwort Plantain	<i>Plantago lanceolata</i>	frequent
Rough Meadow-grass	<i>Poa trivialis</i>	occasional
Spear Thistle	<i>Cirsium vulgare</i>	occasional
Timothy	<i>Phleum pratense</i>	rare
White Clover	<i>Trifolium repens</i>	frequent
Yarrow	<i>Achillea millefolium</i>	occasional
Yorkshire-fog	<i>Holcus lanatus</i>	locally abundant

furrows

Amphibious Bistort	<i>Persicaria amphibia</i>	frequent
Cleavers	<i>Galium aparine</i>	occasional
Common Fleabane	<i>Pulicaria dysenterica</i>	frequent
Field Horsetail	<i>Equisetum arvense</i>	occasional
Greater Bird's-foot-trefoil	<i>Lotus pedunculatus</i>	occasional
Hard Rush	<i>Juncus inflexus</i>	rare
Hogweed	<i>Heracleum sphondylium</i>	rare
Lesser Pond-sedge	<i>Carex acutiformis</i>	occasional
Marsh Horsetail	<i>Equisetum palustre</i>	occasional
Marsh-bedstraw	<i>Galium palustre</i>	rare
Meadow Foxtail	<i>Alopecurus pratensis</i>	rare
Redshank	<i>Persicaria maculosa</i>	occasional
Sharp-flowered Rush	<i>Juncus acutiflorus</i>	locally frequent
Silverweed	<i>Potentilla anserina</i>	frequent
Water-pepper	<i>Persicaria hydropiper</i>	occasional
Yellow Iris	<i>Iris pseudacorus</i>	locally abundant

tracks & disturbed ground

Dandelion	<i>Taraxacum aggregate</i>	rare
Greater Plantain	<i>Plantago major</i>	frequent
Hoary Mustard	<i>Hirschfeldia incana</i>	occasional
Lesser Burdock	<i>Arctium minus</i>	rare
Marsh Cudweed	<i>Gnaphalium uliginosum</i>	occasional
Pineappleweed	<i>Matricaria discoidea</i>	occasional
Prickly Sow-thistle	<i>Sonchus asper</i>	occasional
Scentless Mayweed	<i>Tripleurospermum inodorum</i>	rare
Spear Thistle	<i>Cirsium vulgare</i>	occasional
Spear-leaved Orache	<i>Atriplex prostrata</i>	rare
Wild Teasel	<i>Dipsacus fullonum</i>	rare
<u>northern ditch</u>		
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	locally dominant
Canadian Fleabane	<i>Conyza canadensis</i>	occasional
Common Nettle	<i>Urtica dioica</i>	abundant
Common Reed	<i>Phragmites australis</i>	abundant
Elder	<i>Sambucus nigra</i>	rare
Hawthorn	<i>Crataegus monogyna</i>	occasional
Hogweed	<i>Heracleum sphondylium</i>	occasional
Rusty Willow	<i>Salix cinerea subsp. oleifolia</i>	abundant
Water Figwort	<i>Scrophularia auriculata</i>	occasional
<u>eastern ditch</u>		
Bittersweet	<i>Solanum dulcamara</i>	occasional
Blackthorn	<i>Prunus spinosa</i>	occasional
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	abundant
Common Duckweed	<i>Lemna minor</i>	occasional
Common Nettle	<i>Urtica dioica</i>	frequent
Common Reed	<i>Phragmites australis</i>	dominant
Frogbit	<i>Hydrocharis morsus-ranae</i>	locally abundant
Great Willowherb	<i>Epilobium hirsutum</i>	frequent
Hawthorn	<i>Crataegus monogyna</i>	occasional
Male-fern	<i>Dryopteris filix-mas</i>	occasional
<u>western edge & ditch</u>		
Autumn Hawkbit	<i>Leontodon autumnalis</i>	rare
Bittersweet	<i>Solanum dulcamara</i>	occasional
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	frequent
Celery-leaved Buttercup	<i>Ranunculus sceleratus</i>	frequent
Common Duckweed	<i>Lemna minor</i>	locally abundant
Common Fleabane	<i>Pulicaria dysenterica</i>	frequent
Common Nettle	<i>Urtica dioica</i>	occasional
Common Reed	<i>Phragmites australis</i>	dominant
Curled Dock	<i>Rumex crispus</i>	occasional
False Oat-Grass	<i>Arrhenatherum elatius</i>	occasional
Field Horsetail	<i>Equisetum arvense</i>	occasional
Fool's-water-cress	<i>Apium nodiflorum</i>	frequent
Goat Willow	<i>Salix caprea</i>	occasional
Great Willowherb	<i>Epilobium hirsutum</i>	occasional
Hairy Sedge	<i>Carex hirta</i>	locally frequent
Hemp-agrimony	<i>Eupatorium cannabinum</i>	occasional
Marsh Thistle	<i>Cirsium palustre</i>	occasional
Meadowsweet	<i>Filipendula ulmaria</i>	locally frequent

Purple-loosestrife	<i>Lythrum salicaria</i>	occasional
Rusty Willow	<i>Salix cinerea</i> subsp. <i>oleifolia</i>	abundant
Soft-rush	<i>Juncus effusus</i>	frequent
Toad Rush	<i>Juncus bufonius</i> sens. <i>lat.</i>	occasional

Margam Moors (Field N02) SS778850, surveyed 09-Jul-07

ridges

Amphibious Bistort	<i>Persicaria amphibia</i>	occasional
Cock's-foot	<i>Dactylis glomerata</i>	frequent
Common Bent	<i>Agrostis capillaris</i>	abundant
Common Knapweed	<i>Centaurea nigra</i> var. <i>nemoralis</i>	locally frequent
Common Mouse-ear	<i>Cerastium fontanum</i>	occasional
Common Sorrel	<i>Rumex acetosa</i>	occasional
Creeping Bent	<i>Agrostis stolonifera</i>	occasional
Creeping Buttercup	<i>Ranunculus repens</i>	frequent
Creeping Thistle	<i>Cirsium arvense</i>	occasional
Curled Dock	<i>Rumex crispus</i>	occasional
False Oat-Grass	<i>Arrhenatherum elatius</i>	occasional
Field Horsetail	<i>Equisetum arvense</i>	occasional
Hogweed	<i>Heracleum sphondylium</i>	rare
Lesser Stitchwort	<i>Stellaria graminea</i>	rare
Marsh Horsetail	<i>Equisetum palustre</i>	occasional
Marsh Thistle	<i>Cirsium palustre</i>	occasional
Meadow Buttercup	<i>Ranunculus acris</i>	occasional
Meadow Foxtail	<i>Alopecurus pratensis</i>	frequent
Meadow Vetchling	<i>Lathyrus pratensis</i>	occasional
Red Clover	<i>Trifolium pratense</i>	occasional
Red Fescue	<i>Festuca rubra</i>	occasional
Ribwort Plantain	<i>Plantago lanceolata</i>	frequent
Rough Meadow-grass	<i>Poa trivialis</i>	frequent
Timothy	<i>Phleum pratense</i>	rare
Tufted Vetch	<i>Vicia cracca</i>	rare
Tufted Vetch	<i>Vicia cracca</i>	rare
White Clover	<i>Trifolium repens</i>	locally frequent
Yarrow	<i>Achillea millefolium</i>	occasional
Yorkshire-fog	<i>Holcus lanatus</i>	locally abundant

furrows

Amphibious Bistort	<i>Persicaria amphibia</i>	frequent
Common Fleabane	<i>Pulicaria dysenterica</i>	frequent
Common Ragwort	<i>Senecio jacobaea</i>	occasional
Creeping Buttercup	<i>Ranunculus repens</i>	frequent
Curled Dock	<i>Rumex crispus</i>	occasional
Cut-leaved Crane's-bill	<i>Geranium dissectum</i>	rare
Floating Sweet-grass	<i>Glyceria fluitans</i>	frequent
Greater Bird's-foot-trefoil	<i>Lotus pedunculatus</i>	locally frequent
Hairy Sedge	<i>Carex hirta</i>	frequent
Marsh-bedstraw	<i>Galium palustre</i>	occasional
Prickly Sow-thistle	<i>Sonchus asper</i>	occasional
Sharp-flowered Rush	<i>Juncus acutiflorus</i>	occasional
Silverweed	<i>Potentilla anserina</i>	locally frequent
Sneezewort	<i>Achillea ptarmica</i>	occasional

Soft-rush	<i>Juncus effusus</i>	frequent
Square-stalked Willowherb	<i>Epilobium tetragonum</i>	occasional
Water Mint	<i>Mentha aquatica</i>	occasional
Water-pepper	<i>Persicaria hydropiper</i>	occasional
Yellow Iris	<i>Iris pseudacorus</i>	occasional
<u>tracks & disturbed ground</u>		
Annual Meadow-grass	<i>Poa annua</i>	frequent
Black Medick	<i>Medicago lupulina</i>	occasional
Bristly Oxtongue	<i>Picris echioides</i>	occasional
Common Bird's-foot-trefoil	<i>Lotus corniculatus var. sativus</i>	occasional
Common Ragwort	<i>Senecio jacobaea</i>	occasional
Creeping Bent	<i>Agrostis stolonifera</i>	frequent
Dove's-foot Crane's-bill	<i>Geranium molle</i>	rare
Greater Plantain	<i>Plantago major</i>	frequent
Knotgrass	<i>Polygonum aviculare</i>	occasional
Lesser Burdock	<i>Arctium minus</i>	rare
Lesser Trefoil	<i>Trifolium dubium</i>	occasional
Mugwort	<i>Artemisia vulgaris</i>	rare
Perennial Rye-grass	<i>Lolium perenne</i>	frequent
Pineappleweed	<i>Matricaria discoidea</i>	frequent
Prickly Sow-thistle	<i>Sonchus asper</i>	occasional
Shepherd's-purse	<i>Capsella bursa-pastoris</i>	rare
Soft-brome	<i>Bromus hordeaceus</i>	rare
<u>northern ditch</u>		
Bittersweet	<i>Solanum dulcamara</i>	occasional
Blackthorn	<i>Prunus spinosa</i>	locally dominant
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	locally dominant
Branched Bur-reed	<i>Sparganium erectum</i>	occasional
Celery-leaved Buttercup	<i>Ranunculus sceleratus</i>	occasional
Cleavers	<i>Galium aparine</i>	occasional
Common Duckweed	<i>Lemna minor</i>	locally abundant
Common Nettle	<i>Urtica dioica</i>	occasional
Common Reed	<i>Phragmites australis</i>	dominant
Creeping Bent	<i>Agrostis stolonifera</i>	occasional
Fool's-water-cress	<i>Apium nodiflorum</i>	occasional
Great Willowherb	<i>Epilobium hirsutum</i>	frequent
Hoary Mustard	<i>Hirschfeldia incana</i>	occasional
Least Duckweed	<i>Lemna minuta</i>	occasional
Lesser Burdock	<i>Arctium minus</i>	rare
Marsh Ragwort	<i>Senecio aquaticus</i>	occasional
Toad Rush	<i>Juncus bufonius</i>	occasional
<u>eastern ditch</u>		
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	abundant
Branched Bur-reed	<i>Sparganium erectum</i>	rare
Common Chickweed	<i>Stellaria media</i>	rare
Common Duckweed	<i>Lemna minor</i>	abundant
Common Nettle	<i>Urtica dioica</i>	frequent
Common Reed	<i>Phragmites australis</i>	dominant
Fool's-water-cress	<i>Apium nodiflorum</i>	occasional
Fragrant Agrimony	<i>Agrimonia procera</i>	rare
Frogbit	<i>Hydrocharis morsus-ranae</i>	locally frequent

Great Willowherb	<i>Epilobium hirsutum</i>	abundant
Greater Duckweed	<i>Spirodela polyrhiza</i>	occasional
Hemp-agrimony	<i>Eupatorium cannabinum</i>	occasional
Male-fern	<i>Dryopteris filix-mas</i>	rare
Reed Sweet-grass	<i>Glyceria maxima</i>	occasional
Tufted Forget-me-not	<i>Myosotis laxa</i>	occasional
Water Mint	<i>Mentha aquatica</i>	occasional
Yellow Iris	<i>Iris pseudacorus</i>	rare
Yellow Loosestrife	<i>Lysimachia vulgaris</i>	occasional
<u>western ditch & edge</u>		
Bittersweet	<i>Solanum dulcamara</i>	occasional
Blackthorn	<i>Prunus spinosa</i>	locally abundant
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	locally dominant
Branched Bur-reed	<i>Sparganium erectum</i>	occasional
Colt's-foot	<i>Tussilago farfara</i>	rare
Common Duckweed	<i>Lemna minor</i>	occasional
Common Nettle	<i>Urtica dioica</i>	frequent
Common Reed	<i>Phragmites australis</i>	dominant
False Oat-Grass	<i>Arrhenatherum elatius</i>	occasional
Field Horsetail	<i>Equisetum arvense</i>	occasional
Fool's-water-cress	<i>Apium nodiflorum</i>	occasional
Great Willowherb	<i>Epilobium hirsutum</i>	occasional
Hard Rush	<i>Juncus inflexus</i>	occasional
Hemp-agrimony	<i>Eupatorium cannabinum</i>	occasional
Hogweed	<i>Heracleum sphondylium</i>	occasional
Marsh Ragwort	<i>Senecio aquaticus</i>	occasional
Meadowsweet	<i>Filipendula ulmaria</i>	occasional
Perennial Sow-thistle	<i>Sonchus arvensis</i>	rare
Purple-loosestrife	<i>Lythrum salicaria</i>	occasional
Rosebay Willowherb	<i>Chamerion angustifolium</i>	locally frequent
Rusty Willow	<i>Salix cinerea subsp. oleifolia</i>	abundant
Tufted Vetch	<i>Vicia cracca</i>	occasional
Water Figwort	<i>Scrophularia auriculata</i>	occasional
Wild Teasel	<i>Dipsacus fullonum</i>	occasional
Yellow Iris	<i>Iris pseudacorus</i>	occasional

Margam Moors (Field N03) SS780850, surveyed 10-Jul-07

ridges

Amphibious Bistort	<i>Persicaria amphibia</i>	occasional
Cock's-foot	<i>Dactylis glomerata</i>	frequent
Common Bent	<i>Agrostis capillaris</i>	frequent
Common Knapweed	<i>Centaurea nigra var. nemoralis</i>	occasional
Common Mouse-ear	<i>Cerastium fontanum</i>	occasional
Common Nettle	<i>Urtica dioica</i>	occasional
Common Sorrel	<i>Rumex acetosa</i>	occasional
Creeping Buttercup	<i>Ranunculus repens</i>	frequent
Creeping Thistle	<i>Cirsium arvense</i>	occasional
False Oat-Grass	<i>Arrhenatherum elatius</i>	frequent
Field Horsetail	<i>Equisetum arvense</i>	occasional
Greater Plantain	<i>Plantago major</i>	rare
Hogweed	<i>Heracleum sphondylium</i>	occasional

Meadow Buttercup	<i>Ranunculus acris</i>	occasional
Meadow Foxtail	<i>Alopecurus pratensis</i>	frequent
Meadow Vetchling	<i>Lathyrus pratensis</i>	occasional
Red Clover	<i>Trifolium pratense</i>	occasional
Tufted Vetch	<i>Vicia cracca</i>	occasional
White Clover	<i>Trifolium repens</i>	frequent
Yorkshire-fog	<i>Holcus lanatus</i>	frequent
<u>furrows</u>		
Amphibious Bistort	<i>Persicaria amphibia</i>	occasional
Creeping Bent	<i>Agrostis stolonifera</i>	occasional
Curled Dock	<i>Rumex crispus</i>	occasional
Hairy Sedge	<i>Carex hirta</i>	frequent
Marsh Horsetail	<i>Equisetum palustre</i>	occasional
Meadowsweet	<i>Filipendula ulmaria</i>	occasional
Silverweed	<i>Potentilla anserina</i>	frequent
Soft-rush	<i>Juncus effusus</i>	occasional
Spear Thistle	<i>Cirsium vulgare</i>	rare
Timothy	<i>Phleum pratense</i>	occasional
Wood Dock	<i>Rumex sanguineus</i>	rare
<u>northern ditch</u>		
Agrimony	<i>Agrimonia eupatoria</i>	frequent
Amphibious Bistort	<i>Persicaria amphibia</i>	frequent
Clustered Dock	<i>Rumex conglomeratus</i>	occasional
Common Fleabane	<i>Pulicaria dysenterica</i>	frequent
Common Reed	<i>Phragmites australis</i>	occasional
Common Vetch	<i>Vicia sativa</i>	rare
Creeping Bent	<i>Agrostis stolonifera</i>	occasional
False Fox-sedge	<i>Carex otrubae</i>	occasional
Floating Sweet-grass	<i>Glyceria fluitans</i>	occasional
Great Willowherb	<i>Epilobium hirsutum</i>	occasional
Greater Bird's-foot-trefoil	<i>Lotus pedunculatus</i>	occasional
Greater Pond-sedge	<i>Carex riparia</i>	occasional
Grey Club-rush	<i>Schoenoplectus tabernaemontani</i>	frequent
Gypsywort	<i>Lycopus europaeus</i>	rare
Hard Rush	<i>Juncus inflexus</i>	occasional
Lesser Water-parsnip	<i>Berula erecta</i>	frequent
Marsh-bedstraw	<i>Galium palustre</i>	occasional
Oval Sedge	<i>Carex ovalis</i>	rare
Purple-loosestrife	<i>Lythrum salicaria</i>	rare
Rusty Willow	<i>Salix cinerea subsp. oleifolia</i>	rare
Silverweed	<i>Potentilla anserina</i>	frequent
Skullcap	<i>Scutellaria galericulata</i>	occasional
Soft-rush	<i>Juncus effusus</i>	occasional
Spear-leaved Orache	<i>Atriplex prostrata</i>	rare
Toad Rush	<i>Juncus bufonius</i>	rare
Tufted Forget-me-not	<i>Myosotis laxa</i>	occasional
Water Mint	<i>Mentha aquatica</i>	frequent
Yellow Iris	<i>Iris pseudacorus</i>	occasional

Margam Moors (Field N04) SS780851, surveyed 10-Jul-07

ridges

Amphibious Bistort	<i>Persicaria amphibia</i>	occasional
Cock's-foot	<i>Dactylis glomerata</i>	frequent
Common Bent	<i>Agrostis capillaris</i>	abundant
Common Knapweed	<i>Centaurea nigra var. nemoralis</i>	occasional
Common Mouse-ear	<i>Cerastium fontanum</i>	occasional
Common Sorrel	<i>Rumex acetosa</i>	occasional
Creeping Buttercup	<i>Ranunculus repens</i>	abundant
Creeping Thistle	<i>Cirsium arvense</i>	abundant
Cut-leaved Crane's-bill	<i>Geranium dissectum</i>	rare
False Oat-Grass	<i>Arrhenatherum elatius</i>	frequent
Field Horsetail	<i>Equisetum arvense</i>	occasional
Hogweed	<i>Heracleum sphondylium</i>	occasional
Meadow Buttercup	<i>Ranunculus acris</i>	frequent
Meadow Vetchling	<i>Lathyrus pratensis</i>	occasional
Perennial Rye-grass	<i>Lolium perenne</i>	rare
Red Clover	<i>Trifolium pratense</i>	occasional
Red Fescue	<i>Festuca rubra</i>	occasional
Ribwort Plantain	<i>Plantago lanceolata</i>	frequent
Sweet Vernal-grass	<i>Anthoxanthum odoratum</i>	occasional
White Clover	<i>Trifolium repens</i>	frequent
Yorkshire-fog	<i>Holcus lanatus</i>	frequent
<u>furrows</u>		
Amphibious Bistort	<i>Persicaria amphibia</i>	frequent
Compact Rush	<i>Juncus conglomeratus</i>	rare
Creeping Bent	<i>Agrostis stolonifera</i>	occasional
Curled Dock	<i>Rumex crispus</i>	occasional
Floating Sweet-grass	<i>Glyceria fluitans</i>	frequent
Greater Bird's-foot-trefoil	<i>Lotus pedunculatus</i>	occasional
Hairy Sedge	<i>Carex hirta</i>	frequent
Marsh-bedstraw	<i>Galium palustre</i>	occasional
Sharp-flowered Rush	<i>Juncus acutiflorus</i>	occasional
Soft-rush	<i>Juncus effusus</i>	occasional
Timothy	<i>Phleum pratense</i>	rare
Yellow Iris	<i>Iris pseudacorus</i>	occasional

Margam Moors (Field N05) SS780853, surveyed 10-Jul-07

ridges

Amphibious Bistort	<i>Persicaria amphibia</i>	occasional
Cock's-foot	<i>Dactylis glomerata</i>	frequent
Common Bent	<i>Agrostis capillaris</i>	frequent
Common Knapweed	<i>Centaurea nigra var. nemoralis</i>	occasional
Common Mouse-ear	<i>Cerastium fontanum</i>	occasional
Common Nettle	<i>Urtica dioica</i>	occasional
Common Sorrel	<i>Rumex acetosa</i>	occasional
Creeping Buttercup	<i>Ranunculus repens</i>	frequent
Creeping Thistle	<i>Cirsium arvense</i>	abundant
False Oat-Grass	<i>Arrhenatherum elatius</i>	frequent
Field Horsetail	<i>Equisetum arvense</i>	occasional
Field-rose	<i>Rosa arvensis</i>	rare
Hogweed	<i>Heracleum sphondylium</i>	occasional
Meadow Buttercup	<i>Ranunculus acris</i>	occasional

Meadow Foxtail	<i>Alopecurus pratensis</i>	occasional
Meadow Vetchling	<i>Lathyrus pratensis</i>	occasional
Red Clover	<i>Trifolium pratense</i>	rare
Red Fescue	<i>Festuca rubra</i>	occasional
Ribwort Plantain	<i>Plantago lanceolata</i>	occasional
Sharp-flowered Rush	<i>Juncus acutiflorus</i>	occasional
Sweet Vernal-grass	<i>Anthoxanthum odoratum</i>	occasional
Tufted Vetch	<i>Vicia cracca</i>	occasional
White Clover	<i>Trifolium repens</i>	occasional
<u>furrows</u>		
Creeping Bent	<i>Agrostis stolonifera</i>	frequent
Creeping Thistle	<i>Cirsium arvense</i>	locally frequent
Curled Dock	<i>Rumex crispus</i>	occasional
Dandelion	<i>Taraxacum aggregate</i>	occasional
Greater Bird's-foot-trefoil	<i>Lotus pedunculatus</i>	occasional
Hairy Sedge	<i>Carex hirta</i>	frequent
Marsh-bedstraw	<i>Galium palustre</i>	occasional
Meadowsweet	<i>Filipendula ulmaria</i>	locally frequent
Prickly Sow-thistle	<i>Sonchus asper</i>	rare
Sharp-flowered Rush	<i>Juncus acutiflorus</i>	occasional
Soft-rush	<i>Juncus effusus</i>	locally frequent
Yellow Iris	<i>Iris pseudacorus</i>	locally frequent
Yorkshire-fog	<i>Holcus lanatus</i>	frequent
<u>east ditch</u>		
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	abundant
Common Reed	<i>Phragmites australis</i>	abundant
Hawthorn	<i>Crataegus monogyna</i>	frequent
Rusty Willow	<i>Salix cinerea subsp. oleifolia</i>	abundant
<u>southern ditch</u>		
Agrimony	<i>Agrimonia eupatoria</i>	occasional
Bittersweet	<i>Solanum dulcamara</i>	occasional
Blackthorn	<i>Prunus spinosa</i>	locally dominant
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	abundant
Celery-leaved Buttercup	<i>Ranunculus sceleratus</i>	rare
Clustered Dock	<i>Rumex conglomeratus</i>	rare
Common Duckweed	<i>Lemna minor</i>	occasional
Common Nettle	<i>Urtica dioica</i>	frequent
Common Reed	<i>Phragmites australis</i>	locally dominant
Fool's-water-cress	<i>Apium nodiflorum</i>	locally frequent
Great Willowherb	<i>Epilobium hirsutum</i>	frequent
Greater Pond-sedge	<i>Carex riparia</i>	occasional
Hard Rush	<i>Juncus inflexus</i>	occasional
Hawthorn	<i>Crataegus monogyna</i>	occasional
Hedge Bindweed	<i>Calystegia sepium subsp. sepium</i>	occasional
Meadow Foxtail	<i>Alopecurus pratensis</i>	rare
Meadowsweet	<i>Filipendula ulmaria</i>	frequent
Pink Water-speedwell	<i>Veronica catenata</i>	rare
Rusty Willow	<i>Salix cinerea subsp. oleifolia</i>	occasional
Soft-rush	<i>Juncus effusus</i>	occasional
Toad Rush	<i>Juncus bufonius sens. lat.</i>	rare

Margam Moors (Field N06) SS779853, 09-Jul-07

ridges

Amphibious Bistort	<i>Persicaria amphibia</i>	occasional
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	occasional
Cock's-foot	<i>Dactylis glomerata</i>	frequent
Common Bent	<i>Agrostis capillaris</i>	abundant
Common Sorrel	<i>Rumex acetosa</i>	occasional
Common Vetch	<i>Vicia sativa</i>	rare
Creeping Buttercup	<i>Ranunculus repens</i>	frequent
Creeping Thistle	<i>Cirsium arvense</i>	abundant
Curled Dock	<i>Rumex crispus</i>	occasional
False Oat-Grass	<i>Arrhenatherum elatius</i>	occasional
Field Horsetail	<i>Equisetum arvense</i>	occasional
Hairy Sedge	<i>Carex hirta</i>	occasional
Hogweed	<i>Heracleum sphondylium</i>	rare
Meadow Buttercup	<i>Ranunculus acris</i>	occasional
Meadow Fescue	<i>Festuca pratensis</i>	occasional
Meadow Foxtail	<i>Alopecurus pratensis</i>	locally frequent
Perennial Rye-grass	<i>Lolium perenne</i>	occasional
Timothy	<i>Phleum pratense</i>	occasional
White Clover	<i>Trifolium repens</i>	occasional
Yorkshire-fog	<i>Holcus lanatus</i>	frequent

furrows

Amphibious Bistort	<i>Persicaria amphibia</i>	frequent
Bittersweet	<i>Solanum dulcamara</i>	occasional
Broad-leaved Dock	<i>Rumex obtusifolius</i>	occasional
Common Nettle	<i>Urtica dioica</i>	occasional
Creeping Bent	<i>Agrostis stolonifera</i>	locally frequent
Curled Dock	<i>Rumex crispus</i>	occasional
Field Horsetail	<i>Equisetum arvense</i>	occasional
Hairy Sedge	<i>Carex hirta</i>	frequent
Meadowsweet	<i>Filipendula ulmaria</i>	occasional
Perennial Rye-grass	<i>Lolium perenne</i>	occasional
Purple-loosestrife	<i>Lythrum salicaria</i>	rare
Redshank	<i>Persicaria maculosa</i>	occasional
Sharp-flowered Rush	<i>Juncus acutiflorus</i>	locally frequent
Tufted Vetch	<i>Vicia cracca</i>	occasional
Water-pepper	<i>Persicaria hydropiper</i>	occasional
Yellow Iris	<i>Iris pseudacorus</i>	locally abundant

northern ditch

Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	abundant
Cleavers	<i>Galium aparine</i>	occasional
Common Reed	<i>Phragmites australis</i>	dominant
Great Willowherb	<i>Epilobium hirsutum</i>	frequent
Gypsywort	<i>Lycopus europaeus</i>	rare
Hemp-agrimony	<i>Eupatorium cannabinum</i>	occasional
Marsh-bedstraw	<i>Galium palustre</i>	occasional
Mugwort	<i>Artemisia vulgaris</i>	rare
Rusty Willow	<i>Salix cinerea subsp. oleifolia</i>	abundant
Soft-rush	<i>Juncus effusus</i>	occasional
Tufted Forget-me-not	<i>Myosotis laxa</i>	rare

eastern ditch

Common Reed	<i>Phragmites australis</i>	locally dominant
Field-rose	<i>Rosa arvensis</i>	rare
Goat Willow	<i>Salix caprea</i>	occasional
Hawthorn	<i>Crataegus monogyna</i>	frequent
Rusty Willow	<i>Salix cinerea subsp. oleifolia</i>	frequent

southern ditch

Blackthorn	<i>Prunus spinosa</i>	frequent
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	frequent
Common Duckweed	<i>Lemna minor</i>	occasional
Common Nettle	<i>Urtica dioica</i>	frequent
Common Reed	<i>Phragmites australis</i>	locally dominant
Frogbit	<i>Hydrocharis morsus-ranae</i>	rare
Hawthorn	<i>Crataegus monogyna</i>	abundant
Lady-fern	<i>Athyrium filix-femina</i>	rare
Male-fern	<i>Dryopteris filix-mas</i>	occasional
Marsh-bedstraw	<i>Galium palustre</i>	occasional
Meadowsweet	<i>Filipendula ulmaria</i>	occasional
Purple-loosestrife	<i>Lythrum salicaria</i>	rare
Rusty Willow	<i>Salix cinerea subsp. oleifolia</i>	occasional

Margam Moors (Field N07) SS781853, surveyed 10-Jul-07

ridges

Cock's-foot	<i>Dactylis glomerata</i>	frequent
Colt's-foot	<i>Tussilago farfara</i>	rare
Common Bent	<i>Agrostis capillaris</i>	abundant
Common Mouse-ear	<i>Cerastium fontanum</i>	occasional
Common Sorrel	<i>Rumex acetosa</i>	occasional
Creeping Buttercup	<i>Ranunculus repens</i>	frequent
Creeping Thistle	<i>Cirsium arvense</i>	abundant
Curled Dock	<i>Rumex crispus</i>	occasional
Field Horsetail	<i>Equisetum arvense</i>	occasional
Hairy Sedge	<i>Carex hirta</i>	occasional
Meadow Buttercup	<i>Ranunculus acris</i>	occasional
Meadow Fescue	<i>Festuca pratensis</i>	frequent
Meadow Foxtail	<i>Alopecurus pratensis</i>	occasional
Meadow Vetchling	<i>Lathyrus pratensis</i>	occasional
Perennial Rye-grass	<i>Lolium perenne</i>	rare
Tufted Vetch	<i>Vicia cracca</i>	occasional
White Clover	<i>Trifolium repens</i>	occasional
Yorkshire-fog	<i>Holcus lanatus</i>	frequent

furrows

Amphibious Bistort	<i>Persicaria amphibia</i>	occasional
Common Reed	<i>Phragmites australis</i>	frequent
Compact Rush	<i>Juncus conglomeratus</i>	occasional
Creeping Thistle	<i>Cirsium arvense</i>	abundant
Curled Dock	<i>Rumex crispus</i>	occasional
Great Willowherb	<i>Epilobium hirsutum</i>	occasional
Greater Bird's-foot-trefoil	<i>Lotus pedunculatus</i>	occasional
Hairy Sedge	<i>Carex hirta</i>	frequent

Hard Rush	<i>Juncus inflexus</i>	occasional
Marsh-bedstraw	<i>Galium palustre</i>	occasional
Meadowsweet	<i>Filipendula ulmaria</i>	occasional
Sharp-flowered Rush	<i>Juncus acutiflorus</i>	occasional
Silverweed	<i>Potentilla anserina</i>	frequent
Soft-rush	<i>Juncus effusus</i>	frequent
Timothy	<i>Phleum pratense</i>	occasional
Tufted Forget-me-not	<i>Myosotis laxa</i>	occasional
Water-pepper	<i>Persicaria hydropiper</i>	occasional
Yellow Iris	<i>Iris pseudacorus</i>	occasional
<u>furrows (far eastern section)</u>		
Common Reed	<i>Phragmites australis</i>	occasional
Greater Pond-sedge	<i>Carex riparia</i>	dominant
Hedge Bindweed	<i>Calystegia sepium subsp. sepium</i>	frequent
Skullcap	<i>Scutellaria galericulata</i>	occasional
Tufted Forget-me-not	<i>Myosotis laxa</i>	occasional
<u>northern ditch</u>		
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	abundant
Common Nettle	<i>Urtica dioica</i>	frequent
Common Reed	<i>Phragmites australis</i>	dominant
Great Willowherb	<i>Epilobium hirsutum</i>	occasional
Greater Pond-sedge	<i>Carex riparia</i>	occasional
Hogweed	<i>Heracleum sphondylium</i>	occasional
Marsh-bedstraw	<i>Galium palustre</i>	occasional
Rusty Willow	<i>Salix cinerea subsp. oleifolia</i>	frequent
<u>Margam Moors (Field N08) SS782852 10-Jul-07</u>		
<u>ridges</u>		
Amphibious Bistort	<i>Persicaria amphibia</i>	occasional
Cock's-foot	<i>Dactylis glomerata</i>	frequent
Common Bent	<i>Agrostis capillaris</i>	frequent
Common Knapweed	<i>Centaurea nigra var. nemoralis</i>	occasional
Common Nettle	<i>Urtica dioica</i>	occasional
Common Sorrel	<i>Rumex acetosa</i>	occasional
Creeping Buttercup	<i>Ranunculus repens</i>	frequent
Creeping Thistle	<i>Cirsium arvense</i>	abundant
Curled Dock	<i>Rumex crispus</i>	occasional
False Oat-Grass	<i>Arrhenatherum elatius</i>	frequent
Field Horsetail	<i>Equisetum arvense</i>	occasional
Hogweed	<i>Heracleum sphondylium</i>	occasional
Meadow Buttercup	<i>Ranunculus acris</i>	occasional
Meadow Foxtail	<i>Alopecurus pratensis</i>	locally frequent
Meadow Vetchling	<i>Lathyrus pratensis</i>	occasional
Perennial Sow-thistle	<i>Sonchus arvensis</i>	occasional
Red Clover	<i>Trifolium pratense</i>	rare
Red Fescue	<i>Festuca rubra</i>	occasional
Ribwort Plantain	<i>Plantago lanceolata</i>	occasional
Tufted Vetch	<i>Vicia cracca</i>	occasional
White Clover	<i>Trifolium repens</i>	occasional
<u>furrows</u>		
Amphibious Bistort	<i>Persicaria amphibia</i>	frequent
Broad-leaved Dock	<i>Rumex obtusifolius</i>	occasional

Common Fleabane	<i>Pulicaria dysenterica</i>	occasional
Common Nettle	<i>Urtica dioica</i>	occasional
Common Reed	<i>Phragmites australis</i>	frequent
Common Sorrel	<i>Rumex acetosa</i>	occasional
Creeping Thistle	<i>Cirsium arvense</i>	frequent
Curled Dock	<i>Rumex crispus</i>	frequent
Floating Sweet-grass	<i>Glyceria fluitans</i>	frequent
Greater Bird's-foot-trefoil	<i>Lotus pedunculatus</i>	occasional
Hairy Sedge	<i>Carex hirta</i>	frequent
Hogweed	<i>Heracleum sphondylium</i>	occasional
Marsh Foxtail	<i>Alopecurus geniculatus</i>	occasional
Marsh Thistle	<i>Cirsium palustre</i>	occasional
Marsh-bedstraw	<i>Galium palustre</i>	occasional
Meadow Foxtail	<i>Alopecurus pratensis</i>	occasional
Prickly Sow-thistle	<i>Sonchus asper</i>	occasional
Purple-loosestrife	<i>Lythrum salicaria</i>	occasional
Reed Canary-grass	<i>Phalaris arundinacea</i>	occasional
Silverweed	<i>Potentilla anserina</i>	frequent
Soft-rush	<i>Juncus effusus</i>	frequent
Timothy	<i>Phleum pratense</i>	occasional
Tufted Vetch	<i>Vicia cracca</i>	rare
Wild Angelica	<i>Angelica sylvestris</i>	rare
Yellow Iris	<i>Iris pseudacorus</i>	locally frequent
<u>northern ditch</u>		
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	abundant
Cleavers	<i>Galium aparine</i>	occasional
Common Duckweed	<i>Lemna minor</i>	occasional
Common Nettle	<i>Urtica dioica</i>	frequent
Common Reed	<i>Phragmites australis</i>	abundant
Elder	<i>Sambucus nigra</i>	rare
Greater Pond-sedge	<i>Carex riparia</i>	frequent
Least Duckweed	<i>Lemna minuta</i>	locally abundant
Marsh-bedstraw	<i>Galium palustre</i>	occasional
Meadowsweet	<i>Filipendula ulmaria</i>	frequent
Reed Sweet-grass	<i>Glyceria maxima</i>	rare
Rusty Willow	<i>Salix cinerea subsp. oleifolia</i>	dominant
<u>eastern ditch</u>		
Amphibious Bistort	<i>Persicaria amphibia</i>	occasional
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	occasional
Branched Bur-reed	<i>Sparganium erectum</i>	occasional
Celery-leaved Buttercup	<i>Ranunculus sceleratus</i>	rare
Common Duckweed	<i>Lemna minor</i>	abundant
Common Fleabane	<i>Pulicaria dysenterica</i>	occasional
Common Nettle	<i>Urtica dioica</i>	frequent
Common Reed	<i>Phragmites australis</i>	dominant
Frogbit	<i>Hydrocharis morsus-ranae</i>	occasional
Great Willowherb	<i>Epilobium hirsutum</i>	frequent
Greater Duckweed	<i>Spirodela polyrhiza</i>	rare
Greater Pond-sedge	<i>Carex riparia</i>	abundant
Hogweed	<i>Heracleum sphondylium</i>	frequent
Least Duckweed	<i>Lemna minuta</i>	locally abundant

Lesser Water-parsnip	<i>Berula erecta</i>	frequent
Meadowsweet	<i>Filipendula ulmaria</i>	frequent
Pink Water-speedwell	<i>Veronica catenata</i>	rare
Reed Sweet-grass	<i>Glyceria maxima</i>	locally frequent
Rusty Willow	<i>Salix cinerea subsp. oleifolia</i>	frequent
Water-pepper	<i>Persicaria hydropiper</i>	occasional
Water-plantain	<i>Alisma plantago-aquatica</i>	rare

Margam Moors (Field N09) SS781851, surveyed 10-Jul-07

ridges

Agrimony	<i>Agrimonia eupatoria</i>	rare
Amphibious Bistort	<i>Persicaria amphibia</i>	occasional
Cock's-foot	<i>Dactylis glomerata</i>	frequent
Common Bent	<i>Agrostis capillaris</i>	frequent
Common Knapweed	<i>Centaurea nigra var. nemoralis</i>	occasional
Common Mouse-ear	<i>Cerastium fontanum</i>	occasional
Common Nettle	<i>Urtica dioica</i>	occasional
Common Sorrel	<i>Rumex acetosa</i>	occasional
Creeping Buttercup	<i>Ranunculus repens</i>	frequent
Creeping Thistle	<i>Cirsium arvense</i>	abundant
False Oat-Grass	<i>Arrhenatherum elatius</i>	frequent
Field Horsetail	<i>Equisetum arvense</i>	occasional
Hogweed	<i>Heracleum sphondylium</i>	occasional
Meadow Buttercup	<i>Ranunculus acris</i>	occasional
Meadow Foxtail	<i>Alopecurus pratensis</i>	occasional
Meadow Vetchling	<i>Lathyrus pratensis</i>	occasional
Red Clover	<i>Trifolium pratense</i>	occasional
Red Fescue	<i>Festuca rubra</i>	occasional
Ribwort Plantain	<i>Plantago lanceolata</i>	occasional
Sweet Vernal-grass	<i>Anthoxanthum odoratum</i>	rare
Tufted Vetch	<i>Vicia cracca</i>	occasional
White Clover	<i>Trifolium repens</i>	occasional
Yarrow	<i>Achillea millefolium</i>	rare

furrows

Amphibious Bistort	<i>Persicaria amphibia</i>	frequent
Common Nettle	<i>Urtica dioica</i>	frequent
Common Sorrel	<i>Rumex acetosa</i>	occasional
Curled Dock	<i>Rumex crispus</i>	occasional
Floating Sweet-grass	<i>Glyceria fluitans</i>	frequent
Greater Bird's-foot-trefoil	<i>Lotus pedunculatus</i>	occasional
Hard Rush	<i>Juncus inflexus</i>	frequent
Rough Meadow-grass	<i>Poa trivialis</i>	rare
Sharp-flowered Rush	<i>Juncus acutiflorus</i>	locally frequent
Silverweed	<i>Potentilla anserina</i>	frequent
Soft-rush	<i>Juncus effusus</i>	frequent
Tufted Vetch	<i>Vicia cracca</i>	occasional
Yellow Iris	<i>Iris pseudacorus</i>	locally abundant

disturbed ground

a hawkweed	<i>Hieracium sp.</i>	rare
Autumn Hawkbit	<i>Leontodon autumnalis</i>	occasional
Biting Stonecrop	<i>Sedum acre</i>	occasional

Buck's-horn Plantain	<i>Plantago coronopus</i>	locally frequent
Common Nettle	<i>Urtica dioica</i>	locally frequent
Common Orache	<i>Atriplex patula</i>	frequent
Common Stork's-bill	<i>Erodium cicutarium</i>	rare
Creeping Thistle	<i>Cirsium arvense</i>	frequent
Dandelion	<i>Taraxacum aggregatum</i>	occasional
Early Meadow-grass	<i>Poa annua</i>	abundant
Fat-hen	<i>Chenopodium album</i>	occasional
Greater Plantain	<i>Plantago major</i>	frequent
Groundsel	<i>Senecio vulgaris</i>	rare
Knotgrass	<i>Polygonum aviculare</i>	occasional
Meadow Fescue	<i>Festuca pratensis</i>	occasional
Perennial Rye-grass	<i>Lolium perenne</i>	frequent
Pineappleweed	<i>Matricaria discoidea</i>	frequent
Prickly Sow-thistle	<i>Sonchus asper</i>	occasional
Rat's-tail Fescue	<i>Vulpia myuros</i>	occasional
Sand-hill Screw-moss	<i>Syntrichia ruraliformis</i>	rare
Scentless Mayweed	<i>Tripleurospermum inodorum</i>	occasional
Shepherd's-purse	<i>Capsella bursa-pastoris</i>	occasional
Smooth Sow-thistle	<i>Sonchus oleraceus</i>	rare
Soft-brome	<i>Bromus hordeaceus</i>	occasional
Spear Thistle	<i>Cirsium vulgare</i>	rare
Spear-leaved Orache	<i>Atriplex prostrata</i>	occasional
Squirreltail Fescue	<i>Vulpia bromoides</i>	rare
Timothy	<i>Phleum pratense</i>	occasional
Upright Hedge-parsley	<i>Torilis japonica</i>	rare
Viper's-bugloss	<i>Echium vulgare</i>	abundant
<u>northern ditch</u>		
Blackthorn	<i>Prunus spinosa</i>	abundant
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	abundant
Common Duckweed	<i>Lemna minor</i>	occasional
Common Nettle	<i>Urtica dioica</i>	frequent
Common Reed	<i>Phragmites australis</i>	abundant
Frogbit	<i>Hydrocharis morsus-ranae</i>	rare
Goat Willow	<i>Salix caprea</i>	rare
Greater Pond-sedge	<i>Carex riparia</i>	locally frequent
Hawthorn	<i>Crataegus monogyna</i>	occasional
Hedge Bindweed	<i>Calystegia sepium subsp. sepium</i>	frequent
Hemp-agrimony	<i>Eupatorium cannabinum</i>	occasional
Least Duckweed	<i>Lemna minuta</i>	occasional
Lesser Water-parsnip	<i>Berula erecta</i>	rare
Male-fern	<i>Dryopteris filix-mas</i>	occasional
Meadowsweet	<i>Filipendula ulmaria</i>	occasional
Reed Sweet-grass	<i>Glyceria maxima</i>	rare
Rusty Willow	<i>Salix cinerea subsp. oleifolia</i>	occasional
Wild Teasel	<i>Dipsacus fullonum</i>	rare
<u>western ditch</u>		
Bittersweet	<i>Solanum dulcamara</i>	occasional
Blackthorn	<i>Prunus spinosa</i>	occasional
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	abundant
Common Fleabane	<i>Pulicaria dysenterica</i>	occasional

Common Reed	<i>Phragmites australis</i>	abundant
Great Willowherb	<i>Epilobium hirsutum</i>	occasional
Hairy Sedge	<i>Carex hirta</i>	occasional
Hawthorn	<i>Crataegus monogyna</i>	occasional
Lady-fern	<i>Athyrium filix-femina</i>	rare
Marsh Foxtail	<i>Alopecurus geniculatus</i>	rare
Marsh Thistle	<i>Cirsium palustre</i>	rare
Tufted Forget-me-not	<i>Myosotis laxa</i>	occasional
Water Mint	<i>Mentha aquatica</i>	occasional
Yellow Iris	<i>Iris pseudacorus</i>	occasional
<u>roadside verge</u>		
Agrimony	<i>Agrimonia eupatoria</i>	occasional
Amphibious Bistort	<i>Persicaria amphibia</i>	rare
Black Medick	<i>Medicago lupulina</i>	frequent
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	locally abundant
Cat's-ear	<i>Hypochaeris radicata</i>	rare
Cleavers	<i>Galium aparine</i>	occasional
Cock's-foot	<i>Dactylis glomerata</i>	frequent
Common Bent	<i>Agrostis capillaris</i>	frequent
Common Fleabane	<i>Pulicaria dysenterica</i>	occasional
Common Knapweed	<i>Centaurea nigra var. nemoralis</i>	occasional
Common Restharrow	<i>Ononis repens</i>	occasional
Creeping Cinquefoil	<i>Potentilla reptans</i>	frequent
Dandelion	<i>Taraxacum aggregate</i>	occasional
False Oat-Grass	<i>Arrhenatherum elatius</i>	abundant
Field Horsetail	<i>Equisetum arvense</i>	frequent
Hawthorn	<i>Crataegus monogyna</i>	rare
Hogweed	<i>Heracleum sphondylium</i>	occasional
Lesser Trefoil	<i>Trifolium dubium</i>	rare
Mugwort	<i>Artemisia vulgaris</i>	occasional
Perennial Rye-grass	<i>Lolium perenne</i>	occasional
Red Clover	<i>Trifolium pratense</i>	occasional
Red Fescue	<i>Festuca rubra</i>	occasional
Ribwort Plantain	<i>Plantago lanceolata</i>	occasional
Soft-brome	<i>Bromus hordeaceus</i>	occasional
Upright Hedge-parsley	<i>Torilis japonica</i>	occasional
White Clover	<i>Trifolium repens</i>	occasional
Yarrow	<i>Achillea millefolium</i>	occasional

Margam Moors (Field N10) SS784853, surveyed 10-Jul-07

ridges

Amphibious Bistort	<i>Persicaria amphibia</i>	occasional
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	occasional
Cock's-foot	<i>Dactylis glomerata</i>	frequent
Common Bent	<i>Agrostis capillaris</i>	abundant
Common Knapweed	<i>Centaurea nigra var. nemoralis</i>	occasional
Common Mouse-ear	<i>Cerastium fontanum</i>	occasional
Common Nettle	<i>Urtica dioica</i>	occasional
Common Sorrel	<i>Rumex acetosa</i>	occasional
Creeping Bent	<i>Agrostis stolonifera</i>	frequent
Creeping Buttercup	<i>Ranunculus repens</i>	occasional

Creeping Thistle	<i>Cirsium arvense</i>	frequent
Curled Dock	<i>Rumex crispus</i>	occasional
Dandelion	<i>Taraxacum aggregate</i>	occasional
Greater Pond-sedge	<i>Carex riparia</i>	rare
Hairy Sedge	<i>Carex hirta</i>	occasional
Hogweed	<i>Heracleum sphondylium</i>	occasional
Marsh Thistle	<i>Cirsium palustre</i>	rare
Meadow Buttercup	<i>Ranunculus acris</i>	rare
Meadow Fescue	<i>Festuca pratensis</i>	occasional
Meadow Foxtail	<i>Alopecurus pratensis</i>	locally frequent
Red Fescue	<i>Festuca rubra</i>	occasional
Ribwort Plantain	<i>Plantago lanceolata</i>	occasional
Spear Thistle	<i>Cirsium vulgare</i>	rare
Timothy	<i>Phleum pratense</i>	rare
Tufted Hair-grass	<i>Deschampsia cespitosa</i>	rare
White Clover	<i>Trifolium repens</i>	occasional
Yorkshire-fog	<i>Holcus lanatus</i>	frequent
<u>furrows</u>		
Broad-leaved Dock	<i>Rumex obtusifolius</i>	occasional
Celery-leaved Buttercup	<i>Ranunculus sceleratus</i>	occasional
Clustered Dock	<i>Rumex conglomeratus</i>	frequent
Common Nettle	<i>Urtica dioica</i>	frequent
Common Water Starwort	<i>Callitriche stagnalis sens. lat.</i>	occasional
Creeping Bent	<i>Agrostis stolonifera</i>	frequent
Creeping Thistle	<i>Cirsium arvense</i>	frequent
Curled Dock	<i>Rumex crispus</i>	occasional
Floating Sweet-grass	<i>Glyceria fluitans</i>	locally abundant
Great Willowherb	<i>Epilobium hirsutum</i>	rare
Greater Plantain	<i>Plantago major</i>	rare
Greater Pond-sedge	<i>Carex riparia</i>	locally abundant
Hard Rush	<i>Juncus inflexus</i>	frequent
Lesser Water-parsnip	<i>Berula erecta</i>	rare
Marsh-bedstraw	<i>Galium palustre</i>	frequent
Pink Water-speedwell	<i>Veronica catenata</i>	occasional
Redshank	<i>Persicaria maculosa</i>	rare
Reed Sweet-grass	<i>Glyceria maxima</i>	occasional
Rusty Willow	<i>Salix cinerea subsp. oleifolia</i>	rare
Silverweed	<i>Potentilla anserina</i>	occasional
Soft-rush	<i>Juncus effusus</i>	frequent
Tufted Forget-me-not	<i>Myosotis laxa</i>	frequent
Water Mint	<i>Mentha aquatica</i>	occasional
Water-pepper	<i>Persicaria hydropiper</i>	frequent
Water-plantain	<i>Alisma plantago-aquatica</i>	rare
Yellow Iris	<i>Iris pseudacorus</i>	frequent
<u>disturbed area by gate</u>		
Annual Meadow-grass	<i>Poa annua</i>	frequent
Creeping Bent	<i>Agrostis stolonifera</i>	frequent
Greater Plantain	<i>Plantago major</i>	frequent
Knotgrass	<i>Polygonum aviculare</i>	occasional
Perennial Rye-grass	<i>Lolium perenne</i>	occasional
Pineappleweed	<i>Matricaria discoidea</i>	frequent

Shepherd's-purse	<i>Capsella bursa-pastoris</i>	rare
White Clover	<i>Trifolium repens</i>	occasional
<u>northern ditch</u>		
Blackthorn	<i>Prunus spinosa</i>	locally abundant
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	abundant
Branched Bur-reed	<i>Sparganium erectum</i>	rare
Common Duckweed	<i>Lemna minor</i>	occasional
Common Nettle	<i>Urtica dioica</i>	frequent
Common Reed	<i>Phragmites australis</i>	locally frequent
Greater Pond-sedge	<i>Carex riparia</i>	occasional
Hart's-tongue	<i>Phyllitis scolopendrium</i>	occasional
Hawthorn	<i>Crataegus monogyna</i>	occasional
Hedge Bindweed	<i>Calystegia sepium subsp. sepium</i>	frequent
Lady-fern	<i>Athyrium filix-femina</i>	occasional
Least Duckweed	<i>Lemna minuta</i>	occasional
Male-fern	<i>Dryopteris filix-mas</i>	occasional
Rusty Willow	<i>Salix cinerea subsp. oleifolia</i>	frequent
<u>roadside verge</u>		
Barren Brome	<i>Anisantha sterilis</i>	occasional
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	abundant
Carrot	<i>Daucus carota</i>	occasional
Cleavers	<i>Galium aparine</i>	occasional
Cock's-foot	<i>Dactylis glomerata</i>	frequent
Common Bird's-foot-trefoil	<i>Lotus corniculatus</i>	rare
Common Nettle	<i>Urtica dioica</i>	occasional
Cow Parsley	<i>Anthriscus sylvestris</i>	occasional
Dandelion	<i>Taraxacum aggregate</i>	occasional
Dove's-foot Crane's-bill	<i>Geranium molle</i>	rare
False Oat-Grass	<i>Arrhenatherum elatius</i>	abundant
Great Mullein	<i>Verbascum thapsus</i>	rare
Great Willowherb	<i>Epilobium hirsutum</i>	occasional
Hawthorn	<i>Crataegus monogyna</i>	frequent
Hoary Mustard	<i>Hirschfeldia incana</i>	occasional
Hogweed	<i>Heracleum sphondylium</i>	frequent
Hop Trefoil	<i>Trifolium campestre</i>	occasional
Lesser Trefoil	<i>Trifolium dubium</i>	rare
Perennial Rye-grass	<i>Lolium perenne</i>	occasional
Prickly Sow-thistle	<i>Sonchus asper</i>	rare
Smooth Hawk's-beard	<i>Crepis capillaris</i>	occasional
Smooth Sow-thistle	<i>Sonchus oleraceus</i>	rare
Soft-brome	<i>Bromus hordeaceus</i>	occasional
Thyme-leaved Sandwort	<i>Arenaria serpyllifolia</i>	occasional
Yarrow	<i>Achillea millefolium</i>	occasional

Margam Moors SSSI (Field S01) SS784852, surveyed 24-Jul-07

ridges

Amphibious Bistort	<i>Persicaria amphibia</i>	occasional
Common Bent	<i>Agrostis capillaris</i>	locally frequent
Common Mouse-ear	<i>Cerastium fontanum</i>	occasional
Common Sorrel	<i>Rumex acetosa</i>	occasional
Creeping Buttercup	<i>Ranunculus repens</i>	occasional

Creeping Thistle	<i>Cirsium arvense</i>	occasional
Curled Dock	<i>Rumex crispus</i>	rare
Dandelion	<i>Taraxacum aggregate</i>	rare
Hairy Sedge	<i>Carex hirta</i>	occasional
Marsh Thistle	<i>Cirsium palustre</i>	rare
Meadow Buttercup	<i>Ranunculus acris</i>	occasional
Meadow Fescue	<i>Festuca pratensis</i>	occasional
Meadow Vetchling	<i>Lathyrus pratensis</i>	occasional
Perennial Rye-grass	<i>Lolium perenne</i>	locally frequent
Red Clover	<i>Trifolium pratense</i>	occasional
Sharp-flowered Rush	<i>Juncus acutiflorus</i>	occasional
Silverweed	<i>Potentilla anserina</i>	occasional
Timothy	<i>Phleum pratense</i>	occasional
White Clover	<i>Trifolium repens</i>	abundant
Yorkshire-fog	<i>Holcus lanatus</i>	abundant
<u>furrows</u>		
Clustered Dock	<i>Rumex conglomeratus</i>	occasional
Common Nettle	<i>Urtica dioica</i>	locally frequent
Creeping Bent	<i>Agrostis stolonifera</i>	frequent
Floating Sweet-grass	<i>Glyceria fluitans</i>	frequent
Greater Pond-sedge	<i>Carex riparia</i>	occasional
Hairy Sedge	<i>Carex hirta</i>	frequent
Hard Rush	<i>Juncus inflexus</i>	occasional
Rough Meadow-grass	<i>Poa trivialis</i>	occasional
Sharp-flowered Rush	<i>Juncus acutiflorus</i>	locally frequent
Silverweed	<i>Potentilla anserina</i>	frequent
Soft-rush	<i>Juncus effusus</i>	abundant
Sweet Vernal-grass	<i>Anthoxanthum odoratum</i>	occasional
Yellow Iris	<i>Iris pseudacorus</i>	locally frequent
Yorkshire-fog	<i>Holcus lanatus</i>	abundant

Margam Moors SSSI (Field S02) SS782850, surveyed 24-Jul-07

ridges

Amphibious Bistort	<i>Persicaria amphibia</i>	occasional
Common Bent	<i>Agrostis capillaris</i>	occasional
Common Mouse-ear	<i>Cerastium fontanum</i>	occasional
Common Sorrel	<i>Rumex acetosa</i>	occasional
Creeping Buttercup	<i>Ranunculus repens</i>	occasional
Creeping Thistle	<i>Cirsium arvense</i>	frequent
Curled Dock	<i>Rumex crispus</i>	rare
Cut-leaved Crane's-bill	<i>Geranium dissectum</i>	rare
Dandelion	<i>Taraxacum aggregate</i>	rare
Hairy Sedge	<i>Carex hirta</i>	occasional
Marsh Horsetail	<i>Equisetum palustre</i>	occasional
Marsh Thistle	<i>Cirsium palustre</i>	rare
Meadow Buttercup	<i>Ranunculus acris</i>	occasional
Meadow Fescue	<i>Festuca pratensis</i>	occasional
Meadow Vetchling	<i>Lathyrus pratensis</i>	occasional
Perennial Rye-grass	<i>Lolium perenne</i>	frequent
Red Clover	<i>Trifolium pratense</i>	occasional
Sharp-flowered Rush	<i>Juncus acutiflorus</i>	occasional

Silverweed	<i>Potentilla anserina</i>	occasional
Timothy	<i>Phleum pratense</i>	occasional
White Clover	<i>Trifolium repens</i>	abundant
Yorkshire-fog	<i>Holcus lanatus</i>	abundant
<u>furrows</u>		
Clustered Dock	<i>Rumex conglomeratus</i>	occasional
Common Nettle	<i>Urtica dioica</i>	occasional
Creeping Bent	<i>Agrostis stolonifera</i>	frequent
Floating Sweet-grass	<i>Glyceria fluitans</i>	frequent
Greater Pond-sedge	<i>Carex riparia</i>	occasional
Hairy Sedge	<i>Carex hirta</i>	frequent
Hard Rush	<i>Juncus inflexus</i>	frequent
Rough Meadow-grass	<i>Poa trivialis</i>	occasional
Sharp-flowered Rush	<i>Juncus acutiflorus</i>	locally frequent
Silverweed	<i>Potentilla anserina</i>	frequent
Soft-rush	<i>Juncus effusus</i>	abundant
Sweet Vernal-grass	<i>Anthoxanthum odoratum</i>	rare
Yellow Iris	<i>Iris pseudacorus</i>	locally abundant
Yorkshire-fog	<i>Holcus lanatus</i>	abundant
<u>eastern ditch</u>		
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	abundant
Branched Bur-reed	<i>Sparganium erectum</i>	abundant
Common Fleabane	<i>Pulicaria dysenterica</i>	rare
Common Reed	<i>Phragmites australis</i>	frequent
Frogbit	<i>Hydrocharis morsus-ranae</i>	frequent
Greater Pond-sedge	<i>Carex riparia</i>	occasional
Hemp-agrimony	<i>Eupatorium cannabinum</i>	occasional
Least Duckweed	<i>Lemna minuta</i>	abundant
Lesser Water-parsnip	<i>Berula erecta</i>	abundant
Marsh-bedstraw	<i>Galium palustre</i>	occasional
Rusty Willow	<i>Salix cinerea subsp. oleifolia</i>	occasional
Skullcap	<i>Scutellaria galericulata</i>	occasional
Water Mint	<i>Mentha aquatica</i>	occasional
Water-plantain	<i>Alisma plantago-aquatica</i>	occasional
<u>southern ditch</u>		
Agrimony	<i>Agrimonia eupatoria</i>	rare
Amphibious Bistort	<i>Persicaria amphibia</i>	occasional
Blackthorn	<i>Prunus spinosa</i>	occasional
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	abundant
Cleavers	<i>Galium aparine</i>	occasional
Clustered Dock	<i>Rumex conglomeratus</i>	occasional
Common Duckweed	<i>Lemna minor</i>	frequent
Common Reed	<i>Phragmites australis</i>	abundant
Common Water Starwort	<i>Callitriche stagnalis sens. lat.</i>	locally frequent
Field Horsetail	<i>Equisetum arvense</i>	occasional
Frogbit	<i>Hydrocharis morsus-ranae</i>	frequent
Great Willowherb	<i>Epilobium hirsutum</i>	occasional
Grey Club-rush	<i>Schoenoplectus tabernaemontani</i>	rare
Least Duckweed	<i>Lemna minuta</i>	abundant
Rusty Willow	<i>Salix cinerea subsp. oleifolia</i>	occasional
Wild Teasel	<i>Dipsacus fullonum</i>	occasional

Margam Moors SSSI (Field S03) SS781849, surveyed 24-Jul-07

ridges

Amphibious Bistort	<i>Persicaria amphibia</i>	occasional
Cock's-foot	<i>Dactylis glomerata</i>	occasional
Common Bent	<i>Agrostis capillaris</i>	locally frequent
Common Mouse-ear	<i>Cerastium fontanum</i>	occasional
Common Nettle	<i>Urtica dioica</i>	occasional
Common Sorrel	<i>Rumex acetosa</i>	occasional
Creeping Buttercup	<i>Ranunculus repens</i>	frequent
Creeping Thistle	<i>Cirsium arvense</i>	frequent
False Oat-Grass	<i>Arrhenatherum elatius</i>	occasional
Greater Bird's-foot-trefoil	<i>Lotus pedunculatus</i>	rare
Hairy Sedge	<i>Carex hirta</i>	frequent
Hard Rush	<i>Juncus inflexus</i>	rare
Hogweed	<i>Heracleum sphondylium</i>	occasional
Marsh Horsetail	<i>Equisetum palustre</i>	occasional
Marsh Thistle	<i>Cirsium palustre</i>	rare
Meadow Buttercup	<i>Ranunculus acris</i>	rare
Meadow Foxtail	<i>Alopecurus pratensis</i>	occasional
Meadow Vetchling	<i>Lathyrus pratensis</i>	occasional
Red Clover	<i>Trifolium pratense</i>	locally frequent
Red Fescue	<i>Festuca rubra</i>	occasional
Ribwort Plantain	<i>Plantago lanceolata</i>	occasional
Sharp-flowered Rush	<i>Juncus acutiflorus</i>	rare
Silverweed	<i>Potentilla anserina</i>	occasional
Spear Thistle	<i>Cirsium vulgare</i>	rare
Sweet Vernal-grass	<i>Anthoxanthum odoratum</i>	rare
Timothy	<i>Phleum pratense</i>	occasional
Tufted Vetch	<i>Vicia cracca</i>	occasional
White Clover	<i>Trifolium repens</i>	locally abundant
Yorkshire-fog	<i>Holcus lanatus</i>	frequent

furrows

Amphibious Bistort	<i>Persicaria amphibia</i>	frequent
Common Nettle	<i>Urtica dioica</i>	occasional
Common Ragwort	<i>Senecio jacobaea</i>	rare
Creeping Bent	<i>Agrostis stolonifera</i>	abundant
Curled Dock	<i>Rumex crispus</i>	occasional
False Oat-Grass	<i>Arrhenatherum elatius</i>	occasional
Great Willowherb	<i>Epilobium hirsutum</i>	locally frequent
Hairy Sedge	<i>Carex hirta</i>	frequent
Silverweed	<i>Potentilla anserina</i>	frequent
Soft-rush	<i>Juncus effusus</i>	abundant
Tufted Vetch	<i>Vicia cracca</i>	occasional
Yellow Iris	<i>Iris pseudacorus</i>	locally abundant
Yorkshire-fog	<i>Holcus lanatus</i>	frequent

disturbed ground

Broad-leaved Dock	<i>Rumex obtusifolius</i>	rare
Cut-leaved Crane's-bill	<i>Geranium dissectum</i>	rare
Greater Plantain	<i>Plantago major</i>	occasional
Knotgrass	<i>Polygonum aviculare</i>	rare

Perennial Rye-grass	<i>Lolium perenne</i>	occasional
Pineappleweed	<i>Matricaria discoidea</i>	occasional
Prickly Sow-thistle	<i>Sonchus asper</i>	rare
Water-plantain	<i>Alisma plantago-aquatica</i>	rare
<u>open section of mother ditch immediately south of road</u>		
Bittersweet	<i>Solanum dulcamara</i>	occasional
Branched Bur-reed	<i>Sparganium erectum</i>	frequent
Common Nettle	<i>Urtica dioica</i>	occasional
Common Reed	<i>Phragmites australis</i>	locally dominant
Curled Dock	<i>Rumex crispus</i>	occasional
False Fox-sedge	<i>Carex otrubae</i>	occasional
Flowering-rush	<i>Butomus umbellatus</i>	10
Fool's-water-cress	<i>Apium nodiflorum</i>	occasional
Greater Pond-sedge	<i>Carex riparia</i>	frequent
Gypsywort	<i>Lycopus europaeus</i>	occasional
Hard Rush	<i>Juncus inflexus</i>	occasional
Lesser Water-parsnip	<i>Berula erecta</i>	occasional
Marsh-bedstraw	<i>Galium palustre</i>	frequent
Meadowsweet	<i>Filipendula ulmaria</i>	frequent
Pink Water-speedwell	<i>Veronica catenata</i>	frequent
Purple-loosestrife	<i>Lythrum salicaria</i>	rare
Reed Sweet-grass	<i>Glyceria maxima</i>	frequent
Sharp-flowered Rush	<i>Juncus acutiflorus</i>	occasional
Silverweed	<i>Potentilla anserina</i>	occasional
Tufted Forget-me-not	<i>Myosotis laxa</i>	frequent
Water Dock	<i>Rumex hydrolapathum</i>	occasional
Water Mint	<i>Mentha aquatica</i>	occasional
Water-cress	<i>Rorippa nasturtium-aquaticum</i>	rare
Water-plantain	<i>Alisma plantago-aquatica</i>	occasional
Wild Angelica	<i>Angelica sylvestris</i>	rare
Wild Teasel	<i>Dipsacus fullonum</i>	occasional
Yellow Iris	<i>Iris pseudacorus</i>	occasional
<u>eastern ditch</u>		
Blackthorn	<i>Prunus spinosa</i>	abundant
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	abundant
Branched Bur-reed	<i>Sparganium erectum</i>	occasional
Celery-leaved Buttercup	<i>Ranunculus sceleratus</i>	rare
Clustered Dock	<i>Rumex conglomeratus</i>	rare
Common Duckweed	<i>Lemna minor</i>	occasional
Common Fleabane	<i>Pulicaria dysenterica</i>	occasional
Common Knapweed	<i>Centaurea nigra var. nemoralis</i>	rare
Common Reed	<i>Phragmites australis</i>	abundant
False Fox-sedge	<i>Carex otrubae</i>	occasional
Floating Sweet-grass	<i>Glyceria fluitans</i>	occasional
Fool's-water-cress	<i>Apium nodiflorum</i>	rare
Glaucous Sedge	<i>Carex flacca</i>	occasional
Great Willowherb	<i>Epilobium hirsutum</i>	occasional
Greater Bird's-foot-trefoil	<i>Lotus pedunculatus</i>	occasional
Lesser Water-parsnip	<i>Berula erecta</i>	frequent
Marsh-bedstraw	<i>Galium palustre</i>	occasional
Meadowsweet	<i>Filipendula ulmaria</i>	occasional

Reed Sweet-grass	<i>Glyceria maxima</i>	occasional
Remote Sedge	<i>Carex remota</i>	rare
Selfheal	<i>Prunella vulgaris</i>	occasional
Skullcap	<i>Scutellaria galericulata</i>	occasional
Tufted Forget-me-not	<i>Myosotis laxa</i>	occasional
Upright Hedge-parsley	<i>Torilis japonica</i>	rare
Water Mint	<i>Mentha aquatica</i>	frequent
<u>southern ditch</u>		
Bittersweet	<i>Solanum dulcamara</i>	rare
Blackthorn	<i>Prunus spinosa</i>	occasional
Bramble / Blackberry	<i>Rubus fruticosus</i> agg.	abundant
Branched Bur-reed	<i>Sparganium erectum</i>	occasional
Clustered Dock	<i>Rumex conglomeratus</i>	occasional
Common Reed	<i>Phragmites australis</i>	abundant
Field Horsetail	<i>Equisetum arvense</i>	occasional
Flowering-rush	<i>Butomus umbellatus</i>	occasional
Frogbit	<i>Hydrocharis morsus-ranae</i>	locally abundant
Great Willowherb	<i>Epilobium hirsutum</i>	frequent
Hawthorn	<i>Crataegus monogyna</i>	occasional
Ivy-leaved Duckweed	<i>Lemna trisulca</i>	occasional
Male-fern	<i>Dryopteris filix-mas</i>	occasional
Meadow Vetchling	<i>Lathyrus pratensis</i>	occasional
Meadowsweet	<i>Filipendula ulmaria</i>	frequent
Purple-loosestrife	<i>Lythrum salicaria</i>	occasional
Rusty Willow	<i>Salix cinerea</i> subsp. <i>oleifolia</i>	occasional
Tufted Vetch	<i>Vicia cracca</i>	occasional
Water Mint	<i>Mentha aquatica</i>	occasional
Water-plantain	<i>Alisma plantago-aquatica</i>	occasional

Margam Moors SSSI (Field S04) SS779848, surveyed 24-Jul-07

ridges

Amphibious Bistort	<i>Persicaria amphibia</i>	occasional
Cock's-foot	<i>Dactylis glomerata</i>	occasional
Common Bent	<i>Agrostis capillaris</i>	occasional
Common Knapweed	<i>Centaurea nigra</i> var. <i>nemoralis</i>	rare
Common Mouse-ear	<i>Cerastium fontanum</i>	rare
Common Sorrel	<i>Rumex acetosa</i>	occasional
Creeping Buttercup	<i>Ranunculus repens</i>	occasional
Creeping Thistle	<i>Cirsium arvense</i>	frequent
Cut-leaved Crane's-bill	<i>Geranium dissectum</i>	rare
Field Horsetail	<i>Equisetum arvense</i>	rare
Glaucous Sedge	<i>Carex flacca</i>	rare
Greater Bird's-foot-trefoil	<i>Lotus pedunculatus</i>	rare
Hogweed	<i>Heracleum sphondylium</i>	occasional
Lesser Trefoil	<i>Trifolium dubium</i>	rare
Meadow Foxtail	<i>Alopecurus pratensis</i>	locally frequent
Red Clover	<i>Trifolium pratense</i>	occasional
White Clover	<i>Trifolium repens</i>	frequent
Yorkshire-fog	<i>Holcus lanatus</i>	frequent

runnels

Amphibious Bistort	<i>Persicaria amphibia</i>	frequent
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Creeping Bent	<i>Agrostis stolonifera</i>	frequent
Creeping Thistle	<i>Cirsium arvense</i>	occasional
Curled Dock	<i>Rumex crispus</i>	frequent
Floating Sweet-grass	<i>Glyceria fluitans</i>	occasional
Greater Bird's-foot-trefoil	<i>Lotus pedunculatus</i>	occasional
Hairy Sedge	<i>Carex hirta</i>	frequent
Meadowsweet	<i>Filipendula ulmaria</i>	occasional
Russian Dock	<i>Rumex confertus</i>	rare
Sharp-flowered Rush	<i>Juncus acutiflorus</i>	occasional
Silverweed	<i>Potentilla anserina</i>	frequent
Timothy	<i>Phleum pratense</i>	occasional
Tufted Vetch	<i>Vicia cracca</i>	occasional
Yellow Iris	<i>Iris pseudacorus</i>	locally frequent
Yorkshire-fog	<i>Holcus lanatus</i>	abundant
<u>eastern ditch</u>		
Amphibious Bistort	<i>Persicaria amphibia</i>	frequent
Bittersweet	<i>Solanum dulcamara</i>	occasional
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	locally abundant
Branched Bur-reed	<i>Sparganium erectum</i>	frequent
Common Nettle	<i>Urtica dioica</i>	occasional
Common Reed	<i>Phragmites australis</i>	dominant
Common Water Starwort	<i>Callitriche stagnalis sens. lat.</i>	occasional
False Fox-sedge	<i>Carex otrubae</i>	occasional
Frogbit	<i>Hydrocharis morsus-ranae</i>	occasional
Great Willowherb	<i>Epilobium hirsutum</i>	occasional
Greater Duckweed	<i>Spirodela polyrhiza</i>	locally frequent
Greater Pond-sedge	<i>Carex riparia</i>	frequent
Gypsywort	<i>Lycopus europaeus</i>	rare
Male-fern	<i>Dryopteris filix-mas</i>	occasional
Meadowsweet	<i>Filipendula ulmaria</i>	frequent
Pink Water-speedwell	<i>Veronica catenata</i>	rare
Toad Rush	<i>Juncus bufonius</i>	rare
Tufted Forget-me-not	<i>Myosotis laxa</i>	occasional
Water Figwort	<i>Scrophularia auriculata</i>	rare
<u>western ditch</u>		
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	dominant
Clustered Dock	<i>Rumex conglomeratus</i>	rare
Common Duckweed	<i>Lemna minor</i>	occasional
Common Reed	<i>Phragmites australis</i>	frequent
Floating Sweet-grass	<i>Glyceria fluitans</i>	occasional
Great Willowherb	<i>Epilobium hirsutum</i>	occasional
Hawthorn	<i>Crataegus monogyna</i>	occasional
Hedge Bindweed	<i>Calystegia sepium subsp. sepium</i>	frequent
Hemlock Water-dropwort	<i>Oenanthe crocata</i>	occasional
Lesser Water-parsnip	<i>Berula erecta</i>	occasional
Meadowsweet	<i>Filipendula ulmaria</i>	occasional
Purple-loosestrife	<i>Lythrum salicaria</i>	frequent
Rusty Willow	<i>Salix cinerea subsp. oleifolia</i>	frequent
Soft-rush	<i>Juncus effusus</i>	occasional
<u>southern ditch</u>		
Ash	<i>Fraxinus excelsior</i>	frequent

Blackthorn	<i>Prunus spinosa</i>	frequent
Bramble / Blackberry	<i>Rubus fruticosus</i> agg.	abundant
Cleavers	<i>Galium aparine</i>	frequent
Common Reed	<i>Phragmites australis</i>	occasional
Goat Willow	<i>Salix caprea</i>	occasional
Hawthorn	<i>Crataegus monogyna</i>	frequent
Hedge Bindweed	<i>Calystegia sepium</i> subsp. <i>sepium</i>	occasional
Spear Thistle	<i>Cirsium vulgare</i>	occasional

Margam Moors SSSI (Field S11) SS782849, surveyed 24-Jul-07

drier areas

Amphibious Bistort	<i>Persicaria amphibia</i>	occasional
Cat's-ear	<i>Hypochaeris radicata</i>	rare
Cock's-foot	<i>Dactylis glomerata</i>	occasional
Common Bent	<i>Agrostis capillaris</i>	occasional
Common Bird's-foot-trefoil	<i>Lotus corniculatus</i>	rare
Common Knapweed	<i>Centaurea nigra</i>	occasional
Common Mouse-ear	<i>Cerastium fontanum</i>	occasional
Common Ragwort	<i>Senecio jacobaea</i>	rare
Common Vetch	<i>Vicia sativa</i>	rare
Creeping Buttercup	<i>Ranunculus repens</i>	frequent
Creeping Thistle	<i>Cirsium arvense</i>	occasional
Crested Dog's-tail	<i>Cynosurus cristatus</i>	occasional
Curled Dock	<i>Rumex crispus</i>	occasional
Hairy Sedge	<i>Carex hirta</i>	occasional
Hogweed	<i>Heracleum sphondylium</i>	occasional
Lesser Trefoil	<i>Trifolium dubium</i>	rare
Marsh Thistle	<i>Cirsium palustre</i>	rare
Meadow Buttercup	<i>Ranunculus acris</i>	rare
Meadow Fescue	<i>Festuca pratensis</i>	occasional
Meadow Vetchling	<i>Lathyrus pratensis</i>	occasional
Perennial Rye-grass	<i>Lolium perenne</i>	abundant
Red Clover	<i>Trifolium pratense</i>	occasional
Ribwort Plantain	<i>Plantago lanceolata</i>	occasional
Selfheal	<i>Prunella vulgaris</i>	occasional
Silverweed	<i>Potentilla anserina</i>	occasional
Timothy	<i>Phleum pratense</i>	occasional
White Clover	<i>Trifolium repens</i>	abundant
Yarrow	<i>Achillea millefolium</i>	occasional

wetter areas

Creeping Bent	<i>Agrostis stolonifera</i>	abundant
Curled Dock	<i>Rumex crispus</i>	occasional
Hard Rush	<i>Juncus inflexus</i>	frequent
Meadow Fescue	<i>Festuca pratensis</i>	occasional
Meadowsweet	<i>Filipendula ulmaria</i>	occasional
Purple-loosestrife	<i>Lythrum salicaria</i>	rare
Sharp-flowered Rush	<i>Juncus acutiflorus</i>	occasional
Soft-rush	<i>Juncus effusus</i>	frequent
Yellow Iris	<i>Iris pseudacorus</i>	locally abundant

disturbed

Amphibious Bistort	<i>Persicaria amphibia</i>	occasional
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Annual Meadow-grass	<i>Poa annua</i>	frequent
Creeping Thistle	<i>Cirsium arvense</i>	occasional
Greater Plantain	<i>Plantago major</i>	frequent
Knotgrass	<i>Polygonum aviculare</i>	occasional
Perennial Rye-grass	<i>Lolium perenne</i>	frequent
Pineappleweed	<i>Matricaria discoidea</i>	frequent
Prickly Sow-thistle	<i>Sonchus asper</i>	occasional
Scentless Mayweed	<i>Tripleurospermum inodorum</i>	occasional
Spear Thistle	<i>Cirsium vulgare</i>	occasional
<u>dredgings</u>		
Bittersweet	<i>Solanum dulcamara</i>	occasional
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	frequent
Common Knapweed	<i>Centaurea nigra</i>	occasional
Common Nettle	<i>Urtica dioica</i>	frequent
Common Reed	<i>Phragmites australis</i>	frequent
Creeping Thistle	<i>Cirsium arvense</i>	frequent
Crested Dog's-tail	<i>Cynosurus cristatus</i>	rare
Field Horsetail	<i>Equisetum arvense</i>	frequent
Greater Bird's-foot-trefoil	<i>Lotus pedunculatus</i>	occasional
Hogweed	<i>Heracleum sphondylium</i>	occasional
Male-fern	<i>Dryopteris filix-mas</i>	occasional
Prickly Sow-thistle	<i>Sonchus asper</i>	occasional
Ribwort Plantain	<i>Plantago lanceolata</i>	occasional
Scarlet Pimpernel	<i>Anagallis arvensis</i>	rare
Spear Thistle	<i>Cirsium vulgare</i>	occasional
Sweet Vernal-grass	<i>Anthoxanthum odoratum</i>	rare
Water Mint	<i>Mentha aquatica</i>	occasional
Yarrow	<i>Achillea millefolium</i>	occasional
<u>eastern ditch</u>		
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	frequent
Branched Bur-reed	<i>Sparganium erectum</i>	dominant
Common Reed	<i>Phragmites australis</i>	frequent
Floating Sweet-grass	<i>Glyceria fluitans</i>	occasional
Frogbit	<i>Hydrocharis morsus-ranae</i>	occasional
Great Willowherb	<i>Epilobium hirsutum</i>	occasional
Least Duckweed	<i>Lemna minuta</i>	abundant
Lesser Water-parsnip	<i>Berula erecta</i>	occasional
Meadowsweet	<i>Filipendula ulmaria</i>	occasional
Perennial Sow-thistle	<i>Sonchus arvensis</i>	rare
Reed Sweet-grass	<i>Glyceria maxima</i>	occasional
Rusty Willow	<i>Salix cinerea subsp. oleifolia</i>	rare
Skullcap	<i>Scutellaria galericulata</i>	occasional
Tufted Vetch	<i>Vicia cracca</i>	occasional
Upright Hedge-parsley	<i>Torilis japonica</i>	locally frequent
Water-plantain	<i>Alisma plantago-aquatica</i>	occasional
Wild Teasel	<i>Dipsacus fullonum</i>	occasional

Margam Moors SSSI (Field S12) SS784850, surveyed 24-Jul-07

<u>ridges</u>		
Cock's-foot	<i>Dactylis glomerata</i>	occasional
Common Bent	<i>Agrostis capillaris</i>	frequent

Common Vetch	<i>Vicia sativa</i>	rare
Creeping Buttercup	<i>Ranunculus repens</i>	frequent
Creeping Thistle	<i>Cirsium arvense</i>	occasional
Crested Dog's-tail	<i>Cynosurus cristatus</i>	occasional
False Oat-Grass	<i>Arrhenatherum elatius</i>	occasional
Hairy Sedge	<i>Carex hirta</i>	occasional
Perennial Rye-grass	<i>Lolium perenne</i>	abundant
Red Clover	<i>Trifolium pratense</i>	occasional
White Clover	<i>Trifolium repens</i>	abundant
a fungus	<i>Hygrocybe conica</i>	present
<u>furrows</u>		
Amphibious Bistort	<i>Persicaria amphibia</i>	occasional
Common Nettle	<i>Urtica dioica</i>	occasional
Common Ragwort	<i>Senecio jacobaea</i>	rare
Curled Dock	<i>Rumex crispus</i>	occasional
Floating Sweet-grass	<i>Glyceria fluitans</i>	occasional
Greater Bird's-foot-trefoil	<i>Lotus pedunculatus</i>	frequent
Hairy Sedge	<i>Carex hirta</i>	frequent
Hard Rush	<i>Juncus inflexus</i>	occasional
Perennial Rye-grass	<i>Lolium perenne</i>	frequent
Sharp-flowered Rush	<i>Juncus acutiflorus</i>	occasional
Silverweed	<i>Potentilla anserina</i>	locally frequent
Soft-rush	<i>Juncus effusus</i>	locally abundant
Water Mint	<i>Mentha aquatica</i>	occasional
Yorkshire-fog	<i>Holcus lanatus</i>	locally abundant
<u>northern ditch</u>		
Blackthorn	<i>Prunus spinosa</i>	frequent
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	abundant
Common Reed	<i>Phragmites australis</i>	frequent
Frogbit	<i>Hydrocharis morsus-ranae</i>	rare
Hawthorn	<i>Crataegus monogyna</i>	frequent
Least Duckweed	<i>Lemna minuta</i>	locally frequent
Purple-loosestrife	<i>Lythrum salicaria</i>	rare

Margam Moors SSSI (Field S13) SS785850, surveyed 24-Jul-07

ridges

Cock's-foot	<i>Dactylis glomerata</i>	occasional
Common Bent	<i>Agrostis capillaris</i>	locally frequent
Common Vetch	<i>Vicia sativa</i>	rare
Creeping Buttercup	<i>Ranunculus repens</i>	frequent
Creeping Thistle	<i>Cirsium arvense</i>	occasional
Crested Dog's-tail	<i>Cynosurus cristatus</i>	frequent
False Oat-Grass	<i>Arrhenatherum elatius</i>	locally frequent
Hairy Sedge	<i>Carex hirta</i>	occasional
Perennial Rye-grass	<i>Lolium perenne</i>	abundant
Red Clover	<i>Trifolium pratense</i>	occasional
White Clover	<i>Trifolium repens</i>	abundant
Yarrow	<i>Achillea millefolium</i>	rare

furrows

Amphibious Bistort	<i>Persicaria amphibia</i>	rare
Common Nettle	<i>Urtica dioica</i>	occasional

Common Ragwort	<i>Senecio jacobaea</i>	occasional
Curled Dock	<i>Rumex crispus</i>	rare
Floating Sweet-grass	<i>Glyceria fluitans</i>	occasional
Greater Bird's-foot-trefoil	<i>Lotus pedunculatus</i>	locally frequent
Hairy Sedge	<i>Carex hirta</i>	occasional
Hard Rush	<i>Juncus inflexus</i>	frequent
Marsh Foxtail	<i>Alopecurus geniculatus</i>	rare
Marsh Thistle	<i>Cirsium palustre</i>	rare
Perennial Rye-grass	<i>Lolium perenne</i>	frequent
Sharp-flowered Rush	<i>Juncus acutiflorus</i>	occasional
Silverweed	<i>Potentilla anserina</i>	frequent
Soft-rush	<i>Juncus effusus</i>	locally abundant
Water Mint	<i>Mentha aquatica</i>	occasional
Yorkshire-fog	<i>Holcus lanatus</i>	frequent

Margam Moors SSSI (Field S14) SS785848, surveyed 24-Jul-07

Ridge

Cock's-foot	<i>Dactylis glomerata</i>	occasional
Common Bent	<i>Agrostis capillaris</i>	occasional
Creeping Buttercup	<i>Ranunculus repens</i>	frequent
Creeping Thistle	<i>Cirsium arvense</i>	occasional
Crested Dog's-tail	<i>Cynosurus cristatus</i>	frequent
False Oat-Grass	<i>Arrhenatherum elatius</i>	locally frequent
Hairy Sedge	<i>Carex hirta</i>	occasional
Perennial Rye-grass	<i>Lolium perenne</i>	abundant
Red Clover	<i>Trifolium pratense</i>	occasional
Selfheal	<i>Prunella vulgaris</i>	rare
White Clover	<i>Trifolium repens</i>	abundant

furrows

Amphibious Bistort	<i>Persicaria amphibia</i>	occasional
Common Nettle	<i>Urtica dioica</i>	occasional
Common Ragwort	<i>Senecio jacobaea</i>	rare
Curled Dock	<i>Rumex crispus</i>	occasional
Floating Sweet-grass	<i>Glyceria fluitans</i>	occasional
Greater Bird's-foot-trefoil	<i>Lotus pedunculatus</i>	occasional
Hairy Sedge	<i>Carex hirta</i>	occasional
Hard Rush	<i>Juncus inflexus</i>	frequent
Marsh Thistle	<i>Cirsium palustre</i>	rare
Oval Sedge	<i>Carex ovalis</i>	rare
Perennial Rye-grass	<i>Lolium perenne</i>	frequent
Sharp-flowered Rush	<i>Juncus acutiflorus</i>	occasional
Silverweed	<i>Potentilla anserina</i>	abundant
Soft-rush	<i>Juncus effusus</i>	abundant
Water Mint	<i>Mentha aquatica</i>	occasional
Water-pepper	<i>Persicaria hydropiper</i>	occasional
Yorkshire-fog	<i>Holcus lanatus</i>	frequent

southern ditch

Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	abundant
Common Duckweed	<i>Lemna minor</i>	occasional
Common Reed	<i>Phragmites australis</i>	abundant
Frogbit	<i>Hydrocharis morsus-ranae</i>	rare

Greater Duckweed	<i>Spirodela polyrhiza</i>	occasional
Greater Pond-sedge	<i>Carex riparia</i>	occasional
Lesser Water-parsnip	<i>Berula erecta</i>	occasional
Meadowsweet	<i>Filipendula ulmaria</i>	occasional
Rusty Willow	<i>Salix cinerea subsp. oleifolia</i>	occasional
Water Mint	<i>Mentha aquatica</i>	frequent
Blackthorn	<i>Prunus spinosa</i>	rare
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	dominant
Clustered Dock	<i>Rumex conglomeratus</i>	occasional
Common Reed	<i>Phragmites australis</i>	frequent
False Fox-sedge	<i>Carex otrubae</i>	occasional
Grey Club-rush	<i>Schoenoplectus tabernaemontani</i>	rare
Hard Rush	<i>Juncus inflexus</i>	occasional
Hawthorn	<i>Crataegus monogyna</i>	rare
Rusty Willow	<i>Salix cinerea subsp. oleifolia</i>	occasional
Selfheal	<i>Prunella vulgaris</i>	rare
Water Dock	<i>Rumex hydrolapathum</i>	rare

Margam Moors SSSI (Field S15) SS784848, surveyed 24-Jul-07

ridges

Cock's-foot	<i>Dactylis glomerata</i>	occasional
Common Bent	<i>Agrostis capillaris</i>	occasional
Common Vetch	<i>Vicia sativa</i>	rare
Creeping Buttercup	<i>Ranunculus repens</i>	frequent
Creeping Thistle	<i>Cirsium arvense</i>	occasional
Crested Dog's-tail	<i>Cynosurus cristatus</i>	frequent
False Oat-Grass	<i>Arrhenatherum elatius</i>	locally frequent
Hairy Sedge	<i>Carex hirta</i>	occasional
Perennial Rye-grass	<i>Lolium perenne</i>	abundant
Red Clover	<i>Trifolium pratense</i>	occasional
Spear Thistle	<i>Cirsium vulgare</i>	rare
White Clover	<i>Trifolium repens</i>	abundant
Yarrow	<i>Achillea millefolium</i>	rare

furrows

Amphibious Bistort	<i>Persicaria amphibia</i>	rare
Common Nettle	<i>Urtica dioica</i>	occasional
Common Ragwort	<i>Senecio jacobaea</i>	rare
Curled Dock	<i>Rumex crispus</i>	occasional
Floating Sweet-grass	<i>Glyceria fluitans</i>	occasional
Greater Bird's-foot-trefoil	<i>Lotus pedunculatus</i>	occasional
Hairy Sedge	<i>Carex hirta</i>	occasional
Hard Rush	<i>Juncus inflexus</i>	frequent
Marsh Foxtail	<i>Alopecurus geniculatus</i>	occasional
Marsh Thistle	<i>Cirsium palustre</i>	rare
Perennial Rye-grass	<i>Lolium perenne</i>	frequent
Sharp-flowered Rush	<i>Juncus acutiflorus</i>	occasional
Silverweed	<i>Potentilla anserina</i>	frequent
Soft-rush	<i>Juncus effusus</i>	dominant
Water Mint	<i>Mentha aquatica</i>	occasional
Water-pepper	<i>Persicaria hydropiper</i>	rare

Yorkshire-fog <u>northern ditch</u>	<i>Holcus lanatus</i>	occasional
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	abundant
Clustered Dock	<i>Rumex conglomeratus</i>	frequent
Common Reed	<i>Phragmites australis</i>	dominant
False Fox-sedge	<i>Carex otrubae</i>	occasional
Greater Pond-sedge	<i>Carex riparia</i>	frequent
Hard Rush	<i>Juncus inflexus</i>	occasional
Water Dock	<i>Rumex hydrolapathum</i>	rare
Water Mint	<i>Mentha aquatica</i>	locally frequent

Margam Moors SSSI (Field S18) SS781847, surveyed 24-Jul-07

ridges

Amphibious Bistort	<i>Persicaria amphibia</i>	occasional
Cock's-foot	<i>Dactylis glomerata</i>	abundant
Common Bent	<i>Agrostis capillaris</i>	frequent
Common Sorrel	<i>Rumex acetosa</i>	occasional
Creeping Buttercup	<i>Ranunculus repens</i>	occasional
Creeping Cinquefoil	<i>Potentilla reptans</i>	rare
Creeping Thistle	<i>Cirsium arvense</i>	occasional
Curled Dock	<i>Rumex crispus</i>	frequent
False Oat-Grass	<i>Arrhenatherum elatius</i>	abundant
Hairy Sedge	<i>Carex hirta</i>	occasional
Hogweed	<i>Heracleum sphondylium</i>	rare
Meadow Buttercup	<i>Ranunculus acris</i>	rare
Meadow Vetchling	<i>Lathyrus pratensis</i>	occasional
Perennial Rye-grass	<i>Lolium perenne</i>	frequent
Red Clover	<i>Trifolium pratense</i>	rare
Ribwort Plantain	<i>Plantago lanceolata</i>	occasional
Spear Thistle	<i>Cirsium vulgare</i>	rare
Sweet Vernal-grass	<i>Anthoxanthum odoratum</i>	occasional
Timothy	<i>Phleum pratense</i>	occasional
Yorkshire-fog	<i>Holcus lanatus</i>	frequent

furrows

a willowherb	<i>Epilobium sp.</i>	occasional
Amphibious Bistort	<i>Persicaria amphibia</i>	frequent
Bittersweet	<i>Solanum dulcamara</i>	occasional
Common Nettle	<i>Urtica dioica</i>	occasional
Common Sedge	<i>Carex nigra var. subcespitosa</i>	2
Creeping Bent	<i>Agrostis stolonifera</i>	frequent
Creeping Buttercup	<i>Ranunculus repens</i>	occasional
Creeping Thistle	<i>Cirsium arvense</i>	occasional
Curled Dock	<i>Rumex crispus</i>	frequent
Field Horsetail	<i>Equisetum arvense</i>	occasional
Great Willowherb	<i>Epilobium hirsutum</i>	occasional
Hairy Sedge	<i>Carex hirta</i>	frequent
Hard Rush	<i>Juncus inflexus</i>	frequent
Marsh Thistle	<i>Cirsium palustre</i>	occasional
Marsh-bedstraw	<i>Galium palustre</i>	occasional
Meadow Foxtail	<i>Alopecurus pratensis</i>	occasional
Sharp-flowered Rush	<i>Juncus acutiflorus</i>	locally frequent

Silverweed	<i>Potentilla anserina</i>	frequent
Soft-rush	<i>Juncus effusus</i>	abundant
Water-pepper	<i>Persicaria hydropiper</i>	occasional
Yellow Iris	<i>Iris pseudacorus</i>	locally frequent
<u>disturbed ground</u>		
Annual Meadow-grass	<i>Poa annua</i>	occasional
Creeping Bent	<i>Agrostis stolonifera</i>	occasional
Greater Plantain	<i>Plantago major</i>	frequent
Perennial Rye-grass	<i>Lolium perenne</i>	frequent
Pineappleweed	<i>Matricaria discoidea</i>	frequent
Prickly Sow-thistle	<i>Sonchus asper</i>	occasional
Scentless Mayweed	<i>Tripleurospermum inodorum</i>	occasional
<u>northern ditch</u>		
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	abundant
Branched Bur-reed	<i>Sparganium erectum</i>	occasional
Common Duckweed	<i>Lemna minor</i>	rare
Common Reed	<i>Phragmites australis</i>	abundant
False Fox-sedge	<i>Carex otrubae</i>	rare
Flowering-rush	<i>Butomus umbellatus</i>	2
Frogbit	<i>Hydrocharis morsus-ranae</i>	frequent
Marsh-bedstraw	<i>Galium palustre</i>	occasional
Purple-loosestrife	<i>Lythrum salicaria</i>	occasional
Reed Sweet-grass	<i>Glyceria maxima</i>	occasional
Tufted Forget-me-not	<i>Myosotis laxa</i>	rare
Water Dock	<i>Rumex hydrolapathum</i>	occasional
Water Horsetail	<i>Equisetum fluviatile</i>	occasional
<u>eastern ditch</u>		
Blackthorn	<i>Prunus spinosa</i>	frequent
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	abundant
Branched Bur-reed	<i>Sparganium erectum</i>	occasional
Clustered Dock	<i>Rumex conglomeratus</i>	occasional
Common Duckweed	<i>Lemna minor</i>	occasional
Common Fleabane	<i>Pulicaria dysenterica</i>	occasional
Common Knapweed	<i>Centaurea nigra</i>	occasional
Common Nettle	<i>Urtica dioica</i>	occasional
Common Reed	<i>Phragmites australis</i>	abundant
Common Spike-rush	<i>Eleocharis palustris</i>	rare
Common Water Starwort	<i>Callitriche stagnalis sens. lat.</i>	rare
Floating Sweet-grass	<i>Glyceria fluitans</i>	occasional
Frogbit	<i>Hydrocharis morsus-ranae</i>	occasional
Gypsywort	<i>Lycopus europaeus</i>	occasional
Hard Rush	<i>Juncus inflexus</i>	occasional
Hedge Bindweed	<i>Calystegia sepium subsp. sepium</i>	frequent
Ivy-leaved Duckweed	<i>Lemna trisulca</i>	rare
Least Duckweed	<i>Lemna minuta</i>	rare
Lesser Water-parsnip	<i>Berula erecta</i>	frequent
Purple-loosestrife	<i>Lythrum salicaria</i>	occasional
Rusty Willow	<i>Salix cinerea subsp. oleifolia</i>	occasional
Water Horsetail	<i>Equisetum fluviatile</i>	rare
Water-plantain	<i>Alisma plantago-aquatica</i>	rare
<u>western ditch</u>		

Branched Bur-reed	<i>Sparganium erectum</i>	abundant
Broad-leaved Pondweed	<i>Potamogeton natans</i>	locally frequent
Common Nettle	<i>Urtica dioica</i>	occasional
Common Reed	<i>Phragmites australis</i>	abundant
Common Spike-rush	<i>Eleocharis palustris</i>	occasional
False Fox-sedge	<i>Carex otrubae</i>	occasional
Flowering-rush	<i>Butomus umbellatus</i>	1
Frogbit	<i>Hydrocharis morsus-ranae</i>	abundant
Great Willowherb	<i>Epilobium hirsutum</i>	frequent
Hard Rush	<i>Juncus inflexus</i>	occasional
Least Duckweed	<i>Lemna minuta</i>	occasional
Lesser Water-parsnip	<i>Berula erecta</i>	frequent
Marsh-bedstraw	<i>Galium palustre</i>	occasional
Meadowsweet	<i>Filipendula ulmaria</i>	abundant
Reed Sweet-grass	<i>Glyceria maxima</i>	occasional
Rusty Willow	<i>Salix cinerea subsp. oleifolia</i>	rare
Tufted Forget-me-not	<i>Myosotis laxa</i>	occasional
Tufted Vetch	<i>Vicia cracca</i>	occasional
Water Dock	<i>Rumex hydrolapathum</i>	occasional
Water Mint	<i>Mentha aquatica</i>	frequent
Water-plantain	<i>Alisma plantago-aquatica</i>	occasional
Wild Teasel	<i>Dipsacus fullonum</i>	occasional
Yellow Iris	<i>Iris pseudacorus</i>	occasional
<u>southern ditch</u>		
Bramble / Blackberry	<i>Rubus fruticosus agg.</i>	abundant
Celery-leaved Buttercup	<i>Ranunculus sceleratus</i>	occasional
Cleavers	<i>Galium aparine</i>	frequent
Common Knapweed	<i>Centaurea nigra var. nemoralis</i>	occasional
Common Reed	<i>Phragmites australis</i>	frequent
Common Water Starwort	<i>Callitriche stagnalis sens. lat.</i>	occasional
Field Horsetail	<i>Equisetum arvense</i>	occasional
Frogbit	<i>Hydrocharis morsus-ranae</i>	occasional
Great Willowherb	<i>Epilobium hirsutum</i>	frequent
Male-fern	<i>Dryopteris filix-mas</i>	occasional
Meadowsweet	<i>Filipendula ulmaria</i>	abundant
Reed Sweet-grass	<i>Glyceria maxima</i>	occasional
Sea Club-rush	<i>Bolboschoenus maritimus</i>	occasional
Square-stalked St John's-wort	<i>Hypericum tetrapterum</i>	rare
Water Dock	<i>Rumex hydrolapathum</i>	rare

Margam Moors SSSI (Field S19) SS781844, surveyed 24-Jul-07

ridges

Amphibious Bistort	<i>Persicaria amphibia</i>	occasional
Cock's-foot	<i>Dactylis glomerata</i>	frequent
Common Bent	<i>Agrostis capillaris</i>	frequent
Common Knapweed	<i>Centaurea nigra var. nemoralis</i>	rare
Common Mouse-ear	<i>Cerastium fontanum</i>	rare
Common Sorrel	<i>Rumex acetosa</i>	occasional
Creeping Buttercup	<i>Ranunculus repens</i>	occasional
Creeping Thistle	<i>Cirsium arvense</i>	frequent
Curled Dock	<i>Rumex crispus</i>	occasional

Cut-leaved Crane's-bill	<i>Geranium dissectum</i>	rare
False Oat-Grass	<i>Arrhenatherum elatius</i>	frequent
Greater Bird's-foot-trefoil	<i>Lotus pedunculatus</i>	rare
Hairy Sedge	<i>Carex hirta</i>	occasional
Hogweed	<i>Heracleum sphondylium</i>	occasional
Lesser Trefoil	<i>Trifolium dubium</i>	rare
Marsh Horsetail	<i>Equisetum palustre</i>	rare
Meadow Buttercup	<i>Ranunculus acris</i>	rare
Meadow Vetchling	<i>Lathyrus pratensis</i>	occasional
Perennial Rye-grass	<i>Lolium perenne</i>	occasional
Red Clover	<i>Trifolium pratense</i>	occasional
Ribwort Plantain	<i>Plantago lanceolata</i>	occasional
Spear Thistle	<i>Cirsium vulgare</i>	rare
Timothy	<i>Phleum pratense</i>	occasional
Tufted Vetch	<i>Vicia cracca</i>	rare
White Clover	<i>Trifolium repens</i>	frequent
Yorkshire-fog	<i>Holcus lanatus</i>	abundant
<u>furrows</u>		
a willowherb	<i>Epilobium sp.</i>	occasional
Amphibious Bistort	<i>Persicaria amphibia</i>	frequent
Bittersweet	<i>Solanum dulcamara</i>	rare
Common Nettle	<i>Urtica dioica</i>	locally frequent
Creeping Bent	<i>Agrostis stolonifera</i>	frequent
Creeping Buttercup	<i>Ranunculus repens</i>	frequent
Creeping Thistle	<i>Cirsium arvense</i>	frequent
Curled Dock	<i>Rumex crispus</i>	frequent
False Fox-sedge	<i>Carex otrubae</i>	rare
Field Horsetail	<i>Equisetum arvense</i>	occasional
Great Willowherb	<i>Epilobium hirsutum</i>	occasional
Greater Bird's-foot-trefoil	<i>Lotus pedunculatus</i>	occasional
Hairy Sedge	<i>Carex hirta</i>	frequent
Hard Rush	<i>Juncus inflexus</i>	frequent
Marsh-bedstraw	<i>Galium palustre</i>	occasional
Meadow Foxtail	<i>Alopecurus pratensis</i>	occasional
Sharp-flowered Rush	<i>Juncus acutiflorus</i>	frequent
Silverweed	<i>Potentilla anserina</i>	frequent
Soft-rush	<i>Juncus effusus</i>	abundant
Timothy	<i>Phleum pratense</i>	occasional
Water Mint	<i>Mentha aquatica</i>	rare
Water-pepper	<i>Persicaria hydropiper</i>	occasional
Yellow Iris	<i>Iris pseudacorus</i>	locally frequent

F Designers Risk Assessment

Design Risk Assessment

Document control		P Fields, Tata Steelworks - CDM Designer's Risk Assessment			
Contributing designers	Revision	Purpose of issue	Checked	Reviewed	Date
Charlotte Lickman	P01	Planning	John Panesar	John Panesar	03.07.2024

Health and Safety Considerations

Stage 1 Identify				Stage 2 Eliminate / Reduce	Stage 3 Inform	Stage 4 Control		
Ref. no.	Project element, material or activity	Key health and safety hazards and their possible effects	People/ environment at risk from the hazard	Design measures taken to eliminate the hazard or reduce the risk	Significant residual hazards and risks	Communication method	Risk owner(s)	Proposed control measures
Guidance	Consider all aspects involved in each stage of interface with the site, environment and structure(s).	Record the key hazards and their potential consequences.	Identify the categories of people at risk.	Include obtaining adequate data for design certainty and any further studies carried out during the risk evaluation process. Proposed measures to be taken by constructors and operators are to be included in Stage 4.	Provide details of residual hazards and risks that will need to be communicated and managed.	Record how information is provided, whether on drawings, pre-construction information, buildability statement, specification, reports or H&S File	Record the name of designers, contractors, the client or other stakeholders who are to ensure the significant residual risk is minimised and controlled.	Recommend measures to be taken by the risk owner(s) to minimise and control the significant residual risk.
Design								
Des1	Design of drainage	Hazards: Underground services crossing the site – confirmation required. Risks: Striking services, death, injury, damage to infrastructure.	Site personnel. Existing infrastructure. Public.	Hazard cannot be eliminated by design. Available information has been reviewed and mapped.	Potential unknown services.	DRA	Designer at detailed stage (identifying known risks) Contractor (construction of the scheme)	Detailed survey of services prior to construction. Liaison with utility providers.
Des2	Design of drainage	Hazard: Ground and groundwater conditions: Ground Investigations indicate groundwater levels may be shallow beneath the site. It should be noted that groundwater levels may vary due to seasonal and other effects. Possible risk of contaminated ground. Risk: Inundation or instability, injury, death, and contamination.	Site personnel. Onsite machinery. Natural Environment (watercourses).	Hazard cannot be eliminated by design. Pipework may be at depth and cannot be eliminated by design.	Ground and groundwater conditions.	DRA	Designer (identifying known risks) Contractor (construction of the scheme)	Follow recommendations from the ground investigation report: Some groundwater management may be required to ensure the protection of the earthworks and materials.
Des3	Design of drainage	Hazard: Unexploded ordnance Risk: Striking ordnance, death, injury, damage to infrastructure	Site personnel. Public. Machinery. Infrastructure.	An unexploded ordnance map has been consulted at zeticauxo.com This has highlighted that there is a low risk of finding UXO across the proposed development site.	Low risk from UXO.	DRA	Designer (identifying known risks) Contractor (construction of the scheme).	Risk assessments and method statements to be prepared in case UXO is encountered on site.

Design Risk Assessment

Health and Safety Considerations

Stage 1 Identify				Stage 2 Eliminate / Reduce	Stage 3 Inform		Stage 4 Control
Ref. no.	Project element, material or activity	Key health and safety <u>hazards</u> and their possible effects	<u>People/ environment</u> at risk from the hazard	<u>Design</u> measures taken to eliminate the hazard or reduce the risk	Significant <u>residual</u> hazards and risks	<u>Communication</u> method	Risk owner(s) Proposed <u>control</u> measures
Construction							
Con1	Excavations	Hazard: Working at height Water Underground services crossing the site: gas pipe, unidentified pipe, proposed utility cable and existing drainage. Ground and Groundwater conditions Risk: Death, injury, drowning, inundation, striking of services and contamination.	Site personnel. Public. Existing Infrastructure.	Hazard cannot be eliminated by design. Available information has been reviewed and mapped.	Potential unknown services.	DRA	Contractor Early involvement of temporary works designer recommended. Risk assessments and method statements and adequate briefing of site personnel. Follow recommendations arising from ground investigation report. Detailed survey of services prior to construction. Liaison with utility providers. Edge protection/barriers and where possible harnesses. Use inspection chambers instead of manholes to prevent confined space risks.
Con2	Plant/ material deliveries	Hazard: The site is currently accessed via the western boundary. Unauthorised access by members of public. Risk: Public are struck by machinery. Death, injury.	Site personnel. Public.	Hazard cannot be eliminated by design. Inform the public of construction working hours and activities.	Site access	DRA	Contractor Consider access to site, road width and expected levels of traffic. Risk assessments and method statements and adequate briefing of site personnel. Informing the public of construction activities. Construction compound should be fenced off to prevent public access.

Design Risk Assessment

Health and Safety Considerations

Stage 1 Identify				Stage 2 Eliminate / Reduce	Stage 3 Inform		Stage 4 Control	
Ref. no.	Project element, material or activity	Key health and safety <u>hazards</u> and their possible effects	<u>People/ environment</u> at risk from the hazard	<u>Design</u> measures taken to eliminate the hazard or reduce the risk	Significant <u>residual</u> hazards and risks	<u>Communication</u> method	Risk owner(s)	Proposed <u>control</u> measures
Con 3	Connection of drainage outfall into the pumphouse	Hazard: Working near water and existing drainage networks. Risk: Striking of existing drainage pipes. Drowning and inundation.	Site personnel.	Hazard cannot be eliminated by design. Detailed survey of the existing drainage to be consulted to facilitate clash check between the existing drainage and proposed outfall location.	Water	DRA	Contractor	The work is to be undertaken during dry low tide and/or dry weather periods when water levels are lower. Risk assessments and method statements and adequate briefing of site personnel.
Operation & Maintenance								
O&M1	Drainage system in operation	Hazard: Potential flooding Risk: Site inundation	Maintenance personnel. Employees. Infrastructure.	Hazard cannot be eliminated by design. Design drainage to an appropriate design life and design storm event. Provide safe overland routing for exceedance flows based on site levels.	Flooding during exceedance events.	Operation and maintenance manual (to be prepared) DRA	Asset owner/operator	Regular maintenance in accordance with O&M manual, normal site safety controls, designated overland flow routes.
O&M2	Maintenance and inspections of drainage system	Hazard: Water Working at height Risk: Waterborne diseases Injury and death	Maintenance personnel	Hazard cannot be eliminated by design.	Water and working at height.	Operation and maintenance manual (to be prepared)	Asset owner/operator	Edge barriers and harnesses to be used near manholes. Inspection and maintenance activities to be undertaken during dry weather periods.
Demolition								
Dem1	Removal of drainage features requiring excavation	Hazards and risks: largely as per the construction stage, except that the removal of the drainage system will increase a risk of flooding to the site.	Site personnel. Public.	Reinstatement of site to greenfield conditions.	Ground conditions, disturbance of services. Increase of flood risk.	DRA	Demolition contractor	Full as-built records, specifications and maintenance procedures included in O&M manual to aid in planning of demolition. Materials brought to site to be from specified providers.

Design Risk Assessment

Environmental Considerations

Stage 1 Identify				Stage 2 Eliminate / Reduce	Stage 3 Inform		Stage 4 Control	
Ref. no.	Project element, material or activity	Key environmental <u>hazards</u> and their possible effects	Who or what is at risk from the hazard	<u>Design</u> measures taken to eliminate the hazard or reduce the risk	Significant <u>residual</u> hazards and risks	<u>Communication</u> method	Risk owner(s)	Proposed <u>control</u> measures
Guidance	Consider all aspects involved in each stage of interface with the site, environment and structure(s).	Record the key hazards and their potential consequences.	Identify the categories of people, animals or environments at risk.	Include obtaining adequate data for design certainty and any further studies carried out during the risk evaluation process. Proposed measures to be taken by constructors and operators are to be included in Stage 4.	Provide details of residual hazards and risks that will need to be communicated and managed.	Record how information is provided, whether on drawings, pre-construction information, buildability statement, specification, reports or H&S File	Record the name of designers, contractors, the client or other stakeholders who are to ensure the significant residual risk is minimised and controlled.	Recommend measures to be taken by the risk owner(s) to minimise and control the significant residual risk.
Design								
EDes1	Design of drainage system	Oil spillage Pollution	Groundwater/ watercourse	The proposed piped system, via the 'Contaminated Stream' shall convey surface water flows towards the Abbey Pump House where existing on-site treatment shall take place prior to discharge into the Bristol Channel.	Lack of maintenance of piped network may risk pollution of groundwater.	O&M manual	Asset owner/operator	Regular maintenance in accordance with O&M manual.
Construction								
Con1	Construction of drainage system	Hazard: Sediment and Oil Risk: Pollution of watercourses/drainage systems during construction, with sediments and oils	Existing surface water drainage network and water bodies	Hazard cannot be eliminated by design.	Pollution	Construction Management Plan (to be prepared)	Contractor	Risk assessment and method statement undertaken to avoid pollution during the works. Water from excavations not to be connected to the drainage system. Use of silt curtains, bunded storage tanks, spill kits envisaged. Construction Environmental Management Plan to be prepared and followed.
Con 2	General site clearance	Risk: Decreased amenity value	Environment	Hazard cannot be eliminated by design.	Existing vegetation	DRA	Contractor	Existing vegetation to be protected as much as possible during construction.
Operation & Maintenance								
O&M1	Inspection and clearance of manholes	Hazard: Oil/fuel, sediment Risk: Pollution	Environment Maintenance personnel	Hazard cannot be eliminated by design.	Pollution	Operation and maintenance manual (to be prepared)	Asset owner/operator	Regular maintenance in accordance with O&M manual, normal site safety controls. Materials/sediments removed to be treated as contaminated and disposed of to a licenced waste management facility.

Design Risk Assessment

Environmental Considerations

Stage 1 Identify				Stage 2 Eliminate / Reduce	Stage 3 Inform		Stage 4 Control	
Ref. no.	Project element, material or activity	Key environmental <u>hazards</u> and their possible effects	<u>Who or what</u> is at risk from the hazard	<u>Design</u> measures taken to eliminate the hazard or reduce the risk	Significant <u>residual</u> hazards and risks	<u>Communication</u> method	Risk owner(s)	Proposed <u>control</u> measures
Demolition								
Dem1	Removal of the drainage system/ general demolition activities	Hazards and Risk: largely as per the construction stage.	Groundwater and water bodies	Pipied surface water drainage network to be constructed.	Pollution	Operation and Maintenance manual	Demolition contractor	Full as-built records, specifications and maintenance procedures included in O&M manual to aid in planning of demolition Risk assessment and method statement undertaken to avoid pollution during the works. Water from excavations not to be connected to the drainage system. Use of silt curtains, bunded storage tanks, spill kits envisaged.



Cyngor Castell-nedd Port Talbot
Neath Port Talbot Council

NEATH PORT TALBOT COUNTY BOROUGH COUNCIL
CYNGOR BWRDEISTREF SIROL CASTELL-NEDD PORT TALBOT

FLOOD AND WATER MANAGEMENT ACT 2010
THE SUSTAINABLE DRAINAGE (APPROVAL AND ADOPTION PROCEDURE) (WALES)
REGULATIONS 2018
THE SUSTAINABLE DRAINAGE (APPROVAL AND ADOPTION) (WALES) ORDER 2018

SAB Pre-Application Feedback

Name and address of the applicant

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NP20 1FQ

DATE REGISTERED **28/08/2024**

ENGINEER NAME & NO. **Ailish Smith, 07980 782943**

APPLICATION NO. **SP2024/0036**

LOCATION **P Fields, TATA Steel, Harbour Way, Port Talbot,
Neath Port Talbot SA13 2NG**

PROPOSAL **A new 2.7Ha Concrete Hardstanding and Laydown
Area to support the essential industrial uses
associated with the operation of the steelworks.**

Following an assessment of your pre-application submission we offer no objection in principle to the proposal, subject to it complying with the Statutory Standards and advice that follows:

Amgylchedd ac Adfywio

David W Griffiths Pennaeth Peirianeg a Chludiant
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Croesewir gohebiaeth yn y Gymraeg a byddwn yn ymdrin â gohebiaeth Gymraeg a Saesneg i'r un safonau ac amserlenni.
We welcome correspondence in Welsh and will deal with Welsh and English correspondence to the same standards and timescales.



Standard 1 – Surface Water Runoff Destination

Priority Level 1: Surface water runoff is collected for Reuse.

Given the nature of the development and its intended use, there is no requirement for the re-use of water from this area and therefore Priority Level 1 has been discounted.

This is accepted by the Authority.

Priority Level 2: Surface water runoff is infiltrated to Ground.

It is considered that infiltration would not be a viable solution for surface water drainage due to potential high groundwater levels indicated by Desktop Surveys undertaken in June 2024. The proposed development is likewise located on “Highly Industrial Land” with the recognised presence of contaminants.

Given the risk of mobilisation to contaminants the authority accept that Priority Level 2 should not be sought as an avenue for the discharge of surface water and that no further testing is required in support of this approach.

Priority Level 3: Surface water runoff is discharged to a Surface Water Body.

It is considered that discharging to the ‘Lower Mother Ditch’ at the Eastern Boundary of the site would be unfeasible given the High Pollution Hazard of the site identified by the Simple Index Approach undertaken and submitted within the Conceptual SuDS Strategy.

This is accepted by the Authority.

Priority Level 4: Surface water runoff is discharged to a Surface Water Sewer or Highway Drain.

It is acknowledged by the authority that Surface Water Runoff is not to be discharged into a Surface Water Drain and that a new piped system shall convey water to the existing Nautilus Building where it shall be treated on-site and discharged via an existing long sea outfall into the Bristol Channel.

This approach is approved by the Authority as Surface Water will be treated on site and asset capacity concerns are removed.

Priority Level 5: Surface water runoff is discharged to the Combined Sewer.

It is acknowledged by the authority that Surface Water Runoff is not to be discharged into a Dwr Cymru Welsh Water Asset and that a new piped system shall convey water to the existing Nautilus Building where it shall be treated on-site and discharged via an existing long sea outfall into the Bristol Channel.



This approach is approved by the Authority as Surface Water will be treated on site and asset capacity concerns are removed.

Standard 2 – Surface Water Runoff Hydraulic Control

In accordance with the Statutory Standards for SuDS in Wales, Section G2.1 the British Channel requires no hydraulic control measures. This water body will be unaffected by the discharge rate and runoff volume of surface water and therefore the hydraulic management control requirement rests solely with the private service provisions, in this case, the new and existing pipework, pump system and associated infrastructure depicted on drawing titled, P Fields Outline Drainage Strategy, Rev F.

The capacity of these pipework shall be proven in subsequent submissions to ensure that this infrastructure can facilitate regular rainfall events.

The development is to provide a drainage betterment of 30% over the current land use to equate for future climate change. Please provide evidence of this prior to submitting a Full SAB Application for 'P' Fields.

Overland Exceedance in major storm events shall be provided in subsequent submissions.

Regular maintenance of access chambers, pumping stations and inceptors indicated on drawing titled, P Fields Outline Drainage Strategy, Rev F will be fundamental in the success of this development. A maintenance schedule shall be submitted together with the Full SAB Application.

Prior to submitting the Full SAB Application, mitigation measures to prevent untreated water entering the "Lower Mother Ditch" as a result of pump-failure are to be approved in writing by the authority.

Pumping Station details are to be provided in subsequent submissions. Pumping Stations should be designed in accordance with BS EN 752:2008 in accordance with section 24.13 of CIRIA C753, The SuDS Manual.



Standard 3 – Water Quality

The proposed development site is classified as a ‘High Pollution Hazard Level’ in accordance with the ‘Simple Index Approach’ undertaken and submitted under table 4-1 titled Pollution Hazard Indices, within the Conceptual SuDS Strategy.

Due to the risk of runoff from materials high in TSS, oils, and possible other contaminants it is proposed to convey surface water through the contaminated network to an existing wastewater treatment system, on site, which services and processes water across the site to sufficient levels to permit discharge to the Bristol Channel via the long sea outfall.

It is acknowledged that the design details of the intended inceptor are still to be decided. Full design details of the inceptor are to be provided in subsequent submissions, prior to full SAB Application.

The existing long sea outfall is the subject of a monitored consent. The conditions of this consent must be maintained with NRW monitoring the quality of discharge.

Standard 4 – Amenity

Due to layout constraints and water quality pollution hazard SuDS systems were not feasible as part of this development. Surface Water is to be conveyed and treated through an underground piped system and on site treatment arrangement. Therefore, amenity benefits are not obtained via the ‘typical’ channels.

Notwithstanding the above, this site forms part of a wider development required to maintain the operation of the steelworks. This wider development incorporates SuDS proposals and ‘Green Areas’ across the configuration of the steelworks, which will maximise amenity across the site and will offset any amenity benefits not achieved on the ‘P’ Fields site.

Standard 5 - Biodiversity

As with the point above, Biodiversity is not enhanced within the ‘P’ Fields site due to existing infrastructure being utilised to convey, store and treat surface water on-site before ultimately discharging into the Bristol Channel.

However, the wider development at TATA Steel Port Talbot, will promote biodiversity throughout the wider site and offset the biodiversity benefits not attained through this smaller development within the same land ownership boundary.



In addition, works are being proposed to the 'Southern Fields' at the southern extent of the wider project boundary, north of the Margam Moors SSSI. The very nature of these works is to promote the biodiversity and ecology within the Southern Fields as supported by the Barry Stewart & Associates Consulting Ecologists May 2008 report, contained in Appendix E.

It is therefore acknowledged by the authority that the wider development and programmed improvements within TATA Steels land boundary will compensate for the lack of Biodiversity enhancements at the 'P' Fields site.

These enhancements will not only compensate for, but further promote conservationism and Ecology throughout the 'heavily Industrialised Steelworks' Site, providing smaller 'green areas' for habitat reintegration, but also on a mass scale on the 'Southern Fields' covering the entirety of approximately 24Ha.

Standard 6 - Design of Drainage for Construction, Operation & Maintenance

A management/maintenance plan should be submitted with any further submissions outlining:

- Who will be responsible for the SuDS features and how they will be maintained.
- Locations where sediment or debris shall be removed
- weekly/monthly/yearly checks that need to be carried out
- Servicing Schedule of Pumping Equipment

A Construction Method Statement should be submitted which will include a means of controlling surface water during the construction phase.

A programme of works or inspection programme shall be submitted so we can determine how many SAB inspections are required for the development.

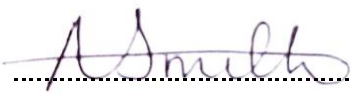
Scaled construction drawings, site plans, cross sections and longitudinal sections are required for approval by the SAB.

Full construction details will be required for the pipework, Pumping Station and Inceptor prior to submitting a Full SAB Application.

These observations are provided without prejudice and are based upon the information submitted. Our observations may change to reflect these amendments and/or additional details.



Cyngor Castell-nedd Port Talbot
Neath Port Talbot Council

Signed : 

pp Head of Engineering and Transport

Date: 18/09/2024

Notes:

Welsh Water has a key role to play in the development and planning process as the services provided are at the forefront of public health and protection of the environment. Welsh Water encourages all developers to engage with them as early as possible in order to address any issues that may arise during the planning/construction process

Upon receipt of a pre-application enquiry, Welsh Water will provide a written response advising whether the local network(s) can support the proposal, whether off-site water mains and/or sewers will need to be provided, and whether there are any apparatus located within the land you wish to develop and the requirements for these apparatus. This service is provided for a fee of £90 and can be submitted by post or by completing the online enquiry form at <http://www.dwrcymru.com/en/Developer-Services>. Further information can be obtained from the dedicated team of planning officers at Welsh Water on 0800 917 2652.

Amgylchedd ac Adfywio

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