SANCTUARY

THE MINISTRY OF DEFENCE SUSTAINABILITY MAGAZINE

Number 46 • 2017

HMS QE AIRCRAFT CARRIER
Mud, mines and mitigation

OPERATION NIGHTINGALE
Archaeological projects benefit recovery of service personnel

DIO DELIVERS ENVIRONMENTAL COMPLIANCE OVERSEAS
in support of new military requirements

SANCTUARY

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Sanctuary is an annual publication about sustainable development in the Ministry of Defence (MOD) and the sustainable management of the natural and built assets across the Defence estate. It illustrates how the MOD is undertaking its responsibility for stewardship of the estate in the UK and overseas. It is designed for a wide audience, from the general public, to the people who work for us or volunteer as members of the MOD Conservation Groups.

Sanctuary is produced for the MOD by the Defence Infrastructure Organisation.

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Foreword by **Chris Packham**

Naturalist and Broadcaster

Paradoxically what I like most about the Defence Estates lands is that I don't know them. I've visited most of the nature reserves and parks across the UK but only on a handful of times have I enjoyed access to the vast swathes of countryside managed by the military. And all have been such a treat. I recall with enormous fondness a damp day on Porton Down in Wiltshire in the 1980's when I was shown a fabulous roost of short-eared owls and more juniper scrub than I'd ever seen. You see, I approve of their lack of access, their level of protection in our overcrowded, over-trampled age and I am reassured that they remain properly protected and managed with the natural environment in mind. Indeed this years Sanctuary Award winners celebrate the conservation of Natterjack toads on Longmoor Camp, the superb educational resource at Foxglove Covert and the extraordinary long term commitment of Roy Canham safeguarding the archaeological treasures on Salisbury Plain. Congratulations and thanks to these and all the other worthy nominees.

However, this magazine also throws focus on the considerable and successful efforts of MOD staff and partners working overseas. I'm particularly drawn to the potentially positive aspects of the reactivation of military training in Belize, a country with significant but imperilled natural resources. Reduction of illegal logging and hunting and protecting the endangered scarlet macaw, a rain forest icon , would be an enormously beneficial aspect of the British Army's renewed presence. Likewise in Laikipia - Kenya, where a training exercise helped consolidate economic security in a region fraught with conflict and difficulties. Conservation management and sustainable building in the Falklands also exemplify the expanding and flourishing stewardship of the Defence Estates, not only at home but all over the world.

Top work! I salute you!
(If civilians are allowed to do that!)

Sanctuary Awards

Sanctuary Features

Sanctuary Around the Regions

SANCTUARY Awards
Recognition for outstanding achievement

The Ceremony 2016
Each year the launch of Sanctuary Magazine coincides with the Award Ceremony, which is held at Main Building in London and co-hosted by the Minister for Defence, Veterans, Reserves and Personnel and the Defence Infrastructure Organisation Chief Executive Officer, with the Head Office and Commissioning Services (Sustainability Lead for MOD), senior military staff and Sustainability Champions from across all of the armed services and other MOD departments in attendance.

Looking back, last year's ceremony was a great success with the Minister Mark Lancaster presenting the Awards to the winners on stage, he said: "*Today is all about celebrating the men and women responsible for a remarkable and diverse range of sustainability, conservation and environmental projects and initiatives delivered across the Defence estate on behalf of the MOD each year. The diversity of these brilliant projects is dazzling.*"

The Sanctuary Awards board for 2017 comprised of:

FINANCE AND MILITARY CAPABILITY (FMC)

Jane Hallett
Deputy Head
Estates Policy

Pippa Morrison
Sustainable MOD Policy

DEFENCE INFRASTRUCTURE ORGANISATION (DIO)

Alan Mayes
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Martin Baxter
Chief Policy Advisor at the Institute of Environmental Management & Assessment (IEMA)

Marcus Yeo
Managing Director of the Joint Nature Conservation Council (JNCC)

The Judges would like to thank Samantha Bevan-Talbot Commerce Decisions QinetiQ for her assistance with the AWARD Tool.

Award winners of 2016 with co-hosts Mark Lancaster MP and Graham Dalton DIO CEO © Crown

Sanctuary Awards 2017

The Ministry of Defence (MOD) prestigious Sanctuary Awards recognises and encourages group and individual efforts that benefit sustainable development, energy saving measures, wildlife, archaeology, environmental improvement or community awareness of conservation on or within land and property that the MOD owns or uses in the UK and overseas.

The 2017 Awards were divided into five categories: Environmental Project, Heritage Project, Sustainability Project, Utilities Project and Individual Achievement. The winners of each category were then considered for two further awards.

The coveted Silver Otter is awarded to Conservation Groups or individuals, MOD personnel or MOD-led projects. The Sustainable Business Award is awarded to more commercial projects who have achieved a particular success in ensuring sustainable solutions that deliver against the commitment to the armed forces by enabling them to live, train and work.

The Sanctuary Award board would like to congratulate, on behalf of the MOD, the following winners and runners-up for 2017.

For further information on entering the 2018 Awards please contact the Sanctuary Team DIO-Sanctuary@mod.uk

INDIVIDUAL ACHIEVEMENT AWARD **WINNER**

SILVER OTTER WINNER

Roy Canham MBE. Without Roy the archaeological landscape of Salisbury Plain would have looked very different. In the 1970 increasing incidents of damage to monuments from armoured training were being reported. As the County Archaeologist for Wiltshire, Roy was well aware not only of the importance of this wonderful historic landscape but also of the need for military training in the area. In discussions between the MOD, English Heritage and Wiltshire Council, it emerged that no true record of archaeology existed for the Plain and thus, in 1985, Roy initiated a landscape survey of the training area, recording over 2200 sites – each given their own unique SPTA (Salisbury Plain Training Area) number on his database.

Roy Canham MBE © Crown

Roy participated in often quite heated meetings with military commanders to design measures to protect these sites creating 'Archaeological Site Groups' (ASG) - concentrations of monuments covering substantial areas - and 'Important and Fragile Sites' (IFS) - the best preserved and rarest ancient features. These highlighted the types of archaeology that would be most sensitive to military training and how to avoid damage to them. As an addition, Roy designed layers of archaeological sensitivity to be used in exercise planning – from digging foxholes through to mine plough requirements. That these are still used today bears testimony to his imagination and foresight.

He emphasised the importance of briefings for troops, working closely with military and also with the civilian archaeologists at Westdown Camp which he insisted upon, and planned the implementation of crucial protective measures. Roy was never less than persistent and dogged in ensuring that all of these measures were adhered to - embarking, like a latter-day Daniel Defoe, on countless visits across the Plain to audit signs and palisades, to check grazing, or to examine scrub encroachment on monuments.

On retirement, Roy led an archaeology sub-group of Imber Conservation Group (ICG) and passed on his enthusiasm to members for over 11 years. His archaeological knowledge and understanding of military training requirements have helped to ensure that the Statutory Bodies and NGOs today view the MOD as a keen environmental and historic steward.

That the archaeology of the largest military training area in Britain is so well preserved and protected whilst the pace of military training has not declined is in no small part down to Roy a fact acknowledged by the award of an MBE in 2008.

See Sanctuary 44, page 26

INDIVIDUAL ACHIEVEMENT AWARD **RUNNER-UP**

Lance Corporal Sheona Macmillan. Defence Infrastructure Organisation Projects Programmes and Development Overseas tasked the Royal Engineers (RE) to deliver new accommodation on three sites within the Falklands (Project ANEMOI), as traditional contractors could not be used due to the remote location.

The RE however had to fulfil the 'contractual' requirement for an Environmental Manager. A chance encounter with LCpl Sheona Macmillan, a Reservist and University graduate, provided a solution. LCpl Macmillan was tasked to develop the Construction Environmental Management Plan (CEMP), including the Site Waste Management Plan (SWMP), into a working document. As part of this role she reviewed the waste management processes to improve efficiencies and reduce cost. The initial plan had been to ship back all waste to the UK but she improved costs by sorting waste on-site, resulting in an approximate saving of £11,500 per ISO of waste sent back. Through this, and challenging contractors' costs, it is anticipated that Sheona's work will save approximately £4M pounds.

The RE were not known for their 'Green' credentials before this project, but Sheona has engaged with both the Host Nation and local NGOs, demonstrating to Falkland Islanders that the project has been taken seriously. Her effort has led to wider areas of the Corps seeking her support for projects, advising on renewables and wildlife friendly design.

LCpl Macmillan's achievements are quite remarkable, but even more so when considering she was a new graduate, with no previous experience in an Environmental Manger role and conducted the work from over 8,000 miles away. Project ANEMOI's success is a testament to her dedicated work ethic.

See article on page 48

LCpl Sheona Macmillan © Crown

SUSTAINABILITY PROJECT AWARD **WINNER**

SUSTAINABLE BUSINESS AWARD WINNER

Army Basing Programme (ABP) Salisbury Plain will rebase Service personnel and their families from Germany and re-role units within the UK by 2020 through building UK-based military communities. The scale of ABP's Salisbury Plain programme is unprecedented with an investment of over £1.3 billion, delivering 1,339 Service Family Accommodation (SFA), 2,600 Single Living Accommodation (SLA) units and extensive technical facilities.

The designated sites of Salisbury Plain and the River Avon are highly vulnerable to population-related environmental impacts, so sustainable development considerations have been integrated into the programme from the outset to address the identified environmental challenges that have had to be overcome before planning permissions could be granted. A range of environmental challenges were identified that required solutions before planning could be granted. These included impacts on the River Avon from abstraction and sewage-derived phosphorus, impacts on Salisbury Plain from recreational pressures, the impact of development on known and unknown archaeology and the loss of 37ha of priority grassland habitat.

DIO has worked with Natural England, the Environment Agency, Historic England and Wiltshire Council to develop a range of innovative solutions, including the development of an Integrated Water Management Strategy (IWMS) for Salisbury Plain's ABP sites, a Catchment-Sensitive Farming (CSF) initiative on the River Avon, Biodiversity Offsetting Plan and a Recreational Access Action Plan.

In addition, extensive archaeological investigation and site remediation programmes have been developed.

These measures have enabled project-level Habitats Regulations Assessments to be positively determined, the Section 106 agreement to be signed and 18 main Planning permissions to be granted. DIO's approach has addressed historic and ABP-related environmental impacts and will help future-proof the Estate.

See Sanctuary 45, page 14

Signing the Section 106 agreement © Crown

SUSTAINABILITY PROJECT AWARD **RUNNER-UP**

RAF Lossiemouth Typhoon Propulsion Support Facility (TPSF) at RAF Lossiemouth currently provides support to three squadrons and was purposely built to supply, repair and maintain EJ200 jet engines. Prior to the build all MOD jet engine facilities were located in adapted existing buildings, thereby presenting difficulties for operators. The project design was complex as it needed to meet the needs of three customers, Rolls Royce, the RAF and Defence Equipment and Support (DE&S).

To develop the correct design solution, visits were made to older support facilities to establish successful and flawed areas of their design. Construction was challenging as the AECOM and DIO project teams were located 200 miles apart and travel through the Cairngorm Mountains for meetings represented a significant winter hazard.

Rolls Royce Jet Propulsion Centre Workshop, RAF Lossiemouth © Crown

The building has been delivered to an extremely high construction standard and incorporates sophisticated computer record and security systems. The project achieved DREAM Excellent, which was no easy task as the building is a combination of workshop and specialist offices and therefore covers different DREAM modules. It has also achieved energy savings of over £11,000. The facility has been future-proofed too, meaning it can seamlessly accept the arrival of an unexpected additional Typhoon squadron. The project has proved such a success that Rolls Royce and DE&S have described the site as a 'World Class Facility' and requested to use the design for jet engine facilities worldwide.

HERITAGE PROJECT AWARD **WINNER**

Ballykinler WW1 Practice Trenches
Northern Ireland was the primary training area of the 36th Ulster Division in World War I (WW1), with many soldiers later fighting at the Somme and other battles. The partnership funded project included DIO, Queen's University Belfast and the Department for Communities Northern Ireland and aimed to obtain greater insight on WW1 practice trenches. The project focused on trench network features, examining levels of preservation and acted as a focal point for the Somme centenary commemorative events.

One of the most interesting finds was the sandbag revetment of a communication trench wall, still in-situ after 100 years. The original communication trench had been modified to create a dugout position and a fire trench with parapets, interpreted as the remains of a machine-gun position.

The finds dispel some myths of the Great War, particularly that soldiers were sent into the Battle of the Somme with little idea of what they may face.

The results revealed the nature of military training on the site 100 years ago and allows those training at Ballykinler today to understand the history behind the landscape features present. The information also contributes to future site management due to a better understanding of the nature of buried deposits and subsequent conservation requirements.

See Sanctuary 45, page 54

Work on the trenches © Crown

HERITAGE PROJECT AWARD **RUNNER-UP**

Excavation work at Dreamer's Bay © Crown

The Ancient Akrotiri Project, Dreamer's Bay at RAF Akrotiri, Cyprus is a haven for wildlife, favoured recreation spot for serving personnel and well known for its archaeological importance. Severe erosion had resulted in ancient pottery sherds strewn across the site and exposure of building wall lines.

University of Leicester School of Archaeology, with the support of RAF Akrotiri staff and DIO, have seasonally surveyed, excavated and recorded the site over the past three years.

Excavations focused on coastal building remains exposed by winter storms and a stone hilltop building - revealing a late Roman/early Byzantine port.

A car park has now been built to prevent vehicle damage to the archaeological remains. Archaeological work in Cyprus is closely monitored by the Republic of Cyprus Department of Antiquities, and the investigations at Dreamer's Bay publically demonstrate the importance the MOD places on taking the stewardship of heritage assets seriously.

Future plans include the use of dating techniques as well as geophysical surveys of the wider area to reveal buried archaeological remains. This will prove helpful to MOD planners when choosing the location of new developments at the base. The Ancient Akrotiri Project continues to reveal, interpret and preserve the remarkable archaeology at RAF Akrotiri.

See article on page 32

ENVIRONMENTAL PROJECT AWARD **WINNER**

Saturday pond dipping session with the Eco Club © Elizabeth Dickinson

25 years of Foxglove Covert. Foxglove Covert was the first Local Nature Reserve (LNR) in both Richmondshire and on MOD land in the UK. It is recognised nationally for its unique mosaic of wildlife habitats, providing refuge to several Red Listed species. The 100 acre site is a source of important biological records for the county, with 2,606 species of plants and animals recorded to date including birds, moths, butterflies and flowers. Television programmes regularly choose the location to highlight the important conservation work being undertaken.

Since 2013 over 62,000 hours of civilian and military volunteer time have been contributed to the reserve.

Foxglove is a Centre of Excellence for bird ringers and has been part of the British Trust for Ornithology's (BTO) Constant Effort Sites Scheme (CES) for 25 years, giving one of the best data sets for the UK. Over 224,000 birds have been processed by the team of licensed bird ringers, including 48,000 birds caught on CES alone. Conservation work is also supported in other areas including Cape Wrath Ranges in Scotland, where over 50,000 seabirds have been ringed, contributing to many research projects.

Since 1992 more than 750,000 people have visited the reserve, including over 40,000 school children and 1,800 community groups. The award-winning Field Centre gives everyone the opportunity to get closer to nature with superb educational facilities serving local schools, including children with severe and complex learning needs, community groups and general visitors. The reserve has nationally important wetlands and is part of the Natural England Flagship Ponds project. Two million pounds has been invested in the site, including funding from the MOD, Natural England, the Heritage Lottery Fund and Richmondshire District Council. The website has had over 3.5 million hits and the number of followers on social media grows by the week. Foxglove look forward to seeing what the next 25 years will bring!

See Sanctuary 44, page 36

ENVIRONMENTAL PROJECT AWARD **RUNNER-UP**

Longmoor Conservation Group Natterjack Toad Project. The Longmoor Conservation Group (LCG) covers sites in the Home Counties including Woolmer Forest, which supports populations of all long-recognised native amphibians and reptiles. The natterjack toads at Woolmer represent the last surviving native population in southern England but in 1974 were on the brink of extinction. For the last ten years a Higher Level Stewardship payment to Amphibian and Reptile Conservation (ARC) has paid for much of the management work undertaken on the natterjack area.

The first action of the LCG was to create new ponds and restore old ones for the natterjacks. Since the 1970s this work has continued apace and included major efforts to restore Woolmer Pond to its former glory. Terrestrial habitat around the natterjack ponds has also undergone a dramatic transformation. Forty years ago, most of the 'natterjack area' was overgrown with pine, birch and willow. By the start of the 21st century, vast swathes of this scrub had been cleared and a regime of cattle grazing was in place.

Natterjack toad © John Buckley/ARC

From the nadir of fewer than ten female natterjacks in the mid-1970s, there are now at least 40-100 females breeding virtually every year. Numbers are still low by amphibian standards and work to increase the population continues, but a rubicon has been crossed and extinction no longer threatens in the short term. Research at Woolmer and management for natterjacks has provided valuable information for work at other heathland sites where natterjacks have been successfully reintroduced. The package of creating temporary ponds with circumneutral pH, scrub clearance and livestock grazing is now a standard formula for natterjack conservation on heaths and dunes.

See Sanctuary 44, page 68

UTILITIES PROJECT AWARD **WINNER**

Maximising MOD Energy Efficient Behaviours. The MOD consumes a significant amount of energy in order to deliver effective military capability and power infrastructure, at home and abroad. In 2012, the MOD set itself a target to reduce reliance on fossil fuels by 18% by 2020/21, against a 2009/10 baseline.

The Defence Science and Technology Laboratory (Dstl) collaborated with DIO and three industry partners, Bright HF, Trimetis and BAE Systems, to develop a methodology known as Future Interventions Start Here (FISH). This approach aimed to understand energy usage and identify options for behavioural change. The methodology was tested at a complex, three-storey, multi-use MOD building at Catterick Garrison. Various interventions were implemented including stakeholder engagement, interaction with senior managers and dispelling 'IT myths.'

Promoting energy behaviour change © Dstl

A range of measures were adopted to evaluate the outcomes including pre- and post-intervention surveys, meter readings and observational audits.

Average electrical energy savings over a four-month period exceed the MOD target at 19% and also translated into relatively substantial financial savings. Notable changes were seen in awareness, attitude and behaviour of personnel. The research concluded that the FISH approach is scientifically robust and easy to understand. The team are now working to up-scale the project so as it can be used to implement other energy efficient schemes across the MOD.

See article on page 28

MOD SEAT Handbook **Update**

Version 8.0 of the MOD Sustainability and Environmental Appraisal Tools (SEAT) Handbook is now available. The handbook contains a suite of appraisal tools that are used to assess and manage the effects of developments and activities across the MOD consistent with the principles of sustainability.

First published in 2002, and now in its 8th iteration, the SEAT Handbook includes guidance on:

Sustainability Appraisal. Designed to assess the potential environmental, social and economic effects of a plan, programme or project against a series of key sustainability objectives.

Strategic Environmental Assessment. A multi-staged process that considers and manages the likely significant effects of a plan or programme on the environment.

Environmental Impact Assessment. A multi-staged process that considers and manages the likely significant environmental effects of a proposed project.

Habitats Regulations Assessment. An assessment used for any plan or project that could have significant effect on a European or internationally important site for nature conservation.

Defence Related Environmental Assessment Methodology. An environmental performance assessment tool associated with the built environment.

Climate Impact Risk Assessment Methodology. A site based assessment designed to identify the risks to defence outputs from current and future climate. These tools not only ensure that operational capability is maintained and legislation complied with but also help to encourage innovation, maximise sustainability benefits and improve the long-term resilience.

Summary Booklet © Crown

UK Military Training in Belize, considering the Environment

The Mayan temple of Caracol, one of the tourist areas assessed for noise pollution © Crown

Belize is a small, diverse and fascinating country on the east coast of Central America with a population of just 353,858. It has a sub-tropical climate, which is distinctly seasonal and there have been over thirty hurricanes and tropical storms since 1930. It is a country rich in biodiversity and Mayan archaeological remains with a deserved reputation for ecotourism. There is a large network of National Parks and other protected areas, some of which operate as private wildlife sanctuaries dedicated to ecotourism and sustainable logging operations.

Since Belize, formerly known as British Honduras, gained its independence from the British Commonwealth in 1981 the British Army has maintained a presence in the country. The country has a long Caribbean coastline and is bordered by Mexico and Guatemala.

In 1994, the British Army Training Support Unit Belize (BATSUB) was established to enable jungle training (close country and tropical environment) to be undertaken by troops from the UK and its international partners. Following the engagement of military forces in the Middle East training was considerably reduced but since 2015 work has been underway to formally reactivate UK Military Training in Belize.

Initially the focus was on land within certain Forest Reserves owned and managed by the Belize Forest Department. However, it soon became clear that the Army required more extensive training areas. The area the British Army wanted to train across was over 380,000ha, which is larger than the entire area of land owned by the MOD in the UK (240,000ha) and is larger than Wiltshire, the home of the Salisbury Plain Training Area.

To secure consent from the Belize Department of the Environment (DOE) to train across this vast estate it was necessary to undertake an Environmental Impact Assessment (EIA). This is an iterative process required under both Belizean and UK Regulations, which evaluates the likely negative and positive environmental impacts of a proposed project, which in this case was the reactivation of military training, and identifies measures to avoid, reduce or mitigate negative environmental effects and enhance positive effects. A team of Defence Infrastructure Organisation (DIO) Environmental Advisers led the EIA process on behalf of BATSUB and Field Training Army.

The EIA focused on topics that military training might adversely affect and this included: Noise and Vibration; Geology and Soils; Biodiversity and Nature Conservation; Historic Environment; and Socio-Economics. The EIA team deployed to Belize in November 2015 and January and May 2017 to conduct field assessments, ground truth desktop studies and meet the DOE, other government departments and land owners. The team also developed close working relationships with key stakeholders including Friends for Conservation and Development, Programme for Belize, the Panthera

Project, as well as the Biodiversity and Environmental Resource Data System of Belize.

In May, the team visited the country and assessed several training areas with the Institute of Archaeology and the Forest Department. This included visits to the Chiquibul Forest Reserve, which supports one of the last populations of scarlet macaw, and Rio Bravo Conservation Area, the largest private reserve in Belize (105,000ha) with direct links to biosphere reserves in Guatemala and Mexico. The latter forms an important part of the Mesoamerican Biological Corridor and it supports the highest density of jaguar in Belize.

The archaeology of Belize is the stuff of (Indiana Jones inspired) dreams; of Mayan temples in clearings in the jungle with toucans flying over, of valleys that lead to caves with skeletons and pottery urns in them and bats flitting around. Belize has some of the World's most impressive and evocative sites. As such the team were acutely aware of the need to ensure that Cultural Heritage was considered very carefully within all of the assessment processes.

The EIA Team wading through Cenoii Creek © Crown

Archaeologists from the Institute of Archaeology accompanied the MOD team as they pushed through jungle paths and waded up rivers to see if military training requirements might have any effects on the sites and monuments of the country. Some Mayan terraces were seen, and pieces of Mayan pottery and artefacts linked to fishing

The team looking over Gauc Bridge © Crown

trips of past societies were found and helped to inform the authors of the subsequent report. Training on how to deal with any unexpected archaeological discoveries will be given to British Forces, and the importance of the heritage of Belize will be emphasised to all users of the training areas. As the UK has just ratified the Hague Convention on the Protection of Cultural Property in armed conflict, having experience of archaeology in countries outside the UK will also be a useful training experience for military personnel.

During the site visits a number of priority species were seen by the team including black howler monkeys, spider monkeys, king vulture, toucan, oscellated turkey and Morolet's crocodile, as well more common but exotic species such as a boa constrictor, which the team spotted whilst wading through Cenoii Creek. A night spent sleeping in hammocks in the jungle was an opportunity to put out camera traps to capture pictures of large mammals, such as jaguar and ocelot, but in this instance to no avail.

Following the site assessments the team delivered two public consultation meetings in the capital city of Belmopan, and San Felipe village, which is situated in the north of Belize towards the Mexican border. The meetings allowed the team to meet members of the community that live in the areas surrounding the proposed training areas and respond to any queries. Over 150 people attended the meeting in San Felipe. The community acknowledged

Belize cougar caught on a camera trap during the large mammal survey © Crown

the comprehensive approach to the EIA and welcomed the increased training by the British Army.

This was a theme throughout the consultation. Illegal logging is a significant threat to the forests of Belize, particularly in remote locations. Illegal hunting, agricultural encroachment (slash and burn) and collecting wild animals to supply the pet trade are all threats to wildlife. The Forest Department and other stakeholders believe that a British military presence could help detect and deter illegal logging camps, which can be active for several months at a time, as well as hunters and farmers clearing land for crops or cattle. Indeed, Belize has a long history of forest exploitation and the abandoned hulks of steam powered tractors and logging trucks that litter the country are testament to this. This highlights the importance of conserving and protecting the remaining forests.

Irish Creek in Rio Bravo © Crown

Measures to avoid or mitigate potential negative effects included the following:

- No felling of mature hardwood trees or good quality specimen trees
- All caves are out of bounds to protect sensitive Mayan archaeological sites
- Provide a Biosecurity Certificate for each piece of imported equipment
- Deployment of trail cameras around jungle training camps to collect data on large mammal distribution
- Controls on boat activity on major rivers to minimise the risk of manatee strikes
- Establish buffer zones between noise receptors and military training, particularly helicopters to protect breeding sites for priority species (e.g. solitary eagle)
- Post exercise sweep of training area to remove military debris and prevent build-up of contamination

Rio Bravo Training Area © Crown

This comprehensive package of measures to avoid, reduce and mitigate potential adverse effects from military training was included in the EIA Report, which was submitted to the Belize DOE and the National Environmental Appraisal Committee. This was subject to further scrutiny and public consultation before the DOE granted consent for the reactivation of military training in time for the first planned exercise in 2017.

The delivery of the EIA was a major undertaking for DIO, BATSUB and Field Army. It involved a large project team from several departments. This integrated approach was critical to the success of the project in securing consent to train across a unique and extensive overseas training estate, which is essential for preparing British troops for operating in this uniquely demanding and often hostile environment.

Clare Richmond
Environmental Adviser
Defence Infrastructure Organisation

Operation Nightingale

Ex Royal Tank Regiment soldier excavating the remains of a WWI German soldier © Harvey Mills Photography

In 2011, the first ever project in a programme which was named 'Operation Nightingale' was run on a wind-swept Salisbury Plain. This programme, backed by the Ministry of Defence from its inception, has utilised the benefits of archaeology to assist with the recovery of service personnel. It has operated on a most eclectic set of sites – from Classical remains in Cyprus, to a World War I practice trench in Scotland and a Roman villa in Wales. Several military team members have become professional archaeologists or gone on to study archaeology at University. Persuading former military personnel that 'digging in' on their training areas can be a pleasurable experience has proved to be a surprisingly easy thing.

Although initially started with The Rifles, the programme has now become Defence-wide with many 'cap badges' participating – furthermore, veterans of recent campaigns in Afghanistan and Iraq from the USA and from Poland have joined Operation Nightingale fieldwork projects in the UK.

The output of Operation Nightingale work has been lodged with many Historic Environment Records which will enable researchers to examine the findings. This has required high quality recording and writing, much of which was supported by professional organisations. There has also been coverage of events in the media and indeed in every issue of Sanctuary since 2012! Some of the finds made are now on display in museums – a photograph of one of the items, an Anglo-Saxon drinking vessel found by Rifleman Rowan Kendrick, now sits opposite the Sutton Hoo helmet in the British Museum.

Another of the stalwarts of the project has been former Royal Marine Richard Bennett. *"For me, getting involved in heritage was a lifesaver, I took my daughter to Salisbury Plain where we excavated an Anglo-Saxon cemetery on a prehistoric burial mound. We recovered 74 skeletons, an Anglo-Saxon sword, a copious amount of jewellery, spears, the lot. It was my first experience with archaeology and I was completely hooked"*.

Richard has left the Marines, gained a (First Class) degree in Archaeology from Exeter University and has set up his own archaeological charity 'Breaking Ground Heritage' to enable others to follow in his footsteps. His story is just one of many involved.

The project seems to have struck a chord with many, both in military and heritage circles and has won not only Sanctuary awards, but also a British Archaeology Award and an Historic England Heritage Angel Award as Best Community Action project in October 2016.

MOD is determined that a high standard of work and appropriate support to participants is provided, and that everyone is aware that this is very much a Defence 'brand'. To this end, 'Operation Nightingale', with a dedicated email DIOSEE-ESCOpNightingale@mod.uk, and its logo was trademarked to the Secretary of State for Defence in 2017 – only projects meeting exacting standards will be approved by MOD and can call themselves 'Op Nightingale' events.

It is hoped that many more projects and exciting finds will be delivered by Op Nightingale in the future.

Richard Osgood
Senior Archaeologist
Defence Infrastructure Organisation

Former Rifleman cataloguing finds on the 'Digging War Horse' Project © Harvey Mills Photography

A Room with a View
East Chisenbury in the Iron Age

The excavation team marking out the roundhouses © Harvey Mills Photography

Midden: Noun – a dunghill or refuse heap

The East Chisenbury Midden close to Upavon on the Salisbury Plain Training Area is one of the more enigmatic monuments on Ministry of Defence land. The site is comprised of a huge collection of material – animal bone, flint, pottery, organic waste – up to three metres in depth, effectively forming an artificial hill which commands wonderful panoramic views of an unspoilt landscape.

A 'No Digging' sign © Harvey Mills Photography

The site was discovered by members of the Royal Air Force in the 1940s and has been the subject of much study since then, ranging from coring surveys to determine the extent and depth of deposits through to academic consideration of the function of the mound. Users of the military estate may also have noticed that the monument is marked as an 'Environmental Site' on the training maps and is hence deemed out of bounds. It is both fenced and palisaded – adorned with 'no digging' signs. The burrowing of badgers continued to reveal substantial deposits of the Early Iron Age (around 700BC) from this monument and thus, in advance of possible designation by Historic England, Defence Infrastructure Organisation Conservation Stewardship Funds were obtained to upgrade the protection fence and to discover more about the purpose of the site.

Two weeks of archaeological fieldwork in both 2016 and 2017 were undertaken to answer some specific questions: Is this site simply a big refuse tip? Is there any evidence for settlement associated with the midden? Is there any trace of an enclosure? Is the spread of material similar in nature across the whole site? Led by Phil Andrews of Wessex Archaeology, and forming part of an Operation Nightingale programme with military veterans as a major part of the dig team, the results were fascinating.

A geophysical survey alongside the excavation work confirmed that the midden lay within an oval enclosure of around 7ha. The enclosure ditch was around 2m in depth and up to 11m wide, a colossal feature when one considers that there was also an internal bank made from the material dug to create the ditch. As such, this feature must have been in a form similar to the hill forts you see close by on the Plain such as at Sidbury although it was created around 400 years earlier, indeed Phil felt that the enclosure could have been utilised for defence as well as serving as a tribal centre, meeting and feasting place. The views from the enclosure would have been spectacular in the Early Iron Age – across the River Avon and also to the far hills of the Vale of Pewsey to the north-west. By the Roman period (AD 43-410), this ditch had largely been filled in with several Roman pottery sherds being excavated from what was then simply a shallow depression by the later Roman era. A number of Roman coins also confirmed that there was a post-Iron Age presence in the area.

Prehistoric finds from the midden © Crown

Beyond the limit of the midden – large numbers of postholes were uncovered and this led to the excavation of an area 20m x 20m in size. These were often up to half a metre in depth, and packed with flints, and an occasional sarsen stone, to hold the now-rotted away timbers in place. All of these postholes had pottery or animal bone present – the latter Early Iron Age in form. No floor surfaces survived within the areas delimited by the postholes but two curved alignments of postholes indicated the presence of at least two Iron Age roundhouses, up to 12m in diameter. These circular houses would have had walls of wattle and daub or cob and with a thatched roof. In fact, they were probably very similar in form to the roundhouse built by some of the excavation team at nearby Tedworth House as part of their work on a 'Help for Heroes' project. Within this area was a further curiosity – a small but discrete deposit of animal bone which seemed to lie on the ground near one of the postholes. This deposit, not a rubbish pit, was largely composed of cattle bone, but amongst it were three fragments of human skull, two with evidence of injury. Was this part of a head trophy held in the house? Do the bones actually represent the remains of one of the ancestors of those living in the house? These are questions that remain unanswered but nonetheless add some macabre detail to the dwelling in what

Site director Phil Andrews of Wessex Archaeology © Harvey Mills Photography

was probably quite a vibrant and busy settlement over centuries.

Pottery was abundant – from pots called 'short-necked-furrowed bowls' through to sherds with incised patterns and inlaid white decoration and plainer vessels. Spindle whorls (used for spinning wool) and decorate bone pins and combs highlighted the industry here in the past and these finds also extended into the more decorative; a single fragment of a polished black shale bracelet was found and, more perplexing, a small bronze object – the function of which has baffled experts.

In the Iron Age there were large numbers of animals on this site; the bones that survive indicating the presence of lots of sheep, cattle, pigs and also horses and dogs. It also indicated extensive animal husbandry and feasting on a very large scale. The midden itself represents the physical remains of these activities.

To add some context to life in the Iron Age for the military volunteers on the project, Iron Age food (using materials that the archaeological evidence illustrated were available in that period – such as barley, wheat, hazelnut or indeed plums at East Chisenbury) was cooked for the team by Caroline Nicolay whilst Ian Thackray trained up participants in the arts of iron smithing. Briony Clifton of the National Trust also demonstrated how the multitude of pottery found on the site would have been made. Some of the more intricate vessels included white inlay decoration. This all helped to demonstrate that the lives of people on the site over 2,500 years ago were complex, vibrant and rich giving the archaeologists of the 21st century a healthy respect for their Celtic forebears.

Iron Age worked bone object, perhaps a comb. Insert shows comb after careful cleaning © Crown

Richard Osgood
Senior Archaeologist
Defence Infrastructure Organisation

Climate Change Resilience across the Defence Estate

Freshwater lagoon at Fingringhoe Ranges following an unusually dry summer, 2017 saw the hottest, dryest spring since records began © Crown

The MOD has been working over many years to understand and react to the challenges of a changing climate. Defence Infrastructure Organisation (DIO) created the Climate Impact Risk Assessment Methodology (CIRAM) to assess establishment risks posed by current and projected impacts of climate as well as extreme weather events on the outputs of MOD establishments and identify actions required to maintain and optimise operational capability.

Recent changes to infrastructure management across Defence provided an opportunity to review current climate resilience practices. A working group was set up to look at augmenting the resilience of the defence estate to climate change, with the aim to pull together a wide range of defence personnel with a concern in both infrastructure climate impacts and defence resilience. The group was chaired at Senior level and membership consisted of representatives from front line commands and supporting organisations who have the responsibility for delivering a safe and secure estate. A number of actions were agreed, to drive forward estate and infrastructure climate resilience in a concerted and coordinated manner, ensuring any risks are reflected in planning and funding decisions.

During group discussions, it became clear that a lot of work is already underway. The following articles demonstrate the breadth of work that is on-going to ensure our understanding of the impacts of climate change remains up to date. This knowledge will support decisions taken on the structure and locations of the estate and underpins investment appraisal conclusions.

DIO reaches landmark 100th Climate Resilience Workshop

Regular readers of Sanctuary Magazine will recall that back in 2014 climate resilience was a featured article. At the time we explained climate change adaptation and resilience and how our CIRAM supported Defence resilience. Since then DIO have continued to apply CIRAM across the MOD estate and in March this year completed the 100th CIRAM assessment! This milestone CIRAM workshop was conducted at Norton Manor Camp, Taunton, home to 40 Commando Royal Marines.

The scope of CIRAM is wide ranging, including but not limited to the built estate, contaminated land, historic assets, and wildlife on site. CIRAM aims to improve the resilience of both site infrastructure and operations, identifying site vulnerabilities such as overheating and potential solutions such as planning for training during heat waves.

To aid the process, it is essential that the CIRAM workshop is attended by a range of knowledgeable site roles that can provide expertise on past and current vulnerabilities and how these have been managed. We have learnt numerous lessons along the way, through the knowledge of such attendees and have continuously improved the CIRAM methodology. Norton Manor, for instance, is a Grade II Listed building country house that now serves as the Officers Mess. Due to the design of the building, the guttering runs through the inside of the building but is unable to cope with current rainfall and therefore causes ingress into the building, leading to expensive

CA process chart © CarillionAmey

sympathetic repairs being required. Due to the listed status of the building it is not possible to fit larger guttering which would alleviate the problem.

A key lesson learnt is that for many of the risks identified further information is needed to make informed management decisions, in particular for those risks where there is not enough evidence to understand how risks may evolve, such as wind storms and heavy precipitation. Examples such as Norton Manor will feed into a strategic analysis of our estate, along with data provided by our Industry Partners and aims to identify real impacts on the estate, costs being generated and how the data compares to the climate projections. The next challenge will be how to use this data to identify critical thresholds across the estate.

Numerous other improvements are being made to increase the robustness of the CIRAM process and ensure climate resilience is embedded across the MOD estate. This includes embedding climate resilience into the Defence Estate Optimisation Programme and future contracts, understanding skills gaps within the organisation and delivering targeted training on climate resilience and supporting service budget holders and sites to annually review and update their Climate Resilience Risk Registers. More specifically we have tasked suppliers with monitoring and recording when reactive maintenance has been triggered by weather events. We have been working closely with CarillionAmey (CA), supporting them

Insufficient guttering on Norton Manor, a Grade II listed building © Crown

Handheld devices being used to record weather impacted damage on the estate © CarillionAmey

to develop a methodology that will help CA and MOD sites monitor these events. This information is now fed into the CIRAM process, and used to inform CIRAM workshops and annual reviews. All these improvements could not have been possible without everyone's collaboration, including DIO colleagues and suppliers. A lot more needs to be done and we look forward to continuing working together to understand and address the challenges ahead.

Louise Buckley and
Begonia Pedreira-Regueira
Climate Resilience Team
Defence Infrastructure Organisation

Innovative weather impact reporting system

Over the past three years CarillionAmey (CA) has been working in close collaboration with DIO to put in place a significantly improved weather impact reporting system. Together, the CA and DIO Sustainability teams have worked to determine what exactly is required, the data format and how best to collate it.

This involved analysing vast quantities of historic response data as well as a review of the information that is recorded by the CA helpdesk. After a thorough study the data revealed that CA's current systems were not up to the task of providing sufficient information; large volumes of weather impact data were likely falling through the cracks.

Some background: CA supports the MOD estate through provision of facilities management and additional works services. Part of the work includes responding to failures, damages and other impacts. The response maintenance process for weather impact jobs works as follows:

When, for example, a window is damaged during a storm the end user will phone the CA helpdesk to report the issue. The helpdesk will then arrange for an engineer to make safe and repair the damage. On job completion they are able to tag "weather impacted" on the recently rolled out tablet system. With this system detailed data can be gathered on the trades that are responding to weather damage, how long they are spending on the repair, the location and much more.

The system has been successfully deployed and high quality data is now being collected. This data is being shared with DIO on a regular basis and is also being fed into the CIRAM process, providing more detail on the types of weather damage that are occurring across the estate.

The CA sustainability team is rolling out further training and communications and awareness of this improved process, to speed its adaptation. This enhanced dataset will enable better understanding of the risks posed by climate change, comprehend the costs associated with weather impacts and be in a much better position to support the MOD in ensuring a climate resilient estate.

Martin Plappert
Sustainability Specialist
CarillionAmey

Yardley Chase – A hidden jewel

Some of the fantastic veteran trees at Yardley Chase © Jeff Blincow

Yardley Chase, Northamptonshire, was formerly a World War II (WWII) ammunition storage establishment and is now primarily a Cadet Training Centre, providing cadets with a unique training area to hone their field skills; only now is the true value of this wildlife gem becoming known. It is proving to be one of the best conservation sites managed by the MOD and it is important that the profile of this site is enhanced. The rail system is long gone, but the storage bunkers and more importantly the surrounding ponds have remained little disturbed in 75 years.

Historically a Norman hunting chase where much of the enclosed woodland was coppiced, now it is a mixture of woodland, pasture and parkland with large areas of valuable neutral grassland and 80 ponds. The wide age range of old and veteran trees within the Deer Park makes for sound ecological continuity; a rarity in a region where the number of country estates has reduced along with the stock of old trees. In the northern wet woodland unit, valuable coppice woodland and important numbers of birch, field maple and common ash exist. This rare woodland blend, with considerable standing and lying deadwood, impacts very favourably on the invertebrate fauna.

Ant beetle *Thanasimus formicarius* © Jeff Blincow

Surveying Saproxylic beetles at Yardley Chase

Saproxylic beetles are dependent upon habitats associated with dead or dying heartwood of veteran trees, or species associating with these habitats, for part of their life-cycle. To build up a picture of the beetle species present, a veteran tree survey was carried out in the Deer Park section of the Site of Special Scientific Interest (SSSI). There has been a continuous history of good management for saproxylic invertebrates at Yardley Chase because the deer park dates back 500 years. A survey began only two years ago and a target of 40 species was set; a total that defines a site as being notable for Saproxylic coleoptera. Humorously, the target of 40 species was easily surpassed within four weeks and became the best recorded site in Northamptonshire within nine weeks. With less than two years of data, 121 species have been recorded. The SSSI is one of the top sites in the region and is already a site of national importance. Large-girth open-grown veteran trees are the key feature at Yardley Chase for supporting this nationally important assemblage. The enjoyment from surveying these beetles has come from the difficulties in finding them. Each species has a restricted life-cycle associating with just one part of a tree. Some with general wood decay, others with heartwood decay, and some with bark, others with sap-runs and then there are those that rush their breeding cycle in the short life-span of the fungal fruiting bodies. Saproxylic beetles are indicators of the continuity of dead-wood habitats in ancient woodlands and recommendations are already being made for the maintenance and enhancement of the habitats on which these species depend.

Amongst other valuable invertebrates recorded is the lepidoptera assemblage which includes nationally significant numbers of wood white *Leptidea sinapis*, at least one colony of black hairstreak *Satyrium pruni*, a recently discovered white-letter hairstreak *Satyrium w-album*, a small colony of heart moth *Dicycla oo* and good numbers of Concolorous *Photedes extrema*. With so many habitats present on the site, a wide variety of fungi has also been recorded, especially those associated with the old trees; most notable amongst these being the oak polypore *Piptoporus quercinus*.

Wood white *Leptidea sinapis* © Jeff Blincow

The site qualifies as a SSSI for several reasons; a notable one being the large population of great-crested newts and some of the ponds are excellent habitat for this protected species including the adjacent assortment of habitats which is perfect for their foraging and hibernation; this population is thought

to be in the top ten in the country. Significant numbers of dragonflies overfly the stonewort filled ponds which support water invertebrate populations as important as any in the region.

All of this valuable knowledge can be used to help formulate the management plan and prepare integrating the cadets' training needs with nature. The realisation that Yardley Chase is one of the most important conservation sites in the Midlands is encouraging indeed; it is a wildlife jewel surfacing from obscurity to take its place at the top table.

Jeff Blincow
Yardley Chase Conservation Group

Restoring the bunker ponds at Yardley Chase

The range of diverse habitats at Yardley Chase has been enhanced by the military's use of the site, which has protected it from intensive agriculture. In particular, an array of biologically-rich ponds are home to a varied population of wetland vegetation including aquatics such as shining pondweed *Potamogeton lucens*, marginal vegetation such as lesser reedmace *Typha angustifolia* and damp loving plants including southern marsh orchid *Dactylorhiza praetermissa*.

Oak polypore © Jeff Blincow

The ponds also support nationally important populations of dragonflies and great-crested newt *Triturus cristatus* and form part of a larger area of regional importance for the diversity of breeding birds.

The ponds were created following the construction of a number of storage bunkers during WWII. The bunkers were located within grassed bunds built from material from the surrounding land, which left large depressions in the ground to form ponds.

One of the many Bunker ponds rich in wildlife © Jeff Blincow

In recent years, some of the ponds have become increasingly overgrown with trees and scrub, causing problems of overshading and eutrophication which can threaten the ponds' biodiversity. This led to Natural England categorising the SSSI as 'Unfavourable'. Since 2014 significant funding has been invested from the Defence Infrastructure Organisation (DIO) Conservation Stewardship Fund to enable Landmarc to deliver the required programme of scrub and woodland clearance to bring the ponds into 'Favourable' or 'Unfavourable Recovering' condition.

Over a period of three weeks, the team cleared willow, coppiced hazel and hawthorn and felled oak, willow and silver birch on selected ponds to provide the required level of open habitat. Initial results have been very positive in terms of water quality improvement and recolonisation by the specialised wildlife associated with these habitats, and will contribute towards MOD objectives for improving the condition of SSSIs on the defence estate. Further pond restoration will continue on site as part of DIO's annual programme of SSSI management to ensure that the quality of these features is maintained and protected for the future.

Stephen Cross
Rural Estate Delivery Adviser
East Region
Landmarc Support Services

Great-crested newt, female © Jeff Blincow

Assuring the Future of Britain's Military **Sites of Historic Importance**

The 11 Group Bunker at the former RAF Uxbridge, now transferred to the London Borough of Hillingdon © Crown

The Defence Infrastructure Organisation (DIO), working in conjunction with RAF Northolt has handed over ownership of two Defence sites of significant historic importance to their local councils. This will preserve their long-term viability for future generations to enjoy.

In 2016, following extensive planning and negotiation, RAF Northolt handed over both stewardship and ownership of two pieces of historic Royal Air Force real estate linked to the Battle of Britain. The 11 Group Bunker, at the former RAF Uxbridge, was transferred to the London Borough of Hillingdon and St George's Memorial Chapel, at former RAF Biggin Hill, was transferred to the London Borough of Bromley. RAF Northolt had parented the sites since the closure of the stations that had housed them in 2011 and 1992 respectively.

While the sites had been closely managed between DIO, RAF Northolt and groups of dedicated volunteers over recent years and had developed into sites of special historic significance, the fact that they were both non-operational assets meant that they had limited investment in their infrastructure. Additionally, specialist expertise and development was needed to ensure that the story of these important sites could be properly preserved and made accessible to a broader audience.

The historic importance of the sites

The 11 Group Bunker, located 60 feet underground, was the command centre for 11 Group fighter operations during the Battle of Britain and played a key role in the Battle's victorious outcome for the RAF. Indeed, Winston Churchill was present in the Bunker on what is now known as Battle of Britain day, 15th September 1940. Witnessing first-hand the RAF's valiant defence of the United Kingdom, it was here that he first uttered the now famous words "*Never in the field of human conflict was so much owed by so many to so few*".

The history of St George's Chapel goes back to 1943 when the idea emerged to create a memorial to RAF Biggin Hill and its airmen and women who fought so valiantly in the Battle of Britain. Three prefabricated huts were acquired and placed together to form the original chapel, for which a commemorative service, unveiling, dedication and placing of the Book of Remembrance took place on Sunday 19th September 1943. The original Chapel survived World War II but caught fire in December 1946 and was almost totally destroyed. Winston Churchill, who retained a strong connection to the unit, was extremely distressed and set about raising funds to build a permanent Chapel through a special appeal. The design chosen was based on the original Chapel and was intended to capture its austerity, simplicity and atmosphere. Private

donations were forthcoming and the building was finally finished and dedicated by the Bishop of Rochester in November 1951.

Handing over the sites

Various models for keeping the sites operational and open to the public under MOD stewardship were discussed in partnership with local councils. However, in 2015, and with the councils able to secure central government funding and provide their own additional investment and specialist support it was becoming apparent that the most effective way to assure their future was to hand over the sites to those councils in their entirety. Both Hillingdon and Bromley councils were extremely forward leaning in developing new proposals in which they would take over ownership and stewardship of the sites from DIO.

Group Captain David Manning hands over the keys of the 11 Group Bunker to the Leader of Hillingdon Council, Councillor Ray Puddifoot on 5th March 2016 © Crown

Thus the detailed work began to prepare the sites for handover. This entailed a raft of work services in order to reduce legacy work for the new owners and the formalisation of documentation and processes that had been used to administrate the sites by the volunteer groups that had put so much work into keeping the sites open; for example the cataloguing inventory items for the sites' museum rooms - which in the case the of Bunker totalled over 7,000 individual pieces - and ensuring that objects of historic value to the RAF were retained by the service. Some documents of historical interest and a bust of Marshall of the Royal Air Force Hugh Trenchard fell into this category. The rest of the items were handed over to the new owners as contents.

What next for the bunker, the chapel and their new owners

Both sites have seen a commitment from their local councils that will assure their long-term futures. Hillingdon Council is investing a further £4.5M towards the 11 Group Bunker with the construction of a high-tech visitor and education centre adjacent to it. For the Chapel, Bromley Council has also been awarded a stage one pass for a Heritage Lottery Fund (HLF) grant of almost £2M.

Recognising both the value of these sites to the nation, and the local council commitment, the Government in 2015 committed a total of £3M of LIBOR funding between the two sites to support their maintenance.

A model for success

Though complex and time consuming, the processes and mechanisms used to hand over these sites to willing local authorities is a success story of how historic sites can be managed smartly and pragmatically in Defence to the benefit of all stakeholders.

The important steps were to firstly recognise the historic importance of the site - that it is worth preserving; understand the benefits and limitations of various management models between the site's stakeholders; collaboratively put together a plan that reassures those stakeholders legally, financially and organisationally; then finally work through the devilish detail of handing over the site, from the actual land itself, to the buildings and their contents.

The double success for the Bunker and the Chapel has provided the MOD with a model of how similar historic sites, with no development potential, can be preserved, understood and enjoyed by future generations.

Sqn Ldr James Tenniswood
Media and Communications Officer
RAF Northolt

Rt. Hon. Boris Johnson MP and the then Rt. Hon. George Osborne MP visit the 11 Group Bunker in 2015 to get an update on the plans for its future © Crown

Pippingford Park CPTA
30 years of bird surveying

A majestic male redstart © Dave Kjaer

Noisy training at Pippingford generally does not start until 0730hrs so although the British Army gets up early the wildlife they share their training grounds with is best heard even earlier and so enjoyment of early mornings is a must for bird surveyors. A small group of volunteers from the Sussex Ornithological Society (SOS), led by long-time lead surveyor Mike Scott-Ham, usually experience many early morning treats when conducting the annual bird survey of Pippingford; 300ha of dwarf shrub heath, broad leaved mixed woodland and parkland type grassland located in the heart of Ashdown Forest in the Weald of East Sussex. Personal favourites include; a late foraging tawny owl emerging from the valley mist calling to its fledglings, the drumming and calls associated with all three British woodpecker species, glimpses of the shadowy movements of common redstart high in the tree canopy, the tail flicking habit of grey wagtails fly fishing on the edge of weirs, and the melodies of tree pipits as they gracefully parachute to perch – any of which are motivation for a 0545hrs start on the designated day in May when the count is conducted.

Each year since 1987 the survey team have walked a fixed transect route that covers the bulk of the training area and recorded all species seen and heard during a five hour period. The methodology involves walking the same transect every year to give a comparative snap-shot of bird populations across the diverse range of habitat types involved. It is this 'purposeful' bird watching that makes bird surveying work so attractive as well as valuable as surveys of this kind provide the data on which the impact of changes in habitat usage and condition can be assessed to help shape future management planning.

Pippingford is currently used by a wide range of military personnel for general training purposes, mainly on foot with limited off-road vehicle movements and no live firing. More recently use has diversified to include non-military outdoor training and weekend recreational events such as survival skills, cyclo-cross and extreme cross country running. Although these events can involve high numbers of people they are relatively infrequent and care is taken to avoid disturbance to breeding ground nesting birds.

There are currently two major management initiatives underway on the estate which are being informed by the bird survey data. The first is a collaborative project with Defence Deer Management and in conjunction with neighbouring land owners; over the past five years a number of fallow deer have been culled to reduce grazing pressure and browsing of woodland.

Deer browsing of woodland has a mixed impact on birds as over browsing removes the under storey which is detrimental to some species, notably garden warbler and dunnock, which our surveys have demonstrated are scarce in Pippingford. But, an open understorey favours other species, notably common redstart and tree pipit, and our surveys record that Pippingford has regionally significant populations of both species – usually over 20 pairs of common redstart and up to 15 pairs of tree pipit.

Secondly, the data has been used to monitor priority heathland restoration

Tree pipit singing on a tree top © Dave Kjaer

to get the habitat into a more favourable condition. A fenced grazing area was established in 2008, since then an average of 30 ponies owned and managed by Sussex Pony Grazing and Conservation Trust have been in residence. The ponies have significantly reduced the density of invasive purple deer grass and this has allowed heathland plants to regenerate but numbers of heathland specialist birds have yet to increase, possibly because the ponies are a bit too destructive of older stands of heather and gorse. However, an additional impact of pony grazing is the way they churn up muddy ground which provides feeding opportunities for waders, notably lapwing, which were recorded on the survey for the first time in 2009.

A scenic misty morning in April at Pippingford Park © Bob Kennedy

The diversity of habitats within Pippingford is reflected in the number of species seen during the surveys with an annual average of nearly 50 species. Additional detailed fieldwork conducted by SOS volunteers for the 2007-2011 British Trust for Ornithology Bird Atlas produced 'probable' or 'confirmed' breeding records for 65 species with a total of 90 species seen in the whole Atlas period. This gives Pippingford an impressive BTO Bird Assemblage Index Score of 70 compared to the guideline Threshold Index of 59 for Combined Woodland and Lowland Heath. This is largely due to the presence of several heathland specialists such as woodlark, nightjar, and Dartford warbler as well as woodland rarities such as lesser spotted woodpecker.

It has been a privilege as well as a thrill to participate in the surveying work at Pippingford over the years especially as the future is likely to be as exciting as the past. In seeking to balance military and commercial use while at the same time providing optimal habitat conditions to retain, and possibly increase, the diversity of bird species, the estate is adopting an integrated approach. For example, annual bird survey data shows low numbers of most heathland specialists but creating pony exclosures within the grazing area could provide ground nesting heathland birds with the density of shrub coverage they need and at the same time provide military users with additional training features. So, with the 30th anniversary milestone of bird surveying at Pippingford reached this May, volunteers look forward to being able to continue to help generate more survey data that demonstrates that a well-run training area is good for birds as well as being a valuable resource for its military users.

Matt Kirk
Volunteer Bird Surveyor
Sussex Ornithological Society

Grazing ponies at Pippingford Park © Matt Kirk

Defence Munitions Environmental Risk Assessments

DM Crombie Jetty looking east © Tom Adie

Defence Munitions

Defence Munitions (DM) receives, stores, maintains and issues the range of General Munitions and Complex Weapons to equip the Front Line Commands and Operations. Munitions and explosives are not generally things you would associate with environmental protection, however…

This article gives an overview of the environmental and conservation issues DM depots have to consider to remain operational and the potential impacts these operations may have on the environment. DM has seven depots in the UK, four in England, DM Gosport, DM Plymouth, DM Kineton and DM Longtown and three in Scotland, DM Crombie, DM Beith and DM Glen Douglas; as well as two smaller Sub-depots in Sennybridge, Fargo and Honington. The depots receive munitions by a number of transport routes, rail, road and sea and supply and receive munitions from all over the world, which they process, maintain and store.

This year a variety of conservation issues have arisen at the depots and although the sites are spread out over great distances, this article sets out to explain how working together improves environmental management regardless of location.

Six of the DM sites within the UK are classed as Major Accident Control Regulation (MACR) sites and as such are required to produce an Environmental Risk Assessment (ERA) that conforms with the specified standard. Major Accident Control Regulations (MACR) JSP 498 is implemented by the MOD as an equivalent regime to the UK Control of Major Accident Hazards Regulations 1999 (COMAH) and its subsequent amendments in 2005 and 2015. Both of these regulatory regimes aim to prevent major accidents involving dangerous substances and to limit the consequences to human health and the environment. The ERA's provide extensive detail on the environment surrounding the DM sites and the potential consequences following a major accident. By assessing these and gathering available data we can effectively plan and put mitigation in place to protect the environment.

Analysing the potential scenarios informs emergency plans and allows sufficient contingency planning to be put in place to respond effectively in the event of a major incident; assessing where to direct spill response teams in the event of a pollution incident ensures a quicker response to contain the spill.

Case Study: DM Crombie

DM Crombie stores and handles significant quantities of hazardous materials, mainly consisting of explosives and has therefore been classified as a TOP TIER site under the MACR regime.

The area immediately bordering the site's foreshore is a Special Site of Scientific Interest (SSSI), Special Protection Area (SPA) and a Ramsar site associated with the Firth of Forth. Torry Bay which lies east of the depot is designated as a Local Nature Reserve, with boundaries extending along the eastern depot foreshore to the jetty. These national and international designations extend to the intertidal areas only, protecting flora and fauna and notably visiting and breeding birds. In addition, large numbers of Atlantic grey seals also feed and pup in the area off DM Crombie. The grey seal pups in November and the young can often be seen basking on the rocky shore adjacent to the depot.

To consider the effects a major accident could have on the surrounding environment many factors had to be looked at. To assist with this, the Department of the Environment, Transport and the Regions (DETR) tables were utilised, these specify the thresholds for a major accident. The DETR tables are used when assessing the potential harm to the environment a MACR incident would cause at varying thresholds of severity.

Data Collection

Meteorology. Data is gathered from the Met Office giving detail on annual temperature, rainfall and mapping the average wind speed. The depot has an anemometer on the jetty to provide details of wind speed and direction to inform activities at the jetty and in the event of an emergency.

Hydrology, Hydrogeology and Tidal Information. Geology maps, borehole distribution and groundwater maps were sourced from the British Geological Society to analysis the geology of the area. Information on the tidal patterns in the estuary, including; spring, neap, low and high are provided. This allows the depot to predict the dispersal of a spillage at the varying conditions as well as establish basking patterns of seals and the probability of birds being present on the mudflats.

Marine Mammals. Seals are known to bask on the foreshore which is outside of the wire but in front of the Explosive Store Houses (ESH). There is a possibility, in the event of an explosion, they could be injured or killed by the blast and/or debris created.

The assessment takes into account the population size of the seals, blast ranges, seasonal variations, breeding patterns and distributions. Distribution of seals and boundaries of seal management areas and harbour seal conservation areas were gathered along with details of pupping.

By looking at this data a risk profile for the seals can be built; knowing when there is an increased population in the estuary due to pupping which, in turn, increases the probability of a MACR event occurring. Knowing where the main population base is and where the pupping beaches are means that in the event of a spillage the contracting clean up team can place protective equipment, such as booms and skimmers, in these vulnerable areas to contain the spill if required.

Bird Species. Several protected bird species visit the estuary for breeding, migration or wintering. These include red-throated diver, bar-tailed godwit, sandwich tern plus wintering birds such as pink-footed geese.

The British Trust for Ornithology website provides bird count and distribution patterns which were utilised to predict the effect on the main bird population in the event of a MACR incident.

Working with SEPA

Scottish Environment Protection Agency (SEPA) provide details of the Forth Area Management Group who oversee conservation issues for the estuary. Through this, DM Crombie is now notified of any activity on the estuary in close proximity to the site. By establishing this contact the depot can work closely with SEPA in the future.

DM Crombie storage area © Tom Adie

Outcomes

Overall the DM Crombie ERA has improved the understanding of the surrounding environment, how the site interacts with it, and shows that with the right planning in place, the depots can operate effectively to support front line commands.

Actions taken forward have allowed the emergency response plans and MACR exercises to incorporate the environmental impacts of an incident. It has also provided contacts within SEPA and coastal management who have an in depth knowledge of the Firth of Forth Estuary and who would assist in co-ordinating the response to a major incident such as a fuel spill. Mitigation measures such as having a tug boat with a spill kit on standby when re-fuelling activities are taking place means that spill kit can be deployed quickly to contain the pollutants as much as possible while the emergency response contract is mobilised. The lessons learnt from the DM Crombie report have been carried forward to be incorporated and examined in future assessments.

The above is a very small snapshot of the many elements needing to be considered when writing an ERA. Environmental management is a matter DM take very seriously and are committed to supporting and developing.

Sian Flaherty
DM Environmental Safety Assurance Manager

Seal basking at DM Crombie Stub pier © Tom Adie

Provision of Bare Ground Patches for Insects on Lowland Heathland Sites

A sunny earth bank and track, ideal habitat for invertebrates at Barossa Training Area © Crown

One of the essential nature conservation attributes of lowland heathland in southern England is that of bare ground, specifically for invertebrates. This was formerly provided by people and their vehicles e.g. carts as people travelled across the heaths, came to tend animals or collect produce from the heaths. Such use was often sporadic in nature allowing reptiles and invertebrates to exploit these areas between disturbance. With the growth of modern human leisure activities provision of such routes for use by both walkers and cyclists on heathlands, as well as the use by heavier forms of modern military non-tracked vehicles has led to their overuse. This means the disturbance is continuous, leading to erosion and the desire to improve track and road surfaces which is undesirable from a conservation perspective. The consequence of this is that targeted conservation action is required to attract reptiles and invertebrates to specific areas away from tracks which are over disturbed. Unfortunately instead of gaining conservation benefits as a by-product of utilitarian use we have to find funding to create and maintain such habitats and therefore have to compete for limited funds.

The provision of bare ground includes not only flat sites but also that of banks and erosion cliffs. Erosion is a naturally produced habitat where water trickles down from the top of a hill to its bottom creating mini-cliff like channels. Many organisations, still see erosion in natural habitats as a cause for concern, when, particularly on lowland heathland sites it is an essential habitat much exploited by wildlife especially on sun exposed vertical cliff-like surfaces. In some cases different insect species exploit flat ground sites compared to vertical sites, so it is the mark of a well-managed heathland site that allows the natural formation of erosion to occur or to allow the excavated provision of both flat and vertical bare ground sites. Such erosion is not desirable when the loosened soil feeds into mires and watercourses. There is still further education to be considered to explain the importance of such features and where and when they are beneficial and when not.

The old English Nature Report No. 511, entitled 'Lowland Heathland SSSIs: Guidance on conservation objectives setting and condition monitoring' and carried through to today in later Natural England publications and advice was that 'bare ground' should be at a cover of "*at least 1% but not more than 10% of the area of the feature i.e. dry heaths. This should consist of firm, sunlit, horizontal, sloping or vertical, exposed bare ground*". Also for insects and invertebrates it needs to be situated in a mosaic with the most extensive and characteristic dwarf shrubs that occur on lowland heathland, namely ling, *Calluna vulgaris*, cross-leaved heath *Erica tetralix* and bell heather *Erica cinerea* for best results. In turn the best situations are when the bare ground is created in patches, in shapes extending to a minimum of 3m x 3m up to a maximum size of 6m x 6m within either the pioneer, building or mature phases of heather growth. The narrow patches often created for sand lizards tend to shade over too quickly which inhibits their adoption by insects.

A former bare sandy track on the Aldershot military training area now surfaced to a 3m width, the former habitat shown at the left bank with a natural grey soil colour, remains as a bee and wasp nesting site © Stephen R Miles

A whole community of insects of at least 300 species, but particularly solitary wasps and bees and their fly and beetle parasites will benefit from such provision in southern England. Due to plant succession new patches will need to be excavated for the insects on average every five years, as the heathers or grasses re-grow and cover over the patches. These patches may be excavated by hand or mechanical digger but need to be done between November and mid-February each year, i.e. before woodlarks establish their breeding territories. The local military commander and other stakeholders should have agreed this through the Integrated Rural Management Plans (IRMP's) and the work duly consented by Natural England if on designated sites. It is essential that any site of archaeological or historical value is also avoided which the IRMP process delivers. If the site has had conifers or other trees growing on it amongst the heather community it is essential to remove the depth of any darker soil humus layers to expose the white or greyish mineral soils beneath, if not done these humus layers will retain water and will remain damp thus not providing the required dry bare ground.

Another important element in the creation of bare patches is the decision of where the earth bank containing the turves and soil that are removed to create the patch are to be located. The excavated turves should be laid upside down in a south or west facing position at the edge of the bare patch. The excavated soil should then be placed on top of these turves, as this will allow the Calluna/Erica to regrow back successfully. With the soil covering as on this site in Wareham Forest (below) excavated by Forestry Commission staff,

An excellent demonstration of good practice of a south facing bank with an excavated bare patch created in 2011 in Wareham Forest. Note the successful regrowth of the *Erica cinerea* and *Calluna vulgaris* through the soil of the bank. Photograph © Stephen R Miles

The Potter wasp *Eumenes coarctatus* about to insert a moth caterpillar into the neck of a pot it has constructed from sandy clay often to be found and scraped from the bare ground of such patches by these solitary wasps © John Walters

the bank as a bare ground site has been equally as successful, with many species of solitary bees and wasps occurring, having dug their nest holes in it. This hillside which is south or west facing has the optimum exposure to the sun.

A number of bare patches were created by the writer with the help of contractors working for the Hampshire and Isle of Wight Wildlife Trust in collaboration with MOD on the heathlands at Aldershot military training area that are part of the Thames Basin Heaths Special Protection Area between 2008 and 2015. One of these was in a slightly wetter area and several specimens of the Potter wasp *Eumenes coarctatus* benefited, as the underlying sandy clay was exposed, enabling them to scrape the soil from these areas to use in the nest pots that they construct and attach to gorse or heather plant branches nearby. It is therefore also important to not only choose dry sites but also wet heathland sites for patch creation. In the latter situation of wet sites, marsh clubmoss *Lycopodiella inundata*, and round-leaved sundew *Drosera rotundifolia* and oblong-leaved sundew *Drosera intermedia* plants may often benefit too.

In a previous article published in Sanctuary magazine in 2011, the Biodiversity Action Plan species, the mottled bee-fly *Thyridanthrax fenestratus* and its host wasp *Ammophila pubescens* was the primary beneficiary and target of the bare ground creation in southern England. This bee-fly occurs at only 67 separate sites in just twenty-six 10km squares, within the counties of Berkshire, Sussex, Surrey, Hampshire and Dorset. But there is the potential for a number of other less common or actually scarce species of bees, wasps, flies, beetles and bugs to benefit from bare patch provision on both lowland and upland heathland sites throughout the country. Provision of such bare patches should be planned and costed as an essential part of each lowland heathland site's management plan for the excavation of different patches every five years. If done this will become a conservation gain and will help these sites reach favourable conservation status.

Stephen R Miles FRES
Conservation Group Member

The solitary wasp *Ammophila pubescens'* carrying a caterpillar of the beautiful yellow underwing moth *Anarta myrtilli* which itself feeds at the tips of plants of ling. This wasp in its pre-pupal form is the host of the mottled bee-fly *Thyridanthrax fenestratus* © Steven J Falk

New Pine Rows at Stanford Training Area

An established row of Scots pine used as a military training feature © Landmarc Support Services

Pine rows are a distinguishing feature of the flat, arable, Suffolk and Norfolk Breckland landscape, known locally as 'The Brecks'. They date back to the early 1800s when it is thought that the trees were planted as hedges to provide an important windbreak for crops in the adjacent fields. In the early 19th century the Breckland landscape was one of open grasslands and heaths, shifting sand dunes and rotational cultivation. Pine rows are defined as 'single rows of Scots pine trees *Pinus sylvestris* which exhibit varying degrees of twisting and contortion'. Some are still managed as hedges but most have long since grown into lines of mature trees.

In a 2010 study by Tom Williamson from the University of East Anglia, entitled: '*T*he Breckland Pine Rows: History, Ecology and Landscape Character', it was concluded that "*The pine rows are an important and characteristic feature of the Breckland landscape and every attempt should be made in the future to protect and enhance surviving examples, and to establish new ones*."

Stanford Training Area (STANTA) in Norfolk forms a significant part of this distinctive Breckland region, so a major project has been funded by the Defence Infrastructure Organisation's (DIO) Conservation Stewardship Fund to help develop new pine rows across some open areas of the training estate. Project managed by Landmarc Support Services and supported by the Farming and Wildlife Advisory Group, some 850 Scots pine trees have been planted at 2m intervals on a 1,700m stretch along Smugglers Road, in the North of the training area. The trees create a boundary between the road and the adjacent land. Protective measures include, a fence between the trees and the field, tree guards to prevent damage from rabbits and hares and biodegradable mulch pads for weed suppression to avoid the need for herbicides or weed killers.

The biodiversity value of the pine rows is significant. Firstly, the rows generally come with an associated strip of tussocky, ungrazed grass, which provides a home to a range of species including several rare moths and important populations of beetles, including the nationally rare species *Ophonus laticollis*. They are also favoured by skylarks, grey partridges and other farmland birds as well as barn owls and bats. The 2010 study also suggests that they serve as 'important wildlife corridors, linking larger areas of woodland and unimproved grassland'.

Secondly, the wind breaks provided by the trees help to protect local farmland by alleviating the effects of strong winds across the dry, sandy soils that are typical of the Brecklands. Wind still remains a particular problem in the Brecks because it can affect crop growth rates and damage plants, leading to crop to failure.

It will take some 15–20 years until these new trees are fully established, more than 40 until they are mature, but planting these first new pine rows on STANTA is a step in the right direction towards preserving this historical landscape for future generations. We hope there will be more to come.

Stephen Cross
Rural Estate Delivery Adviser
East Region
Landmarc Support Services

A row of newly planted Scots pine © Landmarc Support Services

Without a Trace
Safeguarding the Defence Training Estate

Without a Trace main topics © Crown

Without a Trace is a new Chief Environment and Safety Officer (Army) (CESO(A)) sponsored video which will be used during briefs before exercises on the Defence Training Estate (DTE). It is mainly focussed on the need for good environmental protection practises before, during and after an exercise.

Britain's armed forces require safe, sustainable training areas to prepare properly for operations. These areas are there to help deliver military capability. Without them our operational readiness and effectiveness will be compromised. To ensure their availability 24/7, 365 days of the year, training areas are carefully managed and all training operations are planned in detail. It is important for users to understand how all this works so they can play their part in making sure our training areas are available now and in the future. As well as careful management and planning users need to recognise that they are custodians of the land they train on and that the MOD share it with the local community wherever they are in the world. Users need to be environmentally and culturally aware – or our forces will have nowhere to train! Both the military and the public have a responsibility to observe training area access restrictions and ensure they are complied with.

This new video is aimed at military users of the DTE of all ranks. It highlights the correct procedures and good practises to be used during the life of an exercise to ensure that the environment is respected by training units and that we leave it 'Without a Trace'.

Working directly to CESO(A), Amec Foster Wheeler and its sub-contractor Jump (GB) Ltd, were tasked with production of the video. This team had previously produced several other videos for the Army.

The 1st Royal Regiment of Fusiliers agreed to star in the video as well as several MOD training, conservation and safety subject matter experts. Filming took place at several locations close to Tidworth Garrison.

Without a Trace can be viewed on Youtube's British Army Safety channel – www.youtube.com/user/BritishArmySafety.

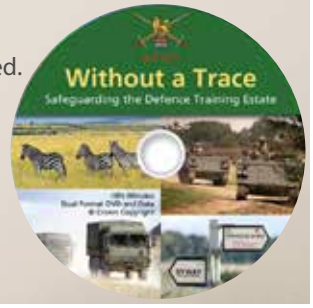
Simon Morriss
SO2 EP, Chief Environment and Safety Officer (Army)

Culture and heritage includes:
- Working in partnership with local communities.
- The balance of public and military access.
- Importance of only using allocated areas.
- Land ownership and local farmer awareness.
- Archaeologically important areas.
- Local knowledge of range staff.

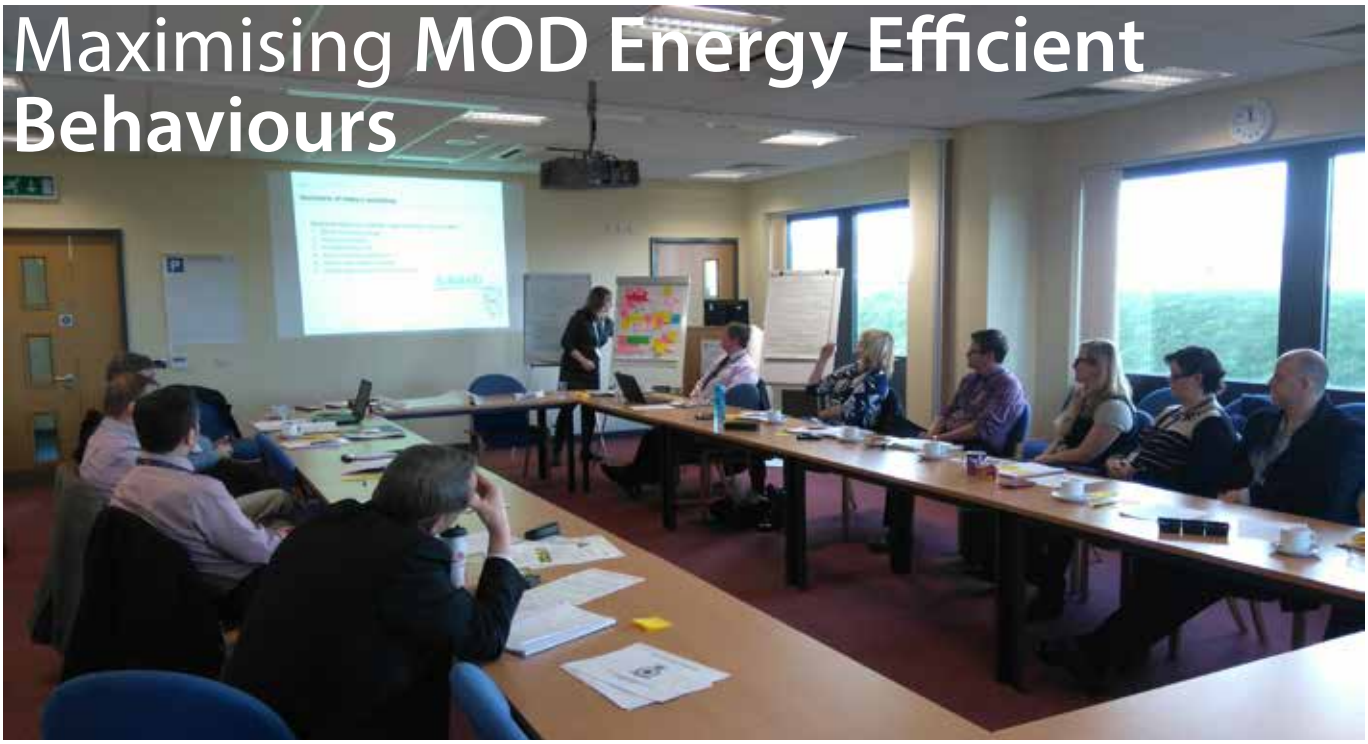
Safety includes:
- Weather and climatic conditions.
- Dangerous flora and fauna.
- Responsibilities to other users of the areas.
- Vehicular activity.
- Dealing with members of the public in restricted areas.
- Ammunition and pyrotechnics.

Environmental impacts include:
- Environmentally sensitive and designated areas.
- Importance of local knowledge when training overseas.
- The MODs positive impact on the environment.
- Pollution prevention.
- Waste management.
- Fire control.
- Correct procedures when digging.

Policies and practices include:
- How training is planned and managed.
- Liaison with training area staff.
- Pre-exercise reconnaissance.
- Range Standing Orders.
- Daily Range Summaries.
- Training Area Aide Memoire.



Maximising MOD Energy Efficient Behaviours



A special working group looking at Behavioural Change © Dstl

Many of us just do not realise, or choose not to engage in the true running costs of the support systems around us i.e. the lighting, heating, cooling, the appliances and powered tools we use in our everyday operations. At approximately 11 pence per kW/h, the cost of excess energy use across the MOD is significant, running into millions of pounds a year.

Steve Perry Defence Infrastructure Organisation (DIO) Area Utilities Manager (AUM) says "*As an AUM for DIO I visit buildings across the estate and have found vast outbreaks in what I call 'energy blindness'. Energy blindness can affect people from all walks of life and touches all genders, ages and shows no barriers to religions/ ethnical persuasions and personal backgrounds. There is a broad spectrum of tell-tale symptoms which I have been able to identify, diagnose and share, with an aim to changing these imbedded behaviours over time*".

One of the initiatives from the work Steve and members of the Defence Utilities Group have undertaken is the establishment of a special working group looking solely at 'Behavioural Change', who meet on a quarterly basis. The group has looked at the business areas and identified many key opportunities that could be changed and improved to help personnel to grow the necessary vision to combat energy blindness. These include (but not limited to) policy, training, intervention techniques and incentivisation programmes.

Additionally, MOD tasked Defence Science and Technology Laboratory (Dstl) and BAE Systems to look into the psychological aspects of the problem and their findings showed that behaviours can be changed using a tried and tested scientific methodology called the COM-B Model. The report below explores this model in more detail.

Steve Perry
DIO Area Utilities Manager

Avoiding the road paved with Good Intentions . . .

The Defence Science and Technology Laboratory (Dstl) commissioned research to investigate how the MOD can reduce energy expenditure through an improved understanding of energy behaviours and behaviour change. The Maximising MOD Energy Efficient Behaviours (MMEEB) team, made up of a collaboration of Dstl and industry partners BAE Systems, Trimetis and Bright HF, developed the FISH approach, colloquially known as 'Future Interventions Start Here', to ensure that interventions are not implemented in response to energy issues on an ad-hoc basis (Anderson *et al*, 2016). A literature review conducted by the team identified many occasions where behaviour change interventions were introduced to achieve a strategic goal without considering the key psychological drivers of the behaviour or the potential counterproductive reactions of the intended audience (Anderson *et al*, 2016). Indeed, there were a number of examples that included what Eccles (2012) light-heartedly called 'ISLAGIATT', standing for 'It Seemed Like A Good Idea At The Time'.

These 'good ideas' are generally formulated without undertaking a systems or holistic analysis of the situation and before the context in which the behaviour is being conducted is fully understood. In these circumstances, the intervention may work but it might equally fail to achieve the desired result or even introduce negative behaviours because the other interventions do not address the key psychological drivers of the behaviour.

The FISH approach is a systematic process based upon the Behaviour

The FISH system © Dstl

Change Wheel (BCW) (Michie *et al*, 2014) and associated Capability-Opportunity-Motivation=Behaviour (COM-B) model that can be applied by energy practitioners at all levels. The BCW was developed by combining the common features of 19 behaviour change frameworks and linking them to the model of behaviour.

To ensure that the development of future interventions begin with a systematic review of the issues, the process was represented graphically as a fish. A fish was selected as the graphical representation because it is memorable and it ensures that the process starts at the nose, broadens out during the body, and that users do not leap straight to the wide tail of interventions where ideas are generated without sufficient understanding of the behaviours or context (i.e. ISLAGIATT).

FISH is a simple and easy to understand approach to encourage better specification of interventions and work towards a common lexicon for energy efficiency activities. It helps policy makers and practitioners identify the process of change that interventions will support by clearly identifying what needs to change in order to make the target behaviour more likely to occur.

The COM-B is the model of behaviour that sits at the heart of the FISH approach and one that is broad enough to be applied to most behaviours in almost any setting (Michie & West, 2013). It can also be used retrospectively to identify shortcomings of existing behaviour change interventions and to highlight why interventions have been successful.

The COM-B model describes the components that influence behaviour and demonstrates the relationships and interdependencies between capability, opportunity, motivation and their requirement for behaviour to occur:

- **Capability**: The person or people concerned must have the capability, in terms of physical strength, knowledge, skills and stamina to perform the behaviour;

- **Opportunity**: There must be the 'opportunity' for the behaviour to occur in terms of a conducive physical and social environment. For example, it must be physically accessible, affordable, socially acceptable and there must be sufficient time to complete the behaviour; and

- **Motivation**: There must be sufficient strong 'motivation': i.e. they must be more highly motivated to do the behaviour at the relevant time than not to do the behaviour, or to engage in a competing behaviour.

To test the FISH approach and the COM-B model, a case study was conducted that concentrated on developing energy efficiency savings in a complex, three-storey, multi-use MOD building at Catterick Garrison. The focus was on switching off equipment (IT and non-IT) and lighting, over a four-month period. The objectives were to: understand the energy behaviours and their specific context; identify appropriate behaviour change interventions; design and implement interventions using best practice principles and measure the outcomes. The MMEEB team worked collaboratively with the AUM, Building Custodian, Catterick Garrison stakeholders and personnel to understand the unique context of this building and to develop and implement the interventions. Those chosen to be implemented included: stakeholder engagement; winning support from senior management; identifying effective feedback and information, and dispelling 'IT myths'. In addition, a variety of measures were adopted to provide feedback to building users and to evaluate the case study outcomes, including; pre and post-intervention surveys, meter readings and observational audits.

The findings from the case study demonstrated average electrical energy savings of 19% over the four-month period which exceeds MOD targets, and also translated into meaningful financial savings. Overall, the interventions resulted in a significant change in awareness, attitude and behaviour change, as well as energy use and financial savings. A number of recommendations were made for similar future behaviour change interventions, how to sustain these behaviours in the longer term and how to scale-up these savings across the wider MOD estate.

The research concluded that the FISH approach is scientifically robust, easy to understand, helps uncover important contextual factors, encourages better specification of interventions, and supports a common lexicon for behavioural energy efficiency activities. More importantly, it assists policy makers and practitioners to identify the potential behaviour changes that interventions will support by clearly identifying what needs to change in order to make the target behaviour more likely to occur.

Work will continue to progress; a collaboration with NATO is underway to test the process in an operational environment and further partnership working with DIO to produce a training course which will help align behaviour change initiatives with ISO 50,001 (Energy Management Systems - Requirements with guidance for use).

Jennifer Doran
Dstl Technical Partner

Karen Craddock
Dstl Project Manager

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Remember to turn off lights when not in use © Crown

Bourley and Long Valley SSSI
Turf Stripping Project

Oblong-leaved sundew © Bob Chapman

Situated within the Home Counties Training Area and part of the Thames Basin Heaths Special Protection Area, Bourley and Long Valley Site of Special Scientific Interest (SSSI) is one of the most important lowland heathland sites in Southern England for military training, ecological habitats and species.

Hampshire and Isle of Wight Wildlife Trust, in partnership with Landmarc and Defence Infrastructure Organisation (DIO), manage the area through a Higher Level Stewardship Scheme, ensuring that the site's conservation objectives are met and that it is progressing towards Favourable Condition according to Natural England's classifications.

As well as grazing, scrub clearance, burning, mowing and bracken management, bare ground creation has been an ever-present form of management across the site. The most recent large-scale project was carried out in 2014, whereby 99 patches of bare ground were created in a wide variety of shapes and sizes, with the aim being to diversify the species present, the habitat structure and provide new opportunities for species to re-colonise.

The work was carried out by an excavator under close ecological supervision. The surface soil was gently peeled back to a depth where the root matter was gathered up and the spoil piled loosely to one side. The depth of the scraping is crucial to success when targeting plant species. Too shallow (1-2") and the remaining root mass will just sprout once more with a flush of grass and the bare ground will be colonised by the same plants that were there previously. Too deep (5-6") and the bare rock, sand or gravel underneath will be exposed, which will not have any seeds within it to germinate.

The locations of the bare ground patches were in areas where the existing plant communities were mono-cultures, i.e. purple moor grass or bracken dominated areas. Some small forestry drains were widened and blocked to create shallow pools, areas recently cleared of scrub were exposed and beds of deep pine needle litter were all worked upon.

The bare ground patches were monitored 12 and 36 months after completion, using the same methodology by a local ecologist, Chris Hall. When combined and compared, the results show clearly that the project was a great success. Overall, across the two years of surveying, a total of 2,078 botanical records were created for the site, of which 1,347, or 65%, were of heathland species which were the primary targets at the start of the project. This confirmed that the dormant seedbanks had indeed been hit across all the scrapes.

In 2016, there was an average of 14.5 heathland species recorded on each new patch of bare ground, ranging between 4-23 species per scrape. This was an increase on the earlier survey of 9.4 species per scrape average, with a range of 3-18 species per scrape. Analysing the results further shows us that 22 of the scrapes had seen a doubling of heathland species recorded upon them between the two periods of surveying. In fact, all bar five of the sites had seen a further increase in the number of species and none had seen a decrease. This clearly shows that some heathland species are quick to germinate but others take a little bit longer.

Across the two years, 19 of the heathland species recorded were of considerable importance due to the status of their populations in both national and regional contexts. The most significant national records were two new populations of marsh clubmoss *Lycopodiella inundata* which is classified in Great Britain and England as Endangered. Other significant records included dodder *Cuscuta epithymum*, oblong-leaved sundew *Drosera intermedia*, cotton-grass *Eriophorum angustifolium*, lesser spearwort *Ranunculus flammula* and lousewort

Pedicularis sylvatica, all of which are classified as Vulnerable. A further 13 other species were recorded which are classified as Near Threatened.

In terms of regionally important records, arguably the most important discovery was that of the ivy-leaved bellflower *Wahlenbergia hederacea*. Described as 'close to extinction' in North Hampshire in recent county-wide surveys, the new population was found in the locality of a long extinct record of the plant from 1884. This gives a clear indication of the longevity of some heathland species seeds which can lie dormant for long periods, yet still remain viable.

This table summarises the results	2015	2016
Total all species	94	128
Total heathland target species	47	65
Great Britain Red List	1	3
England Red List Endangered	0	1
England Red List Vulnerable	3	5
England Red List Near Threatened	11	13
Regionally Uncommon	18	24
Tree and shrub species*	10	13

*excluding broom, gorse, alder buckthorn and dwarf shrubs

In conclusion, the results provide us with empirical evidence to back up initial thoughts that it was a great success on all fronts. Areas previously recorded as mono-cultures are now places of structural and species diversity. As well as the bare ground having been colonised by heathland plants species, a whole host of other fauna has also benefitted from the works including birds, insects and reptiles.

Cotton grass © Darin Smith

On all of the sites where the bare ground was created, grazing is in place. This constant presence of livestock will ensure that the scrub establishment and re-growth will be slowed down and that the faster growing grasses will also be kept in check. However, grazing cannot prevent the eventual full re-colonisation of the new features by grasses, shrubs and scrub, therefore in the long run a programme of bare ground creation should be planned indefinitely. Ideally, projects such as this should be carried out every 3-5 years, with the areas created being new patches of bare ground as opposed to re-visiting previously scraped areas. In sites where grazing is not present, the scrub and grasses will re-establish their dominance more quickly and therefore such projects should be considered every 2-4 years.

In terms of monitoring any future projects the results of this survey show that rather than surveying the sites twice in three years, at a time where finances and resources are constantly being put at risk, once in three years would probably suffice.

This project, and the successes it gave to the site, would not have been possible without the support from partners within DIO and Natural England so much appreciation goes to them.

The author would also like to acknowledge the input of Chris Hall into the historical monitoring of the SSSI and input into its management over the years. Unfortunately, Chris Hall died suddenly of cancer, not long after submitting the second set of survey results. This project would not have been possible without him.

Elliott Fairs
Reserve Manager
Hampshire and Isle of Wight Wildlife Trust

Marsh clubmoss © Hampshire and Isle of Wight Wildlife Trust

The Ancient Akrotiri Project
Dreamer's Bay and its Environs

Late Roman port building under excavation April 2017. This had almost certainly been flattened by an earthquake © Simon James

RAF Akrotiri is a UK Sovereign Base that provides support to British Forces Cyprus and protects Britain's strategic interests in the region. The authorities however also work tirelessly to protect the important archaeological remains on the RAF Station through a programme of surveys, recording and, where necessary excavation.

Dreamer's Bay is on the southern coast of the Akrotiri peninsula (akrotiri meaning 'promontory'). The peninsula is a unique and exceptionally well-preserved block of coastal land, famed for its wildlife. It also contains extensive and important archaeological remains, most famously the Aetokremnos site with pygmy hippo bones and the earliest evidence of human activity on Cyprus dating to 12000BP.

The southern coast consists of high cliffs or very steep eroding slopes except for one area about 600m long in the west, where a broad area of lower-lying land projects into the sea. Here, around Dreamer's Bay, the shoreline stands nowhere more than about 5m above sea level, with eroded rocky ledges and inlets, some of which have accumulated tiny sandy beaches. Nowadays Dreamer's Bay is used by personnel serving on RAF Akrotiri as a favoured spot for bathing, barbeques and scuba diving. But 2,000 years ago the sheltered bay formed a relatively deep natural anchorage for ships plying their trade in the eastern Mediterranean, its use confirmed by the ancient artificial breakwater, anchors and other archaeology recorded on the sea floor.

This part of the southern coast has been protected by its location within the UK RAF base security perimeter, but in an area away from the main airfield complex and residential zone. But Dreamer's Bay, for all its beauty and seclusion is under threat. Its location on the coast and the soft sandstone bedrock has resulted in erosion and the wall foundations of ancient structures are visible in wave-scoured surfaces and cliff edges eroding into the sea. These remains have been the target of three campaigns of archaeological investigation conducted by the University of Leicester School of Archaeology and Ancient History in conjunction with the University of Southampton and, at times, with Operation Nightingale.

Remains of masonry buildings along the shoreline at Dreamer's Bay were first exposed c.1973-4 during heavy rains. By 2015, at the start of the Ancient Akrotiri Project, the remains visible on the ground surface comprised masonry wall foundations and scatters of pottery and other material at various points traced for more than 500m along the east to west shoreline. Recent excavations have shown that the structural remains along the coast at Dreamer's Bay are more extensive and varied than originally thought. Simple rectangular warehouses are the most common type of structure although other types of buildings with a more complex groundplan are also present. Copper alloy nails and complete storage vessels from one particular building may point to the Roman equivalent of a ships chandler or supply shop. Initial examination suggests a similarity between a vessel at Dreamer's Bay found crushed under a fallen wall and that from the 'earthquake house' at nearby Kourion. That this, and some or

all of the other Dreamer's Bay shoreline buildings may have been destroyed in the same earthquake as Kourion during the 360s AD, is a hypothesis to investigate through recovery and analysis of more stratified finds.

On top of a hill overlooking Dreamer's Bay to the north, structural remains had reportedly been accidentally revealed by training soldiers creating a sangar in the 1980s. Prior to 2010 Buffalo University, USA, undertook initial investigations of these remains which proved to comprise part of a room of a substantial masonry building on the crest of the hill. With plastered walls, high quality flooring, ceramic tile roofing and an enigmatic semicircular structure which might be a small tower or perhaps spiral stair foundation, the building was clearly of some importance. The site is also surrounded by substantial piles of large stones cascading down the hill slopes which, as Eleni Procopiou of the Cyprus Department of Antiquities pointed out, could attest defensive walls. The location of the site is not the highest point in the area, but the one which affords the best viewpoint overlooking the sea, commanding the horizon from Limassol Lighthouse near Cape Gata in the east, right around to Cape Zevgari to the west, to Kourion in the north and as far as Pissouri Bay in the northwest. The hilltop remains appear to be of broadly similar age to the coastal buildings, i.e. late Roman to early Byzantine, but as yet more precise dating evidence is lacking.

A spin-off from the archaeological work has been the construction of a small car parking area for Station personnel and their families who use the area for recreational purposes. The bollards are designed to have a minimal visual impact on the site but at the same time prevent cars from accidentally tracking over the archaeological remains. It is also planned to erect some interpretation panels in the car park to explain the site to visitors. The project has also included visits to local schools by specialists on the digging team and establishing Open Days to the excavations, where visitors could examine artefacts and meet the team members.

The Ancient Akrotiri Project continues to reveal, interpret and help preserve the remarkable archaeology on RAF Akrotiri and we are delighted to have been selected as Runners-Up in this year's Sanctuary Heritage Awards.

Future fieldwork is proposed at Dreamer's Bay and also closer to the centre of the RAF station…. so watch this space for news of further archaeological discoveries on RAF Akrotiri in the years to come.

Showing a partially reconstructed wine jar from the port buildings to visitors from the Sovereign Base community during the Open Day at Dreamers Bay 2017 © Simon James

Late Roman port building being eroded by the sea, excavated by University of Leicester students and Operation Nightingale participants in 2016 © Simon James

Professor Simon James
School of Archaeology & Ancient History
University of Leicester

***Acknowledgements**: The Ancient Akrotiri Project relies on support from numerous organisations and individuals and the project team would like to express its gratitude to the UK Sovereign Base Areas Administration and the Republic of Cyprus Department of Antiquities for enabling the fieldwork to take place. We are especially grateful to the Honor Frost Foundation, the Council for British Research in the Levant and the Society for the Promotion of Roman Studies for grant funding which allowed the work to go ahead. DIO and RAF Akrotiri staff facilitated many aspects of the work. Defence Archaeology Group, Operation Nightingale, the University of Southampton, the WSBA Archaeology Society and, last but not least, the digging team of the University of Leicester Archaeological Services rose to the challenge.*

A Matter of Holes and Ditches
New Archaeological Discoveries at Larkhill

Hengiform - the henge located within Larkhill East showing the ring ditch and enclosing circle of post holes, measuring 16m in diameter © WYG/Wessex Archaeology

Graves and henges dominated archaeological work in advance of new Service Family Accommodation (SFA) at Bulford (see Sanctuary 2016), Larkhill has also seen exciting discoveries as part of the Army Basing Project. Some discoveries are helping to rethink the Stonehenge landscape, while others revealed details of World War I training.

Prehistoric archaeology might be expected on a site so close to Stonehenge, and excavations at Larkhill have revealed more about this ancient landscape. A small henge with a circular ditch enclosed by a ring of large postholes was found in the east of the site. It is very similar to others identified during recent geophysical surveys across the Stonehenge World Heritage Site but not excavated. Other prehistoric features have been found across the centre of the site, including an Iron Age (850BC – AD43) farmstead, with the remains of several small round-houses, and burials from the Bronze Age (2000BC – 850BC). One such burial included two skeletons that appear to have been interred in a pit marked by a large wooden post created from a tree trunk that probably acted as a landmark. Nearby, a number of large pottery urns contained cremated human bones from the Middle Bronze Age; this group probably came from a barrow (burial mound) that has lost its earthen mound.

Excavation of a series of short ditches on the western edge of the site identified part of a Neolithic causewayed enclosure. These enclosures served as settlements, meeting places and stock enclosures; some were even used to expose the dead to decay, as was the case at Robin Hood's Ball north-west of Larkhill. Only a small part of this enclosure was investigated; the rest is preserved beneath garrison land, but the area excavated was revealing. The enclosure is formed of short ditches forming a ring, with causeways running between each one. The terminals (ends) of individual ditches defining causewayed enclosures were often the focus of activity, and Larkhill was no exception. In one terminal, pieces of human skull had been laid on the bare chalk, while a flint arrowhead was unearthed in another. Part of a saddle quern, used to grind grain, was found close to another ditch terminal.

The quern provides evidence for agriculture during a time of crucial change, when our ancestors were shifting from a hunter-gatherer lifestyle to farming, with domesticated animals and crops. The enclosure has been dated to 3,650 –3,750BC, making it some 600 years older than Stonehenge. The age of the Larkhill causewayed enclosure and Robin Hood's Ball suggests that they were pioneering monuments in the developing ritual and ceremonial landscape around Stonehenge. This picture of developing monumental activity is reinforced by an alignment of postholes cutting the enclosure. These posts are aligned north-east to south-west and line up on the Midwinter setting of the moon at the time of Stonehenge.

WWI Trenches

Siegfried Sassoon wrote that World War I was "*a matter of holes and ditches*" and the traces of many such features can still be found on Salisbury Plain. SFA Larkhill once resembled the battlefields of northern France, with opposing chalk white trench systems separated by no-man's-land. Evidence of the level of realism in training included over 100 exploded grenades, as well as tins for food, tobacco and foot powder, and bottles for brown sauce

The entrance to a dugout from one of the trenches © WYG

and Camp, a forerunner of instant coffee. These objects show that soldiers were spending days and nights in the trenches, eating the same food as they would on the battlefield, even though their camps were nearby. This picture is confirmed by Australian accounts describing miserable conditions in these very trenches. Training was not restricted to the surface, with subterranean chambers (dug-outs), as well as passages where soldiers trained in mine warfare. Tunnels extended beneath no-man's-land from each set of trenches. In Flanders, the intention was to lay a large explosive charge beneath the enemy and destroy their defences, while on Salisbury Plain, the soldiers learned how to mine and, crucially, how to use listening posts to detect tell-tale noises of enemy miners working towards them.

The tunnels could not be entered as they were unsafe, so a combination of geophysical survey, laser scanning and photography was used to create a full record for the project designers and site engineers, as well as the archaeologists. The chalk also provided a perfect writing surface and soldiers left graffiti underground; many names came from Australian soldiers, reminding us of the thousands of Anzacs stationed around Salisbury Plain during the Great War. Names, units, places of origin and other messages were recorded; Privates Humphries and Rhodes served in 4th Battalion, the Wiltshire Regiment, digging tunnels and trenches, while, on 22nd July 1917, the two Halls brothers described themselves as "*semper fidelis*" meaning 'always faithful'. J. Walker wrote that he was Motor Transport, Army Service Corps, demonstrating the radical shift from horse-drawn to mechanised transport during the war. Meanwhile, fourteen Australian soldiers recorded themselves as 'Bombers' (specialists in grenades), including Lawrence Weathers. In 1918, Weathers won the Victoria Cross for capturing a German machine gun post using grenades, employing skills learned at Larkhill. Meanwhile, Private Fleming wrote his name sometime before going Absent Without Leave, only reappearing in 1920, safely home in Australia.

UAV image showing a section of the training trench system prior to excavation. The zigzag plan was intended to reduce blast damage from enemy shelling © WYG/Wessex Archaeology

These remains shed a light on the past, build a sense of place and add historical roots to the new Army Basing developments. The trenches have already formed the focus of a Service of Remembrance held on 1st July 2016, commemorating the Battle of the Somme; Soldiers from the garrison, SFA team members, children from Larkhill School and others gathered to remember men who fought on the Somme and trained at Larkhill. This service underlined the ethos of the project - working together to support the Service Family while respecting their heritage. At Larkhill the partners included WYG, Wessex Archaeology, Aspire, Bactec-Dynasafe, Gable, Cundall and Sirius, all supporting Defence Infrastructure Organisation. Wiltshire Council's Archaeology Service support has also been critical in securing necessary works and helping us deliver the right outcomes for both past and future.

Martin Brown
Principal Archaeologist
WYG

Preparations for the Somme commemorations on site at Larkhill © Drumbeat/Meeke

Mud, Mines and the MOD
Making Space for Nature and HMS Queen Elizabeth

The arrival of HMS Queen Elizabeth in Portsmouth Harbour © Graham Horton

The arrival of the new HMS Queen Elizabeth aircraft carrier into Portsmouth Naval Base hit the headlines in August 2017. Detailed design work and environmental assessments began in 2002 when, following an extensive Base Porting Study, Defence Ministers announced that two proposed new aircraft carriers should be based in Portsmouth. Over the intervening period many hundreds of people have worked on the project, including the military, civil servants, consultants and regulators. This article combines the reflections of four of those who were most closely involved in the environmental assessments; and who - like so many others – were in Portsmouth on the day, watching with immense pride as the carrier sailed into her new home.

Early Assessment and Engagement

The initial Base Porting Study had identified that the Portsmouth Harbour approach channel, berth pockets and turning circle would have to be dredged wider and deeper; and that the wharfs and jetties would need to be strengthened. In 2003 Defence Infrastructure Organisation's (DIO) predecessor Defence Estates commissioned Royal Haskoning (now Royal Haskoning DHV) to prepare an Environmental Impact Assessment (EIA) Scoping Study to capture baseline information, and to begin consultation with regulators and other stakeholders about what further surveys and studies would be required.

Facts and Figures

The statistics for the vessel are mind-boggling. Weighing in at 65,000 tonnes and measuring 284m from stern to bow, she's roughly four times the size of her predecessors and the largest vessel to have ever entered Portsmouth Harbour. Consequently, her arrival had called for some serious preparation! To ensure she could manoeuvre and berth safely, more than 3.2 million m^3 (or 1,280 Olympic swimming pools) of sediment had to be removed. Costing £3.2bn, no one wanted to risk running this vessel aground, and no one wanted to be responsible for delaying her arrival.

Space for Nature

At this scale, dredging can potentially impact marine species and habitats – for example, increased amounts of sediment in the water can settle on and smother sensitive seagrass beds whilst mudflats can disappear if too much sediment is taken out of a system. Both habitats are present in Portsmouth Harbour, along with populations of migratory birds (e.g. Brent goose) and commercially important shellfish. Despite its industrial façade, Portsmouth Harbour hums with wildlife and is environmentally very important.

Portsmouth Harbour and the adjacent areas of the Solent and Southampton Water, Langstone Harbour and Chichester Harbour are designated as Special Protection Areas (SPAs) and Internationally Important Wetlands (Ramsar Sites) for their bird populations and intertidal habitats. In addition, the Solent area contains several Sites of Special Scientific Interest (SSSIs) Special Areas of Conservation (SACs) designated for coastal and marine habitats.

Heritage and Human Sensitivities

Known heritage assets in and around the Naval Base include the Portsmouth Historic Dockyard, Scheduled Monuments including Portsmouth Dockyard, The Block Mill and Stores 35 and 36 as well as historic naval defences, numerous listed buildings and wreck sites. Other environmental sensitivities include the Portsmouth and Gosport residents and businesses that could be affected by construction noise and traffic; as well as wider coastal and marine commercial interests including tourism, ferries, underwater cables, gravel extraction and fisheries.

Model Approach
A great wealth of data was collected and reviewed to improve our understanding of Portsmouth Harbour and the Solent. Baseline surveys included sediment sampling; benthic grabs and trawls for invertebrates and fish; sonar and magnetometry for buried archaeology; and airborne noise monitoring.

Fundamental to the environmental assessments was a series of hydrodynamic analyses undertaken by specialist marine consultancy ABPmer. First, detailed virtual models of Portsmouth Harbour and the wider Solent were created and carefully calibrated against data from survey vessels and buoys, giving an accurate representation of existing patterns of currents and tidal water movements, sediment mobilisation and deposition, water depths and waves. The models were then rerun to predict the short and long-term effects of the proposed dredging, informing and validating the dredging engineering, environmental and commercial strategies. Modelling demonstrated that there would be no significant increase in waves or flooding within the harbour, and that the intertidal mudflats and seagrass beds would not be eroded or smothered; and dredging equipment and methods were selected to minimise the extent and duration of sediment plumes created within the harbour.

Formal Consultation
The EIA Environmental Statement (ES) was submitted in 2012, in support of a Marine Licence Application to the newly formed Marine Management Organisation (MMO). Even though there had been extensive consultation and sharing of draft conclusions and reports during the preparation of the ES, it was not until publication of the 750 page main report and 1,400 pages of detailed technical appendices that regulators and the public were exposed to the full package of information. The MMO shared all emerging comments with DIO and Royal Haskoning DHV, who sought to address them through a combination of written responses and workshops clarifying the assessment, and where necessary conducted additional analysis.

Avoiding Disturbance
One particularly challenging issue was the potential for noise from piling to disturb overwintering birds and migrating fish. Natural England (NE) accepted the EIA conclusions that the main piling works were sufficiently distant from the mudflats and islands where overwintering birds feed and roost for there to be no seasonal constraints. However, the Environment Agency initially objected due to potential for piling to deter migrating sea trout from entering through the narrow harbour mouth, and further work was undertaken to reassess the local fish migration seasons; the relationship between pile size, piling hammer size, and underwater noise; and the hearing sensitivity and behavioural reactions of trout and other species. Mutually acceptable Marine Licence conditions were agreed and written into the contract processes, restricting installation of larger piles during certain summer months unless monitoring of test piles could demonstrate that noise levels were acceptable. In contrast, piling and construction of 30m tall 'Navigation Aid' lighting towers on mudflats in the inner harbour was timed during the Summer to avoid disturbing feeding birds. The lights are powered by both solar panels and batteries so they will work whatever the weather and to minimise distraction to other vessels, residents and wildlife, they will only be lit when the carriers are approaching or leaving their berths.

An iron cannon one of many artefacts being recovered as part of the dredging process which offer a fascinating insight into the naval history of this significant sea port © Wessex Archaeology

Oyster Beds
Further 'post-application discussions' related to mitigating unavoidable approach channels dredging impacts on edible oyster beds on an area called the Hamilton Bank, which supported a small oyster population spread at low density over a large area. The Solent oyster fisheries were once economically and ecologically thriving, but through the 20th century numbers crashed due to a complex combination of overfishing, pollution, introduced competitors, parasites, diseases, and low breeding success due to low population density. Through post-application discussions, it was agreed a novel mitigation strategy; DIO committed funding to the Southern Inshore Fisheries Conservation Association (IFCA) for oysters trawled in the Portsmouth Harbour area during the 2015 season to be diverted away from market and instead donated to a partnership project installing high-density cages at selected locations within the Solent, to kick-start population recovery.

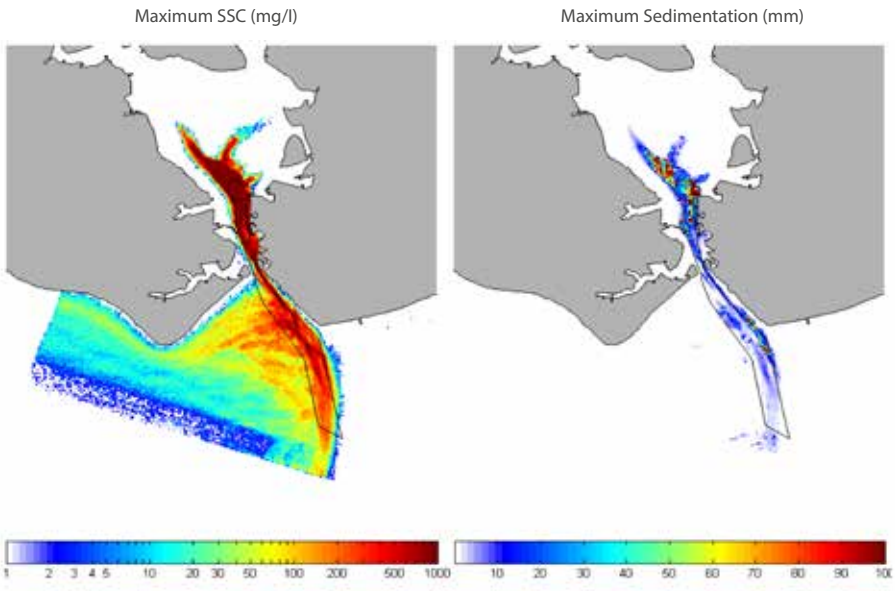
Licences, Contracts and Construction
The Marine Licence was finalised in 2014, and shortly after DIO awarded contracts worth close to £100m for the dredging and construction. The harbour engineering works had few significant environmental issues; the contractor Volker Stevin employed a team of environmental managers to finalise and implement a detailed Construction Environmental Management Plan including noise monitoring, pollution prevention and control, and waste segregation. One possible problem was the unexpected discovery of two seahorses by a dive team working in another part of the Naval Base. Seahorses are legally protected and sensitive to both noise and silt but DIO and NE ecologists were able to agree that these were juvenile seahorses, a pelagic (floating) life stage that had most likely been washed into the harbour by tides; and that there was no suitable breeding habitat in the vicinity of the works.

It was agreed that piling could continue, and the MOD diving instructions were amended to ensure any future sightings are recorded and reported.

Dredging up the Past

The dredging works, contracted to Boskalis Westminster Dredging Ltd, proved very challenging due to the amounts of objects and debris within the sediments, including an early find of a German sea mine. Dredging had to be put on hold while enhanced and novel methods were developed to detect and distinguish between hazardous and non-hazardous materials. Arrays of high-tech sensors and careful working methods proved sufficient in the approach channel and some parts of the harbour. In the inner harbour water-jets were proposed by the project engineers to wash away silts and expose the jumble of metal objects for review with high-resolution ultrasound and video probes. This would be a departure from the dredging methods that had been modelled and assessed for the ES and Marine Licence and so DIO, Royal Haskoning DHV, NE and the MMO worked closely and against mounting time pressure to review the modelling evidence. Working constraints and a monitoring plan were agreed and dredging was allowed to continue.

During the dredge more than 20,000 items were recovered including everything from shoes to sea mines.



Extract from the Environmental Statement (ES) showing modelled worst case suspended sediment concentrations (SSC) and sedimentation on the seabed (Figure 4 of ES Appendix 7.7 "ABPmer Plume Dispersion Modelling for Capital Dredging R.1988.") © ABPmer

Artefacts uncovered included 36 anchors, eight cannons, an aircraft engine and even a human skull, as well as bottles, plates and ceramics that may have belonged to sailors. The project's specialist subcontractor Wessex Archaeology continue to catalogue the finds. Ordnance collected included bullets and cannonballs, a British torpedo, the German sea mine and five large bombs; all were made safe by the Royal Navy's Explosive Ordnance Disposal team.

A German bomb found during the QEC dredging in November 2016 being made safe by the Royal Navy's Portsmouth based Southern Diving Unit © Crown

Success and Next Steps

This was a complex and challenging project, but working together ensured that the project was completed in an environmentally sensitive and sustainable way. The new Princess Royal Jetty was officially opened in Spring 2017 and the dredging was completed over the Summer. The next environmental assessment challenges for Portsmouth Naval Base will include works to refurbish and upgrade the Gosport fuel and munition depots infrastructure; providing a second berth for the new carriers; and agreeing a ten-year Marine Licence for maintenance dredging.

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Microplastics
Stemming the Tide at Tregantle

Tregantle Fort and Antony Training Estate, in Cornwall, is the primary focus for the Royal Navy (including the Royal Marines) live firing, beach and cliff assault training. It is also an unfortunate hotspot for marine plastic but now also the focus for efforts to turn the tide on this problem.

Each year, according to United Nations estimates, marine plastic debris kills at least one million seabirds and 100,000 other marine mammals and turtles. The impact is seen on everything from tiny zooplankton, the foundation of the entire marine food chain, up to whales.

The vagaries of tide and currents make Tregantle one of just a few beaches around Cornwall that act as particular magnets for microplastics (plastics measuring less than 5mm across), which are incredibly hard to remove from the environment.

Many microplastics started out as larger items that have been broken down over time by sunlight and waves, but a large proportion comprise industrial preproduction plastic pellets that entered the sea at this size. These pellets, or 'nurdles', are the building blocks of all the plastics we use. They are manufactured then transported around the world to be melted down and formed into everything from car parts to shampoo bottles, Barbie dolls and biscuit packets.

They enter the marine environment through spills from shipping containers or other transport accidents, or through losses due to poor handling procedures at plastics plants (eventually washing down drains and back into waterways and the sea).

Nurdles are often consumed by birds, fish and other marine species, probably because they float and look like fish eggs. One-third of all fish landed at Plymouth are now found to have microplastics in their guts, and every single fulmar autopsied in the English Channel area has ingested plastics, often including nurdles.

Using the plastic separation machine © Petra Kalcova

This depressing situation was brought to the attention of the Tregantle Conservation Group by member Claire Wallerstein who runs the local beach cleaning group, Rame Peninsula Beach Care. One of her volunteers, Rob Arnold, had a brainwave for a device to remove these nurdles. Close liaison between Defence Infrastructure Organisation SD Training, the Tregantle Conservation Group and Claire and Rob has allowed Rob's device to be trialled and refined. He has invented a separation machine, which involves a flotation tank with a mesh sorting table, powered by a petrol-driven pump utilising fresh water from the stream on the beach.

Volunteers pour in buckets of sand mixed with microplastics. The sand sinks and the plastics float off into a collection bin, while most of the organic material such as seaweed, sandhoppers and kelp fly larvae (which are an important source of nutrients and habitat for strandline organisms) can be returned, clean, to the beach. Using the machine, Rob removed approximately five million pellets from a 100m-wide stretch of beach in just three sessions with the machine in March 2017.

There are still huge amounts to be removed, but since microplastics seem to repeatedly make landfall in the same places, it seems we now really have a chance to target a major hotspot and significantly improve the local marine environment.

Claire Wallerstein
Tregantle Conservation Group Member
www.ramepbc.org

Sorting out the larger plastic waste © Matt Robertson

Space for Giants and Soldiers on Loisaba

Air support to ground troops over Laikipia © Crown

The Laikipia plateau provides endless views, with steep sided hills lightly dusted in acacia that sweep down to the meandering Ewaso river system. Between the ancient rose quartz decorated rock burial mounds on the edges of the escarpments, as you look down at the sand around your feet you see a multitude of animal tracks and droppings. This is Loisaba, a 22,600ha wildlife conservancy that links Laikipia to Samburu and Isiolo counties in northern Kenya. Owned by the Loisaba Community Trust, and supported by a Board of organisations such as The Nature Conservancy, Space For Giants, Ewaso Lions and Laikipia Wildlife Forum. The Chief Executive Officer (CEO), explained that he was looking to develop a sustainable business model through integrating wildlife conservation, with ranching, tourism and military training. Field Training Army were keen to conduct a pilot exercise to see if Loisaba could offer a new challenge for exercising troops that had visited Kenya previously.

So the challenge was on, we needed to complete an Environmental Impact Assessment (EIA) in accordance with Kenyan Law, and secure a license to train on private land in less than four months.

A lioness relaxing in the Laikipia savannah © Richard Snow

The Commander Defence Infrastructure Organisation Service Delivery Training (DIO SD Trg) Kenya and his team set out the military requirement and provided the in country co-ordination. A Senior Estate Surveyor for DIO Land Management Services (LMS) mobilised to meet the land owners and draft the license to train on private land, while I pulled a team of DIO environmental specialists together with a field team of Dr Stuart Otway (ecologist), Guy Salkeld (archaeologist), Chris Burson (land quality), and our National Environmental Management Authority (NEMA) approved environmental specialist from Howard Humphries (East Africa) Ltd.

Arriving in Nanyuki Show Ground the headquarters for British Army Training Unit Kenya (BATUK), the team was briefed and headed out to Loisaba without delay, our objective was to follow the route that the soldiers would take and evaluate each location where they would camp or conduct defensive and offensive activity.

We arrived late into the night at Tango Maos, where the team set up base for the week ahead. Camp beds were

erected and following a specially prepared ugali meal, we geared up for the weeks field work.

Loisaba is remote and rich in wildlife with more than 260 species of bird, 50 species of mammal and routinely supports over 800 elephants as well as herds of buffalo, Grevys zebra, reticulated giraffe and greater kudu. Wild dog, leopard and cheetah can be seen along with three prides of lions, the latter of which we came across repeatedly during our field work.

Having met the Loisaba CEO and his team in the morning, we started in the south, crossed the river from Mpala, and moved north through the ranch assessing the environmental sensitivity, photographing and recording baseline conditions of each training location against the planned military use.

As we turned down a track that led to the next proposed training village, there lying in the track was a dead elephant, with tusks intact it lay motionless. With guns drawn the Conservancy Security Officer and our Training Safety Marshall approached slowly on foot and found it had recently died of natural causes. It felt cold and rough as a concrete block to the touch, and the team fell silent as we listened to the security officer detail the level of poaching in the area.

By the next day the ivory had been removed to hand into the Kenyan Wildlife Service, and the lions had moved in. As we drove by the carcass, adult lions and their cubs could be seen moving back into cover. We drove past without stopping and parked 200m away at the next location to be used within the exercise. From the vehicle we could see occasional tan shapes moving in the scrub below our position. For some reason the team were not too keen to go for a walk around the site quoting something about too many lions in bushes!

Over the course of our field work, it was fascinating to see just how quickly a pride of lions could reduce the carcass day by day. With such a high lion population, the DIO SD Trg (K) Training Safety Marshall insisted that we place temporary fencing around the training villages to keep the exercising personnel safe.

As with all EIA regulations, public consultation is a key part of the process and gathering in Ol Doinyo Lemboro, Swara Camp, BATUK and DIO SD Trg (K) hosted the surrounding community. It was then explained how the proposed exercise would be run, and that our environmental controls included measures such as:

- no cutting policy for trees and shrubs and digging will only occur in designated locations and with the Conservancy's permission;
- that springs and dams will be out of bounds to avoid risk of drowning, risk of pollution and wildlife people conflict;

Moving forward in the long shadows across Laikipia © Crown

A large and bold male greater kudu, *Tragelaphus strepsiceros* © Stuart Otway

- that burial cairns have been mapped to ensure their protection;
- that ablution pits and soak-aways are to be 150m back from surface water features or abstraction points and that all waste will be removed from the training area and disposed of in Nanyuki; and
- that the Range Standing Orders provide detailed fire orders.

The arising questions mostly related to noise and the physical presence of soldiers and vehicles within the landscape as a concern to neighbouring tourist operators. The team explained that positive aspects of training at Loisaba include valued employment opportunities for up to 800 local people during the exercises and a significant financial contribution to the Conservancy to spend on management of invasive weeds and other priority conservation initiatives.

The public consultation and field work enabled the DIO team to consider the views of the community and validate the desktop data.

Rock burial mound decorated with small pieces of rose quartz © Richard Snow

The bulk of the archaeological data was taken from the records of the National Museum of Kenya (NMK) through its Standard African Site Enumerations System (SASES) and NMK electronic database (ARCFIND). High resolution satellite imagery and aerial photographs were also examined for any signs of both surface and subsurface cultural resources. The desk based assessment found that, despite the rich archaeological, palaeontological and cultural history that Kenya is endowed with, the Laikipia Plateau still remains one of the least researched historic landscapes. Early Stone Age (c. 1.7 million to 300,000 years ago) hand-axes and Hominid fossils remains have been reported within Laikipia Plateau, in addition, the Middle Stone Age technology (c. 280,000 to 40,000 years ago) and Later Stone Age is well represented in the region by a high number of highly worked tools known as microlithics.

Some rock shelters preserve evidence of human occupation that stretches from the prehistoric to the recent historical times indicating that pastoral populations may have inhabited the Plateau between 4,000 and 3,000 years ago. The team was able to record the specific locations of twenty burial cairns, which have been mapped and this information has been passed back to the ranch and the National Museum of Kenya.

The Report was finalised in a matter of days on our return to the UK and the EIA Licence was issued by NEMA. A license to train was established by DIO LMS with Loisaba in time for the pilot exercise to commence as planned. While BATUK has no current plans to repeat this specific exercise on Loisaba, this was an excellent example of the wider DIO team and Kenyan environmental specialists working alongside private land owners in support of the military need.

Richard Snow
Senior Environmental Adviser
International and Training Estates
Defence Infrastructure Organisation

A young elephant and some of the highly invasive prickly pear cactus, *Opuntia engelmannii* that the BATUK licence fee is helping to clear from Loisaba Conservancy © Stuart Otway

Conservation at East Cove Port

Enigmatic black-crowned night heron © Bill Dawson

East Cove Port lies on the South East coast of East Falkland. Built as a military port in 1984 it sits in a pristine natural environment adjoining the internationally important Ramsar site of Bertha's Beach. The area is rich in bird and marine life, giving a unique environmental responsibility and custodianship for all port activities.

The port is shared with a constantly changing population of gentoo penguins, southern giant petrels, numerous gull species, kelp geese and many native small birds. Hundreds of rock shags nest around the jetties and structures, making the most of the artificial cliff ledges, whilst several families of enigmatic black-crowned night heron fish peacefully on the slipways.

Beneath the water there is a resident family of Commerson's dolphins, and occasional visitors as diverse as orcas, sealions, leopard and fur seals, all supported by rich kelp forests and seasonal krill swarms.

But, East Cove Port has suffered over the years from poor environmental stewardship. Sheep have grazed the port areas unchecked, devastating the native shoreline grasses to the extent where bare earth is now predominant. The exposed peat layer then suffered extensive wind erosion leaving sand banks that are barely fertile and difficult for native plants to re-establish. Hardier invasive species such as thistle have flourished. The natural flora so essential for the breeding and feeding habitat of native birds has all but disappeared.

Happily this lack of care on the land has not extended to the water, where the marine environment has been spared the ravages of pollution or exploitation, remaining largely pristine.

In 2016, the Queen's Harbour Master started an extensive habitat restoration project to encourage the return of native flora and fauna. The most exciting aspect was winning a grant from Falklands Conservation to establish a native species showcase garden.

East Cove Port panorama © Bill Dawson

The generous grant was used for a design and the purchase of specially grown native bedding plants.

A team of keen conservation volunteers, military and civilian, had a long weekend of planting on a blustery day in April 2017, getting the plants in the ground just in time before the cold Falklands winter set in.

The project has now expanded to include local schools; in late summer 2017 children from the Falkland Islands Community School presented an owl box in the hope of encouraging barn owls to take residence. Meanwhile the Mount Pleasant school, inspired by the project, are looking to expand the scheme in tandem with the opening of their new school in 2018.

As the Austral spring approaches, the signs are good that the majority of plants have taken and not succumbed to the cold. Over the coming year native tussock grass, providing incredibly important habitat for a variety of species along the coastline, will be replanted, utilising the 'cake' from a redundant sewage plant as fertiliser. Tussock planting is a great community event for both military and civilian communities, and families, who enjoy contributing to improving the native Falkland grassland and coastal strip during their tours.

Cdr Bill Dawson Royal Navy
Queen's Harbour Master
East Cove Port

The **Roman Eagle** and the **White Ensign**

Part of the Roman building found during excavations © Crown

Caerwent Training Area in South Wales was built as a Royal Navy Propellant Factory shortly before World War II. In 1959 a static firing bay was added to test Gosling rocket engines for the Navy's Sea Slug surface-to-air missile. The site was decommissioned and decontaminated by 1968 and was a storage base for the United States Air Force and the RAF until 1993, after which it was used for troop training. The site has also been used as a location for television and film. The area hosts several archaeological monuments of national importance dating from the 20th century BC to the 20th century AD.

Whitewall Brake

The military area comprised 1,163 acres, with over 400 buildings, roads and a standard gauge railway. But between the brick, concrete and metal, there are untouched areas of green space. Hiding in a copse of mature trees in the heart of the training area, is Whitewall Brake.

The copse, also known as Castle Tump, is the site of a large Roman building. Excavations by a Mr Colston in the late 19th century revealed "*some coins, yellow and terracotta coloured pottery and tessellated bits of pavement*" and it was assumed that the site was probably a Roman villa. Colston left few records but the Ordnance Survey shows the site as a rectangular building measuring some 60m x 30m.

Between 2011 and 2014 Defence Infrastructure Organisation (DIO) and University of Leicester re-examined Colston's excavations, and applied some modern excavation techniques to inform the management of the site. The team included Leicester students and the award winning Operation Nightingale initiative which uses archaeological fieldwork to promote the recovery of wounded, injured and sick military personnel and veterans. A final excavation by a University of Leicester team in February 2017 completed the project.

The excavations confirmed the presence of undisturbed Roman structural deposits, generally less than 0.20m deep but in some areas actually protruding through the topsoil. However, there are one or two puzzling aspects to the site. Roman sites often produce many artefacts and pottery in abundance, but not at Whitewall Brake, where pottery was in short supply. A second puzzle concerns the hypocaust or under-floor heating system. The hypocaust found in many high status Roman buildings is justly proclaimed as a tribute to Roman ingenuity and engineering. The principal is simple yet effective; hot air from a furnace fills the space of a raised floor supported on stone pillars (pilae) and is vented up the wall by the use of hollow box or flue tiles. The high temperatures normally leave ash, charcoal and heat-reddened surfaces.

At Whitewall Brake an impressive hypocaust was found with walls standing up to 1.2m high and rows of magnificent stone pilae. Hundreds of small stone cubes or tesserae show the floor had a mosaic. However, there was no ash or charcoal leading the excavators to believe that the room was abandoned before it was actually used. Indeed, it seems the whole building was used for only a short period of time, if at all.

The site overlooks the Roman town of *Venta Silurum* (modern day Caerwent) to the south on the Roman road between Gloucester and Caerleon. It seems likely that Whitewall Brake was somehow associated with the town but was it a religious shrine, a military enclave or a wealthy person's house? The mystery will remain for now, but we can say that archaeological deposits are just below the surface and that future management

Recording the findings from the excavation © Crown

Escape tunnel from the Nitrating House through a bund © Crown

of the woodland will be instrumental in the stewardship of this nationally important monument.

Nitro Hill

Many centuries after the Roman Empire and Whitewall Brake crumbled into ruins, Caerwent was busy making propellant for the Royal Navy. A critical stage was the mixing of acids and glycerine to make nitro-glycerine. Sodium carbonate solution, water, glycerine and mixed nitric and sulphuric acids were gathered at the Charge Houses. These products were moved to the Nitrating Houses where the nitration of glycerine was undertaken and cooled by brine. After initial washing procedures, waste acids were transported to the waste acids farm. The nitro-glycerine was then washed more thoroughly, moved to the Paste Mixing and Sheeting House, then mixed with nitro-cellulose pulp and various additives. Water was then removed to give a cordite paste which was cut into sheets and dried.

The nitration of glycerine was a continuous and volatile process. 'Nitro hills' therefore exploited natural hill slopes allowing gravity to move the product without the need for pumps. Lead-lined gutters and embanked runways linked buildings which were designed to release accidental explosions by incorporating blow-out panels. Substantial earthen bunds were designed to direct the force of an explosion upwards.

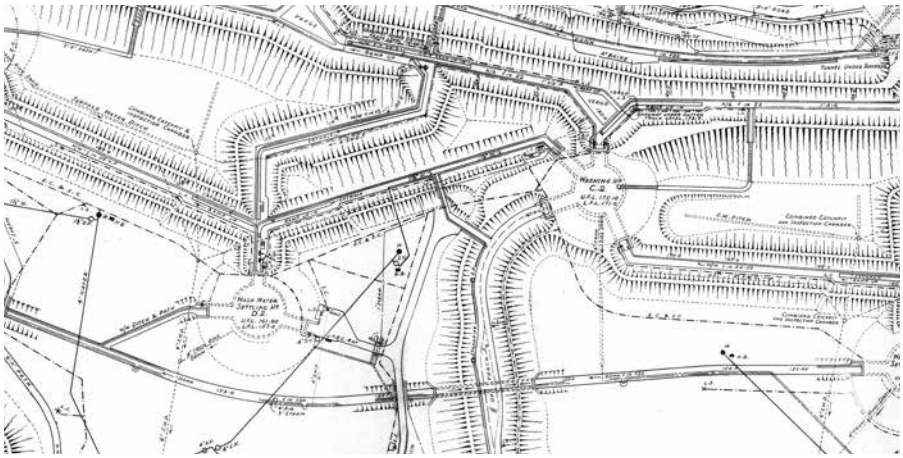
One of the nitro-hills has been scheduled as a nationally important monument. The enormous earthworks, channels, structures and mechanical remains were once designed to control or contain explosive forces, yet this is now a finite and fragile archaeological site. The rigorously disciplined working regime so critical to safe operations has surrendered to natural processes which provide habitats for protected species including badgers, bats, dormice and great-crested newts. However, vegetation growth now requires sensitive management to prevent further deterioration of the monument.

During March 2017 a large quantity of trees and vegetation were cleared from the monument. This exercise accommodated the protected species, including dormice and newts, whilst opening up access routes to enable future management and further vegetation control, all without damage to the fabric of the monument. This might sound simple, but the project required collaboration between Landmarc and site staff, natural and heritage statutory bodies, MOD conservation group members, subject matter experts, and contractors; careful timing and method statements to avoid damage to archaeology and hibernating species in vegetation and the ground; and long lead-times to allow for statutory consents and financial processes. Woodland management to improve habitat for dormice was undertaken and dormice boxes erected to mitigate for loss of habitat within the monument. All this was accomplished with no impact on military operations within one of the MODs busiest training facilities.

It is now much easier to appreciate the character and extent of the nitro-hill. Excellent working relationships have been established with colleagues, partners and interested parties, and a deeper understanding has been gained of the interaction between the historic and natural environments here. The size and complexity of the monument has made it difficult to manage in the past, but hopefully the methods that have been adopted, and the enthusiasm generated, will help to ensure a sustainable approach to its conservation in years to come.

Guy Salkeld
Archaeologist
Defence Infrastructure Organisation

Phil Abramson
Archaeologist
Defence Infrastructure Organisation



Part of an engineering drawing of the Nitro Works © Crown

Making Plants Count on the Defence Estate

Ragged Robin, a beautiful flower found on Sennybridge Training Area © Beth Halski

Wildlife recording in Britain is hugely reliant on citizen science schemes. The UK has incredibly valuable data sets, collected by volunteers, where birds, bats and mammals have been annually monitored. This results in an annual record of abundance for a species or group of species. The data is widely published and used, allowing scientists to determine the driving forces behind changes in species abundance and informing policy and decision makers.

Although plants support many other species groups, relatively little is known about how plants in different habitats are faring. Data has been collected by a variety of people but with no standardised methodology there is a lot of 'noise' in the data which reduces the ability to determine trends.

The National Plant Monitoring Scheme (NPMS) was launched in 2015 to fill this gap in annual plant monitoring in the UK. The scheme is designed and run by four partners who came together in 2012; the Botanical Society of Britain and Ireland (BSBI), Centre for Ecology and Hydrology (CEH), Joint Nature Conservation Committee (JNCC) and Plantlife. During the first three years of the partnership a huge number of species and habitat monitoring experts, statisticians, data users and volunteers were consulted and took part in field-trials in order to develop a scheme that meets these three main aims:

- Provide reliable measures of change for individual species and species groups within semi-natural habitats;
- Utilise both positive and negative indicator species for each habitat;
- Be simple, repeatable, and achievable by volunteers.

The scheme is based on randomly selected 1km grid squares from across the UK. Within each square up to five plots are selected in different semi-natural habitats. For each habitat volunteers record what they can find from a list of plant species as well as noting vegetation height and management where possible. Volunteers select a recording level based on their confidence in species identification, making the scheme accessible to keen beginners as well as experienced botanists. Volunteers visit their plots twice each year in late spring or early summer and then again later in summer and this pattern is then repeated annually. Squares in remote areas can be surveyed in alternate years where access is difficult.

During the launch year of the scheme Plantlife got in touch with the Defence Infrastructure Organisation to establish how many NPMS squares overlapped with military owned land. This exercise revealed that there were 36 sites that overlap; this number is likely to increase as further batches of squares are released. Of these squares 23 are still available to survey.

There are a number of volunteers who have got in touch and become involved with the MOD Conservation Groups for the sites where their squares lie at Sennybridge and Pyestock Hill. The volunteers now attend annual safety

Green-winged orchid amid Dyer's Greenweed on Newtown Ranges, Isle of Wight © Crown

Nationally scarce red-hemp nettle, found on Salisbury Plain Training Area © Crown

briefings and have a much better understanding of what goes on at the sites, enabling them to survey safely, without causing any disruption to base activities, as well as being able to contribute to wider biological recording on the site.

NPMS volunteer Joan Millard has a square on the edge of Sennybridge training area. *"My square doesn't get very much disturbance allowing lots of interesting species to flourish. Access has been simple; I attend the annual safety briefing and then keep the Ops Room up to date with my visits. I was pleased to hear that the establishment hold a yearly conservation meeting, their interest in our work and findings are a great additional motivation for taking part in the scheme."*

The potential uses for data from the scheme are wide ranging; the primary aim is to produce a national indicator for individual species or habitats. The data can also be used to look at the affects of climate change, invasive species and land management or can be compared with other taxon groups e.g. pollinators for a wider picture.

The scheme has been designed to minimise recorder bias as much as possible with squares and plots selected at random. Once there are 30 plots in any one particular habitat or area trends can be deduced. So with such a high overlap with military sites there is great potential to draw out conclusions based on how military sites compare with the national picture, providing a great opportunity to showcase the work of the conservation staff and volunteers within the MOD.

Currently there are over 1,100 volunteers taking part in the NPMS, collecting vast amounts of data. Although it is too early to start deducing trends this will become possible within the next few years.

It is thanks to the dedication of volunteers as well as the enthusiasm of other stakeholder organisations that the scheme has seen such quick success and this will play a vital part in the scheme's sustainability.

Each NPMS volunteer is supported fully throughout the process with a survey pack of materials including a species ID guide. A free training programme is provided across the nation every year with workshops covering the methodology, grass and sedge species ID and help with identifying habitats. Online materials are also provided to help those that cannot make it to the workshops. Each year volunteers are consulted to ask what they would like to see provided by the scheme in the following year and currently Plantlife are working on developing regional groups to start to build NPMS communities.

Grass-of-Parnassus found on Otterburn Training Area, North Yorkshire © Guy Hagg

It would be fantastic if any members of staff or conservation groups would like to take on any of the vacant overlapping squares. The NPMS website includes a map where you can view the available squares and sign up at www.npms.org.uk/square-near-me-public.

Hayley New
NPMS Volunteer Coordinator
Plantlife International

Email Hayley on support@npms.org.uk

Team NPMS at Slapton Ley © Hayley New

Project ANEMOI delivering sustainability remotely

Construction Phase 1 - Winter 2016 © Crown

Introduction

It is a requirement of all commercial overseas projects delivered by Defence Infrastructure Organisation Programme and Project Delivery (DIO PPD) to employ an environmental manager to oversee the delivery of the Construction Environmental Management Plan and ensure compliance by the contractor.

When the Royal Engineers (RE) were directed to deliver a Remote Radar Accommodation Project (known as Project ANEMOI) construction and logistical constraints were identified which could delay the delivery of the project's environmental requirements.

After a search within the Royal Engineers and the RE reserves for a suitable candidate to take on this challenge, Sapper (now LCpl) Macmillan was brought into the team; with her environmental background to guide her. She describes the experience of delivering the project in the article below, alongside two other accounts from Falklands Conservation and Falkland Islands Government.

The Project

Project ANEMOI saw the replacement of three accommodation buildings at the Remote Radar Heads at Mount Kent, Alice and Byron Heights in the Falkland Islands. The current accommodation is fabricated from ISO containers and is to be replaced with a bespoke steel portal frame building on a concrete raft foundation, which is expected to cost in the region of £14m with an in-service date forecasted to be April 2018.

The Royal Engineers have taken on the entire project to demonstrate their capabilities and for the first time require an Environmental Manager (EM), LCpl Sheona Macmillan of 170 Engineering Group to ensure the project complies with UK legislation.

The Construction Environmental Management Plan (CEMP) and Site Waste Management Plan (SWMP) are maintained as live documents. The Falkland Island Government and Falklands Conservation commend the work of the RE to protect native flora and fauna: checking for nesting birds; native endangered/rare plant species on the sites are cordoned off; and during the excavation phase, a snakeplant (endemic protected plant) was successfully translocated.

The project has successfully offset the CO^2 created from cementing works during its UK Mission Specific Training, by gifting 75 saplings to Brompton Estate for plantation. This sets a precedent of how the Corps can be carbon effective with a co-operative and low cost solution.

The waste management process has been completely reconfigured and is now managed and processed at source by the Military Construction Force (MCF), Logistic Node and the Project Management Office, until its end destination, removing the contractor's involvement overseas. The waste contractors are carefully selected and on Island reusing and recycling have reduced the project's carbon footprint. Notably, huge advantages have been achieved from reusing cement on Island as a capping layer to assist DIO Service Delivery landfill management; for road solidification and for various other repairs on the sites; and wet concrete and alkaline water from the cement works have been captured in vehicle wash-down pits on each site, then treated and managed.

The EM delivered Environmental Training Briefs to each Phase of the MCF; covering all topics within the CEMP and SWMP, with emphasis on

why environmental management is so important. An environmental Chain of Command is trained; environmental reviews, hand-over/take-over meetings, audits and assurance visits/reports (with Action Plans) are conducted regularly and risks and issues are controlled.

As a result, enormous savings of over £4m have been made by effectively managing environmental sustainability and waste. Most importantly, Project ANEMOI has increased the awareness within the Corps of Royal Engineers of the necessity to include environmental and waste management as part of Military projects.

LCpl Sheona Macmillan MA (Hons)
PIEMA Environmental Manager and H&S Advisor for Project ANEMOI

Falklands Conservation (FC) worked closely with MOD personnel to identify any ecological impacts that could result from implementation of the ANEMOI project at each of the Remote Radar Head sites. High altitude sites are often host to some of the rarer habitats or species in the Falkland Islands and surveys undertaken by FC found a number of important ecological features at all three sites, including the nationally 'very rare' spleenwort fern at Byron Heights, the nationally 'scarce' and endemic snakeplant at Mount Kent and the 'threatened' fachine habitat at Mount Alice.

Whilst the new accommodation blocks were intended for areas of little or no ecological value, the associated infrastructure, groundworks and laydown areas all had the potential to overlap with the locations of these important plants and habitats. Despite the challenges of working at these sites, development plans were produced that avoided the majority of these areas and protected them during construction activities. Ultimately, it looked like a solitary snakeplant would be lost due to construction; however, this was successfully relocated by on-site MOD personnel, demonstrating the MODs strong commitment to environmental good practice.

Harlequin ladybird *Harmonia axyridis* © Crown

Endemic snakeplant *Nassauvia serpens* at Mount Kent © Andrew Stanworth

Andrew Stanworth
Conservation Manager
Falklands Conservation

Falkland Islands Government
Falklands Island Government (FIG) Biosecurity team worked with the MOD to mitigate risks associated with the accidental introduction of non-native species arriving with imported building materials, plant and machinery, to the hill-top construction sites in the Falklands. Even with all precautions being taken during sourcing, packing and transport of materials to the Falklands, it was inevitable that some risk organisms would slip through the net. These organisms were identified on arrival during biosecurity border inspections.

An example of a biosecurity risk identified on the border was the interception of harlequin ladybirds which were found hibernating in an ISO container of building materials. Harlequin ladybirds are an invasive species in the UK, but are not yet established in the Falkland Islands. FIG and the MOD were keen to ensure that the ladybirds were destroyed by fumigating containers. MOD personnel were made aware of the risks posed by harlequin ladybirds, and the need for vigilance and adequate response should more be found. Happily no further ladybirds were found, and a potential incursion of an invasive species was averted.

Other examples of biosecurity risks identified during inspections were wind-blown thistle seeds stuck among rolls of mesh, spiders in cargo, and feathers littering a container floor. MOD cooperated with FIG throughout the project to ensure that risks were reduced, identified and dealt with, minimising negative impacts of the construction work on local ecosystems.

Ross James
Biosecurity Officer
Falkland Islands Government

Water Consumption reduction
Managing a precious resource

An aerial photograph of Portsmouth Dockyard and surrounding area taken from 2,000 feet. A vital MOD site in delivering key defence outputs © Crown

Water is a precious resource and everyone has an important role to play in reducing its use; the MOD is continually looking at ways to use water responsibly within its business.

Water and waste water services at the majority of MOD sites in Great Britain are provided by private sector partners under the Aquatrine Private Finance Initiative (PFI) contracts. This covers around 2,800 sites including Naval Bases, Barracks, Main Operating Bases, Training sites and many other smaller sites. Collectively, water consumption at these sites is approximately 18 million cubic meters (Mm^3) each year.

Looking to reduce water consumption, Defence Infrastructure Organisation (DIO) recently implemented a Water Consumption Reduction Programme (WCRP) across 150 high consuming sites, the majority with a typical annual consumption exceeding 10,000m^3. The DIO PFI Aquatrine team engaged the contractor CH2MHill (part of the Halcrow Group) to support implementation of the survey programme and the key deliverables below.

- To undertake a comprehensive site survey programme across the 150 sites, in order to identify all water infrastructures on sites, and measure whether there were any constant flows (ie, visible wastage). Furthermore, to produce detailed technical reports of their findings together with recommendations for for technical interventions to reduce reduce consumption.

- To produce site specific User Awareness and Behavioural Change Strategies for each of the 150 sites.

Case Study

HM Naval Base (HMNB) Portsmouth is a vital MOD site in delivering key defence outputs. Significant volumes of water are used at the site each year. In the last two years, 1.15 million cubic meters (Mm^3) of water was used, ie. the volume of just over 460 Olympic swimming pools.

Despite the significant volumes of water used, the WCRP initiative has involved an investment in the replacement of over 100 faulty water management systems, resulting in a reduction of wastage totalling over 14,000m^3.

In 2015, a user awareness workshop was held, attended by representatives from the MOD and BAE Systems. The workshop identified a number of communication opportunities. Since then, a great deal of progress has been made as a direct result of the proactive work undertaken by Richard Gotheridge (BAE Systems Environmental Lead) and Paul Morgan (DIO Area Utilities Manager). One aspect of their work involved educating Naval Base personnel by increasing their awareness of water use. For example:

- arranged tool box talks for all ship project staff to increase the 'eyes on the ground' to ensure the reporting of leaks;

- placed an article in the Shoreside magazine titled 'Reducing the Flow';

- promulgated a Safety, Health & Environment (SHE) alert on water losses from ship to shore hoses and standpipe connections.

There was also liaison with ship personnel to highlight poor practices whereby faulty ship to shore pipes and connections were resulting in relatively large volumes of water being wasted. This liaison led to senior Military support to address these issues.

Technical Interventions

During this three year survey, CH2MHill assessed over 10,000 buildings, inspected thousands of water fittings, and took thousands of flow measurements. Technical reports showed that the best return on investment was to improve efficiency of the urinal cisterns by installing new Cistermiser valves on uncontrolled or faulty urinal cistern valves, and install WC cistern displacement devices (Hippo Bags) to reduce the volume per flush. See image below of the Cistermiser Infrared Control (IRC) unit.

The DIO PFI Aquatrine team engaged with the DIO Utilities team to support implementation of these WCRP technical interventions. This involved a significant amount of collaboration with various organisations and stakeholder teams, and with the MODs Industry Partners for hard facilities management.

Behavioural Interventions

The DIO Utilities team led on behavioural change in relation to reduction in water consumption across the MOD estate and worked with the contractor to achieve this Deliverable. Three pilot workshops were held with the service budget holders to help inform the content of the site specific User Awareness and Behavioural Change Strategies. This involved a Navy workshop at HMNB Portsmouth, an Army workshop at Blandford Forum and a RAF workshop at RAF High Wycombe.

Cistermiser Infrared Control (IRC) unit. © Crown

A ship to shore pipe leaking fresh water into the dock area © Paul Morgan

The outcomes of the three pilot workshops were informative and led to CH2MHill producing the 150 site specific User Awareness and Behavioural Strategies. Each strategy comprised three distinct elements as follows:

- A slide deck to be used for a range of communication opportunities such as induction training, staff briefings, etc.
- A set of advice sheets aimed at specific audiences on a site with advice on how to reduce water consumption.
- A fault report poster to encourage site personnel to report water infrastructure faults and leakage.

Benefits of the WCRP

By the end of July 2017, delivery of WCRP works had been completed at 60 sites, resulting in the installation of over 1,900 Cistermiser valves and over 400 Hippo Bags. Furthermore, this resulted in a total cumulative reduction of approximately 375,000m^3 to-date. Provided the WCRP recommendations are fully implemented, there is a potential to reduce water consumption by the end of March 2020 by a total of approximately 971,000m^3/yr.

Whilst it is possible to measure the reduction in water consumption directly attributable to the technical intervention on metered buildings, it is less straightforward in the case of the behavioural interventions. However, from a broader perspective, implementation of the User Awareness and Behavioural Change Strategies is part of an ongoing process to educate personnel across the MOD to take responsibility for use of water on the MOD estate.

From a sustainability perspective, a number of sites on the MOD estate are located in water stressed areas of Great Britain. This includes sites involved in the WCRP. Therefore, the WCRP initiative is both contributing to the reduction of consumption and costs on the Aquatrine PFIs, and supporting achievement of the Greening Government Commitment targets for water.

Adam Doig
Water Policy Lead
SD Utilities
Defence Infrastructure Organisation

The Return of the **Native**

Introduction
2010 saw the start of one of the largest single site conservation projects in southern England; the return of red deer to a 720ha heathland grazing compartment in Surrey. Seven years on the deer are thriving and the habitat is responding favourably to their presence. This report draws from and updates the article that was published in Sanctuary in 2010.

The Pirbright Range Danger Area (RDA) is located 25 miles from central London in one of the most populous parts of the country and yet it is an unspoilt haven and home to threatened and rare species. The area is an important land resource for the Defence Infrastructure Organisation (DIO) Pirbright Range Complex, and the internationally famous National Rifle Association (NRA) centre at Bisley providing a safe area in the event of a rifle round overshooting the range butts.

The public were allowed into the area until the 1970s, when a review ceased access due to the danger of unexploded ordnance and a 14km long security fence was constructed. The lack of disturbance has created the thriving wildlife community albeit one that was threatened by the difficulties of managing such an area.

Natural History
European lowland heathland is at the heart of Pirbright Ranges wildlife value. The site is a Site of Special Scientific Interest (SSSI), Special Protection Area (SPA) and Special Area of Conservation (SAC) for its undisturbed peat and wetland areas and three particular heathland bird species; nightjar, Dartford warbler and woodlark. The breeding strategy of these bird species (nesting on the ground or within the heather sward) makes them vulnerable to disturbance from dogs; the fenced RDA therefore provides the perfect sanctuary.

Management and Problems
The RDA had not received any environmental management since it was bought by the MOD. On most heathland sites this would have resulted in a rapid transition from heath to scrub to woodland. The area remained as heath due to large fires that periodically swept across the site. These have been started either by accident, acts of vandalism or by military pyrotechnics. The site burnt regularly as the vegetation grew up and provided sufficient fuel. With the emergency services not being able to enter the area, due to the risk of unexploded ordnance, the fires burn much of the site, often lasting for days and occasionally breaking out of the area to threaten homes. This created problems for military training, local residents, the emergency services and wildlife.

A majestic red deer stag on Pirbright Ranges © Surrey Wildlife Trust

Processes have been put in place to reduce the incidence of fire, consequently the decreased likelihood of fire can lead to encroachment by scrub and coarse grasses and a consequent build up of biomass, which would give a future fire greater intensity. Scrub and coarse grasses can overwhelm the more fragile,

interesting and rarer species and reduce biodiversity. Elsewhere heathland managers use a variety of methods to combat these invaders but due to the access restrictions on the RDA, these techniques were not possible. The importance of the site meant there was never an option to do nothing as this would lead to a loss of species and landscape value.

Beginnings

The project's initiation, progress and funding are described in Sanctuary 2010 which is when the deer were introduced after several years of detailed planning and preparation.

Progress

The animals' impacts are being studied by monitoring the site's flora and fauna both before the deer were introduced and at six year intervals. The herd is being managed in response to these factors along with direct observation of the condition of the animals. This makes the project unique; the animals are on site as conservation grazing tools rather than as trophy or meat stock whilst animal welfare remains of the highest importance. Defence Deer Management manages the stock purchased by the Surrey Wildlife Trust (SWT) in accordance with an agreed management plan.

The herd have been tracked using GPS collars and the data has been analysed to observe how the animals use the site. This has allowed SWT to monitor the animals' movement and dispersal patterns, behaviour, feeding habits and response to seasons and stimuli.

Quadrat heathland survey © Surrey Wildlife Trust

Since their introduction the herd has grown to 160 adult animals. Calving rates have been over 80% with animals coming out of the winter in good condition. The habitat is ideally suited to red deer with 130ha of pasture woodland providing shelter along with a diverse range of forage being available through the seasons. It is these seasonal environmental conditions that determine how the deer change and shape the habitat.

Comparing before and after grazing the impacts of deer feeding and trampling have been almost universally positive with significant increases in lichens yet decreases in bracken and scrub within areas of dryer heath, significant increases in sphagnum species and sundew in wet heath and increases in species diversity and positive indicators in areas of mire. Numbers of the SPA bird species have held steady or increased. The SSSI has gone from 'unfavourable declining' condition in 2003 via 'unfavourable recovering' in 2009 to 'favourable' in 2016 all due to the project. It is thought the present deer numbers will provide a sufficient level of grazing to maintain the area.

The improved heathland habitat at Pirbright © Surrey Wildlife Trust

Conclusions

This Sanctuary award winning project has safeguarded one of the last wildernesses of southern England. If you are able to visit in October listen out for the roar of red stags in the rut. The sound reflects an age when these animals roamed naturally across the Surrey heaths, and now it bears testament to the great lengths taken in order to conserve and enhance this very special area and its wildlife.

James Adler
Head of Land Management
Wildlife Trust

MOD Shoeburyness Sea Defences

Shoeburyness sea defence works © QinetiQ

Background

The MOD Shoeburyness range complex sits at or below sea-level and is protected by some 47km of sea and flood defences extending around the perimeter of the mainland and five large islands. The sea and flood defences protect the MOD establishment, Foulness Island residents, tenant farmers, MOD/QinetiQ employees and contractors, and visiting members of the public. The range contains high-value assets including defence Test and Evaluation (T&E) facilities and explosive stores that support many major weapons programmes.

The sea and flood defence habitat itself is protected and in many places is designated as a Site of Special Scientific Interest (SSSI), Special Protection Area (SPA), Special Area of Conservation (SAC) and Wetland of International Importance (Ramsar Site) for overwintering and breeding birds, and rare plants and invertebrates. Following significant flooding in 1953, the sea and flood defences around the estate were improved. However through time, the defences have deteriorated to a point where, when assessed against the Environment Agency's (EA) 2011 Condition Assessment Manual, they were found to be in need of repair and improvement. Additionally, works were required to raise the height of the defences to improve the establishment's resilience to climate impacts, principally rising sea levels and storm surge events.

Scale of Project

Due to the size of the project, delivery has been broken into five phases. Phases 1 and 2 are complete and largely addressed maintenance issues. Each phase involved a year of on-site activity. A variety of design solutions were employed to deliver the necessary repairs and upgrades to the defences which were sensitive to the local ecology and protected features. The engineering work so far includes:

- 4km of sea defences were raised, repaired or upgraded to a 30+ year design life and a 1 in 100 year event flood protection standard (Shoeburyness and Foulness Island sections)
- 5,000 tonnes of rock armour placed to reinforce areas along the River Crouch
- 200m of bituminous crack repairs to Sharpness Head revetments
- 900 tonnes of steel piles installed to protect 2km of existing defences from erosion and seepage
- 5,000 tonnes of specially designed concrete poured over 10,000m^2 of existing revetments to reinforce and protect from erosion and seepage
- 7,000 tonnes of reinforced concrete placed to raise sea defences by up to 1.2m near Fisherman's Head
- reconstruction of embankments to protect failures in isolated areas around Foulness, New England and Havengore
- creation of 150m^2 of eco-terrace habitats within concrete revetments
- 10,000 tonnes of aggregates for the construction of 5km of access tracks, rear of flood defences to facilitate future maintenance and inspection
- In order to deliver Phases 1 and 2, 150,000 man-hours were employed

The subsequent phases address less serious maintenance and where necessary will raise the height of the remaining defences. The remaining phases will be addressed when the next set of climate change predictions are published in 2020.

Ecology Mitigations and Solutions

One of the principal challenges to the project team of QinetiQ, their design contractor CH2M and the MOD (represented by Defence Infrastructure Organisation (DIO)), was the sensitive and protected nature of the habitat on the sea and flood defences. In order to proceed with each phase, an Environmental Impact Assessment Opinion was lodged with the Local Authority, taking advice from Natural England (NE), the EA and the Marine Management Organisation. DIO was also fully informed and assisted in gaining all necessary consents for the works to take place, including the DIO ecology team which was essential in authorising Habitats Regulations Assessments (HRAs) and gaining the approval (SSSI Assent) from NE to start the works. Direct liaison with NE ensured the methods of working within the SSSI were suitably considered and addressed.

Shrubby sea-blite © Crown

The output from the formal HRA and SSSI Assenting processes was an Environmental Mitigation Strategy incorporating an Environmental Action Plan. The strategy put in place appropriate restrictions, mitigations and enhancement actions throughout the project life-cycle to ensure minimal impact on the environmentally designated areas, and no net loss of overall biodiversity value. For example, an ecological restriction adopted by the project was to exclude working from specific areas during either the winter or summer months to minimise disturbance of overwintering or breeding birds.

Eco-terraces designed by CH2M as part of the environmental mitigation strategy © QinetiQ

Three main mitigation and enhancement activities have been identified: 1) the access track enhancements to facilitate the works will enable better management of the sea retained grasslands; 2) work areas and access tracks will be restored and additional grassland habitat mitigation strips created, seeded with a species rich grass and herb mixture; and 3) the construction of eco-terraces to the sea and flood defences for the replanting of key plants such as golden samphire and shrubby sea-blite to mitigate losses during the construction works.

In order to ensure the project continues to maintain its ecological obligations and provide an appropriate response, an Ecological Clerk of Works has been employed to oversee implementation of the mitigation plans and produce six monthly Ecological Monitoring reports. Ongoing liaison between QinetiQ and their contractors, DIO, NE and other stakeholders will continue over the remaining phases of this project, to ensure that it continues to be an exemplar of sensitive and sustainable construction.

Alex Morton
QinetiQ Senior Project Manager

Stuart Otway
Senior Ecologist
Defence Infrastructure Organisation

Example section of priority sea defence repairs and improvements, showing the enhanced access track, retained vegetation where possible and new concrete revetments. New rock toe-protection, and raised sea defences have been installed where necessary to defend against predicted flood risk scenarios © QinetiQ

Operation **MARMAT**

Devastation in the hills © Crown

Introduction

During 2015, 36 Engineer Regiment and The Queen's Gurkha Engineers (QGE) were re-rolling from a Search to a Force Support Engineer Regiment whilst continuing to support the normal gambit of worldwide engineer training and operations. At the peak of this very hectic change programme, disaster struck the mountain kingdom of Nepal; an enormous series of earthquakes striking into the very heart of the Gurkha homeland on 25th April 2015. For a Regiment with 300 Gurkha soldiers and their dependants amongst its number, this was a desperate time. The Regiment was quickly at the forefront of the UK's national response to the disaster and remained so for the full 20 months of Op MARMAT; assisting with earthquake reconstruction tasks on behalf of the Gurkha Welfare Scheme, to support the Government of Nepal.

The Immediate Aftermath

Mustering manpower from the UK, the Falkland Islands, Ascension Island and those already in Nepal on the Regiment's Mount Everest Expedition, 36 Engr Regt rapidly drew together a highly skilled and flexible group to deliver Humanitarian Assistance and Disaster Relief (HADR) to Nepal, focussing on, but not exclusively, its Gurkha communities. This was designated Operation LAYLAND.

Almost 100 personnel from 36 Engr Regt focused on re-enforcement of Headquarters British Gurkhas Nepal (BGN) and the Gurkha Welfare Scheme (GWS) footprint. They delivered life-saving support through rapid reconnaissance, provision of critical advice, water supply, the construction of emergency accommodation and delivery of humanitarian aid across the country. Those on Everest displayed great professionalism and coordinated their own evacuation from the mountain before returning to Kathmandu to support the unit's contribution to the relief effort. Significantly, in the immediate information

Bamboo scaffolding around the school © Crown

vacuum following the earthquakes the Squadron's core engineering reconnaissance skills provided accurate information on the situation across Nepal, informing assessments informed strategic decision making of both the UK and Nepal Governments. By mid-May, the Engineer Squadron Group (ESG) was working out of British Gurkhas Pokhara (BGP), and their forward elements firm in Gorkha. As no freight flight had yet been able to land in Nepal with engineer stores, local purchase and hire of essential stores allowed work to commence and the skills of the tradesmen put to use.

As the ESG became more established they continued to reinforce water supply capability in Kathmandu, and at the end of May, the Operation name was changed to MARMAT 1. They also undertook rubble clearance, building of Internally Displaced Person (IDP) camps and route opening/repair. This would be conducted whilst at the same time, supporting those in the Regiment personally affected by the earthquake. As Non Governmental Organisations began to leave Nepal this provided an opportunity in Kathmandu airport to start to move freight into country.

A shelter design was developed, based on the materials supplied in the aid packs, which could be rapidly erected using basic trade skills. Furthermore, the design was improved to allow UK Sappers to easily train the Nepalese Army Engineers and locals in building these structures. A health post for a community in Mambu, was also designed. It incorporated limited local resources, using techniques that could be practised with only the few tools available, ensuring it was safe and fit for purpose, whilst being simple to build. Concurrently an Infrastructure Damage Assessment was carried out on eight of the Area Welfare Centres (AWC), with the reports allowing future reconstruction to take place. There was continuous improvement on innovative structural designs for buildings and shelters, in order to maximise durability, whilst making the best use of local resources. In July, those who initially deployed returned to the UK to regroup.

Due to the monsoon season in Nepal through June to September, and the unpredictable granting of diplomatic clearance by the Government of Nepal, October saw the deployment of around 80 personnel from 70 Gurkha Field Squadron, supported by 12 personnel from the Queen's Gurkha Signals and Royal Army Medical Corps. Based out of British Gurkhas Kathmandu (BGK), Op MARMAT 2 delivered more deliberate solutions in support of GWS objectives, specifically the construction of Schools and Community Centres in an effort to rebuild key infrastructure in villages in Gorkha, Lamjung, Sindhuili and Ramechap districts through prefabricated construction solutions. Due to the nature of pre-fabricated structures, the ESG were able to complete eight structures in ten weeks, for those communities in the greatest need.

The final element of Op MARMAT 2 delivered a number of earthquake resistant, stone, reinforced concrete homes by way of proof of concept to support the GWS Main Effort; replacement homes for the pensioner community. This involved local construction techniques, stone soling for foundations, and bamboo scaffolding for roof erection. After four homes were completed, the ESG incorporated the lessons learnt and handed over detailed, superbly written method statements and reports to GWS and the incoming ESG.

69 Gurkha Field Squadron deployed late February to conduct a Relief in Place with their sister Squadron on Op MARMAT 3. The task would not be construction this time, but supervisory in nature, overseeing the construction of pensioners' homes for GWS. There were 29 military personnel, including Combat Medical Technicians, a Vehicle Mechanic and a Clerk of Works deployed. They had support from Locally Employed Civilians (LEC) and an Environmental Health Technician on call in the UK. The Construction Supervision Teams (CST) deployed about 180 km North East to Ramechap District, and split into 2-man teams to oversee a series of homes in

Earthquake damage © Crown

Locally employed civilians repairing the roof of a home © Crown

their respective AOs.
The benefits of a local workforce were huge; operating in a supervisory role is force multiplier for military engineers. Likewise, LECs' local knowledge was also invaluable, be that the quickest route through Kathmandu traffic, or where to source timber from. By the end of the deployment in July, the ESG managed to complete 26 of the 38 homes, against the clock of what turned out to be a slightly early monsoon. This would not have been possible without the adaptability of the Gurkha Sapper, often stepping up as often the lone Supervisor, over much older civilian tradesmen with more experience.

69 Gurkha Fd Sqn deployed again for Op MARMAT 4 in September 2016, to conduct some more home supervision, as well as the construction of a school. There were 99 personnel across all cap-badges from the Brigade of Gurkhas, as well as the Royal Engineers, Royal Electrical and Mechanical Engineers, Royal Army Medical Corps and Royal Logistic Corps, with a total of 58 from the Squadron, plus LEC support again.

For the school construction, bamboo scaffolding was again used: cheap, strong, readily available and considerably less logistic burden. Stone soling and walling was used for foundations and also by the locals for mountain road and wall construction. For foundations, it was more economical than concrete, and used considerably less water, which was in short supply, and difficult to transport in bulk. The 19 homes that were supervised, and the 38 on MARMAT 3 were only a small number of the 1,200 homes that GWS were looking to complete. However, results generated by rapid military effort over a short period, allowed HQ GWS to build momentum with their program. All of this is part of the sustainable planning by the Gurkha Welfare Scheme, so that these are not just 'fire & forget' projects. They all involved a great deal of community engagement, obviously being in the heart of those communities most affected by the earthquake.

Maj Rob Oakes RE
Officer Commanding
69 Gurkha Field Squadron
36 Engineer Regiment

Footnote
Since the first deployment, the Regiment has maintained a significant presence in Nepal including British, Foreign and Commonwealth and Gurkha soldiers united by a common humanitarian goal. Throughout, they have stood shoulder to shoulder with the Nepalese people – military, political and civilian. The unit has worked intimately with local communities to build capacity, such that the Nepalese people are better placed to continue to rebuild their own lives. Throughout the initial response the Regiment also supported Defence and Army level events in the UK commemorating 200 years of Gurkha service to the Crown. This included Ceremonial Duties, the Royal Pageant and high profile charity events, reinforcing the role and relevance of the Gurkha soldier to the British people. The Regiment used these events as an opportunity to raise about £80,000 for the GWS Earthquake Response Fund and for Oxfam Earthquake Relief Fund. This money has since been used by our soldiers in the delivery of the works in Nepal.

A completed pensioner's home © Crown

Recording the **Unique Built Heritage** at AWE

The Atomic Weapons Establishment (AWE) operates primarily on two sites located southwest of Reading in West Berkshire. Both Aldermaston and Burghfield played key roles in World War II, the former as an airfield and the latter as a Royal Ordnance Factory. Subsequently they were chosen to form part of the limited number of locations involved in Britain's nuclear weapons programme.

This rich history has left both sites with a wide range of structures dating from the 1940s to the present day, including those forming some of the nation's unique built heritage relating to the Cold War. Structures associated with this period of history are only now beginning to be recognised for their crucial historic importance, just at the time when many are being lost to development across the country.

An example of one of the unique Cold War structures was the Phased Electromagnetic Simulators (PETS). These were used to study the effects of electromagnetic pulses on military systems up to main battle tank size. Now demolished, these comprised of test pads, a generator for each simulator and a shared central control room.

Reflecting this, AWE commissioned an Historic Environment Characterisation report in 2007 which assessed the significance of the structures, identified distinct character areas and provided heritage management recommendations.

Phased Electromagnetic Simulators in use during the early 1970s © Crown

However in 2016 it was recognised that not only had significant changes occurred in the estate but also improvements could be made in the process to ensure buildings are appropriately recorded. Therefore every structure on the estate managed by AWE was re-visited (over 1,500 individual buildings) in order to re-assess their significance and the over-arching Historic Environment Characterisation report was updated.

The substantial improvement on this occasion was to support the main report with a Recording Schedule which details the suggested level of heritage building recording required, in line with Historic England guidelines, prior to demolition or significant refurbishment. Future ideas being explored include using drones and laser scanning techniques in order to provide 3D records of both individual buildings and sites as a whole.

This methodology has been shared with archaeologists from the Local Planning Authority (LPA), the MOD and Historic England. It required working closely with project managers, especially those involved with demolition, and specialist contract support where required. In order to reduce the costs of survey work, in-house expertise has been developed to ensure the sustainability of the programme.

Through this process AWE aims to maintain a record of the site as a whole, and particularly of significant buildings, therefore recording a unique contribution to Cold War history whilst recognising the need to modernise the estate to better meet the demands of the future defence programme. It also provides AWE with the framework for managing its heritage in the current planning context and forms a basis for relationships with the LPA and statutory bodies, such as Historic England.

Phased Electromagnetic Simulators shortly before demolition © Crown

Piran Borlase-Hendry
Senior Environmental Specialist
(Ecology & Heritage)
AWE plc

Breeding Birds of Conservation Concern on Otterburn Training Area

Merlin nest with chicks © Paul Galloway

Used for military training since 1911, Otterburn Training Area is the second largest live firing range in the country and consists of over 60,000 acres of land incorporating the largest impact area in the UK. Approximately 29,000 acres (11,750ha) is set aside for 'dry' (non-live firing) training, in which some 30,000 soldiers annually use the wide variety of terrain. This provides a realistic environment for British and NATO soldiers to train with the latest infantry weapons, artillery, helicopters, and fast air. All of which lies within the boundary of the Northumberland National Park.

As a response to the outcome of the AS90 Public Inquiry[1] and commencing in the spring of 2005 a breeding bird survey has been carried out every year in 26 x 1km national grid squares, which is approximately 10% of the training area. The methodology follows that of the British Trust for Ornithology's (BTO) Breeding Bird Survey. The habitats are diverse and some 70-80 species are attracted to breed including significant numbers of UK Breeding Birds of Conservation Concern. In its fourth national review published by BTO and RSPB in 2015, 67 species were on the Red List of Breeding Birds of Conservation Concern. The Otterburn surveys have shown that 19 of such are regular breeders with four occasional. Their status is summarised in the following account.

The skylark is largely a summer visitor and is the most abundant Red Listed species favouring the extensive grassland areas. During the first three years around 300 pairs were counted in the 26 squares. Following the severe winter of 2008/2009 that prevailed throughout Western Europe there was a dramatic reduction by almost 100 pairs. The subsequent three winters were also very cold and by the summer of 2012 the number had fallen to less than 150 pairs. However the present population is still over 100 pairs in the counted squares and it is estimated that some 800-1000 pairs are breeding across the entire training area.

The curlew, the emblem of the Northumberland National Park, is very much a feature. It too has a preference for the grassland areas. There were almost 50 pairs in the 26 squares in the first three years but the subsequent cold winters saw a decline to some 25 pairs by 2012. The numbers have been steady since then.

The lapwing population has fluctuated between 10 and 30 pairs in the surveyed squares. Favouring the lower grasslands, there is less suitable habitat for this species of wader compared to that preferred by curlew and snipe.

The ground nesting, migratory (trans Saharan) whinchat arrives in early May. It is conspicuous in the sheltered valleys, especially in those to the north of the River Coquet, preferring grassland or bracken patches rather than large areas of unbroken heather, and is particularly attracted to newly planted woodland where grazing stock is excluded. The population in the counted squares has fluctuated between 25 and 50 pairs.

The mistle thrush, recently added to the red list due to national declines, has maintained numbers and occurs in almost every wooded valley in the training area. It is one of the first species to occupy territories in the spring. Thinly distributed it has bred in 18 of the 26 squares surveyed.

A 2002 survey of the entire area revealed that there were only nine pairs of ring ousels breeding, reflecting national declines. This precarious population reflects the national picture, but it has stabilised with most breeding in the hills close to the Scottish Border.

There are numerous invertebrate rich streams running into the River Rede and the River Coquet to which the grey

The trans Saharan migratory whinchat © Peter Fawcett

1 Two public inquiries were held in the late 1990's to examine MOD's proposals to develop Otterburn Training Area for the use of the artillery system AS90 and the multiple launch rocket system (MLRS). One outcome was for MOD to undertake to monitor bird populations on the Training Area.

A chinook lifting two L118 light guns (a 105mm towed howitzer) on Otterburn Training Area © Crown

wagtail is attracted throughout. It is largely absent in winter but is quick to return to its favourite haunts and there are about 15-20 pairs evenly distributed on each of the two water courses.

The cuckoo can still be heard in many of the valleys where there are significant numbers of meadow pipit hosts but numbers are difficult to estimate. This contrasts with large parts of the UK where cuckoos are no longer found.

Prior to the increase in the buzzard population during the 1990s, 5-6 pairs of merlin were regular breeders, recently 1-2 pairs have been breeding. They nest either on the ground in extensive areas of heather or in old crows' nests in various shelter woods.

Only very small numbers of grey partridges occur in the low altitude parts. Formerly it was fairly widespread but a significant decline has coincided with the introduction of the more aggressive, non native red-legged partridge.

Woodcock, song thrushes, spotted and pied flycatchers, tree pipits and lesser redpolls all breed in significant numbers in either the coniferous or deciduous woodlands while the population of linnets steadily increases as the new hedgerows that were planted mature.

Starlings and house sparrows are found wherever there is suitable habitat. Both inhabit the many farm buildings with starlings also finding suitable nest sites in holes in the deciduous trees throughout the area.

Of the 96 UK Amber Listed species 16 are regular breeders and five are occasional. The number of pairs of the most significant are meadow pipit (1000-1500), house martin (100-200), willow warbler (100-200), snipe (50-100), reed bunting (50-100), common sandpiper (25-30) and dipper (20-30).

The habitat requirements of these key species has been maintained through the low intensity grazing regimes across the training area with all tenant farmers having Environmental Stewardship Agreements. There are 31 tenant farms within the boundaries with enterprises based on hill sheep and with some herds of hardy cattle. There are also scattered plantations and native woodlands. In order to cater for a variety of species the overall objectives of the management of the training area are to ensure there is a diversity of vegetation types and structure. This also provides a more diverse environment for troops to train in. For some species such as snipe, taller vegetation is preferred, while lapwings prefer it short.

For many species it is variety that is required with a mosaic of open areas for foraging and for the birds to be able to spot predators and taller tussocks of vegetation for nesting and for chicks to hide in.

In order to improve the status of species active interventions have recently taken place funded through the Defence Infrastructure Organisation Conservation Stewardship Fund. This has included rush cutting and control to create a patchwork in pastures that were formerly overwhelmed by rushes and cultivation of small bare fallow plots. Early results have been promising with several pairs of lapwings successfully breeding in areas where they have not been previously recorded in the spring of 2017.

This long-running survey means that Otterburn is one of the best studied locations on the Defence Estate. Although the survey has recorded declines in numbers this has reflected the national picture. In many cases the situation goes against local, regional or national trends with the training area being a significant refuge for many species of concern.

Bryan Galloway
Otterburn Conservation Group Member

Public Access on the MOD Estate
The Importance of Working Together

DIO, Wiltshire Constabulary and Trail Riders Fellowship have worked hand in hand to try to reduce illegal activity across Salisbury Plain © Crown

The Defence Infrastructure Organisation (DIO) Access and Recreation team (ART), based at Westdown Camp on Salisbury Plain and Rosyth near Edinburgh, form part of the wider DIO Environmental Support and Compliance team. ART are responsible for ensuring a balance between the primary use of the MOD estate for military activity, and the MOD's presumption in favour of public access where it is compatible with the aforementioned primary use.

One of the core approaches ART use in delivering this balance is by building solid working relationships with external stakeholders and recreational user groups. These networks provide opportunities to promote successful projects, share best practice and ensure safety messages are distributed through the most appropriate channels. These good news stories and informative pieces reach stakeholder members, peers and the wider general public.

As has been covered in previous Sanctuary editions, a key fixture of the ART networking roster is the MOD Access Forum. 2017 saw the fourth successful forum held at Castlemartin Training Area in Pembrokeshire. Representatives of key recreational user groups were given the opportunity to see first-hand some of the military activity that takes place, and how this is balanced with the demand for a diverse range of recreational activities, such as climbing, caving and surfing as well as the more customary walking.

The forum is a positive means of creating and reinforcing the appropriate context for individuals who may have no or very limited experience of the military environment. Military briefings and first-hand experience help illustrate the military reasons on which decisions concerning restrictions and exclusions to public access are based.

Face to face interaction with these important bodies also ensures we continue to maintain and enhance relationships with individual recreational user groups, and explore new ways to engage with their members.

Outside of the Access Forum ART have been working closely with a number of these individual user groups to develop and supplement information to pass onto their membership. The past year has been busy with conferences, developing people's understanding of what is safe and responsible public access on the MOD estate and producing new written material for magazines or for their respective websites.

The Ramblers

The Ramblers are one of the oldest recreational groups in the country and an organisation with a long working relationship with the MOD. The Ramblers have a large membership of approximately 114,000 across the UK, a high percentage of which are likely to use areas of MOD land for access and recreation and who consequently have a keen interest in the estate.

Fearing a knowledge gap across their membership, it was agreed that a useful exercise for all parties would be to reinvigorate and promote the key messages of responsible access to the MOD estate via the Ramblers' website.

ART worked closely with the Ramblers policy team, to create a page promoting the relevant safety information and messages that the public will need

Salisbury Plain's bespoke Greenlaning Good Practice Guide can be found on www.gov.uk © Crown

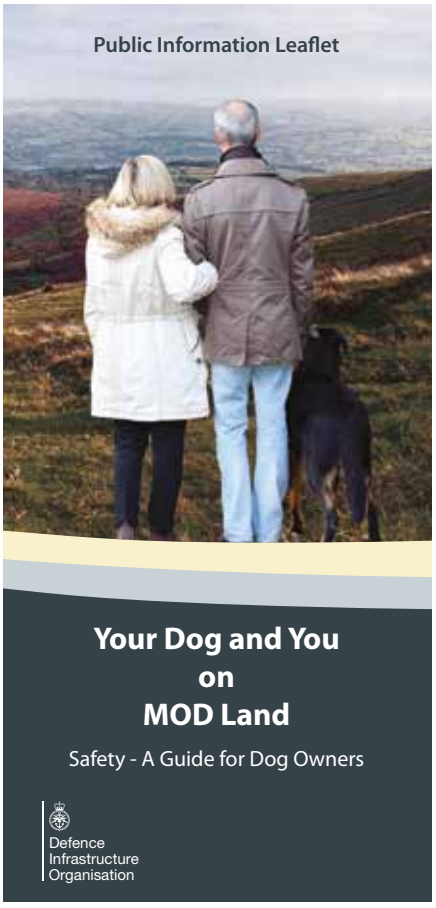
to ensure they take access safely and responsibly, thereby minimising the chance of an accident or disruption to military activity.

This page has now been published and can be found on the Ramblers' website.

British Horse Society
Another organisation represented at the MOD Access Forum is the British Horse Society (BHS).

The BHS, similar to the Ramblers, has a large membership of approx. 91,000, many of whom take equestrian access across the MOD estate. DIO ART and BHS have long worked together to try and promote safe equestrian access on the MOD estate.

Most recently ART attended a BHS Safety conference as a guest speaker, and delivered a presentation covering access across the MOD estate. Our presence was very well received, with extremely positive feedback from the BHS members present and an acknowledgement that this kind of liaison work and information provision is invaluable.



National guidance for dog walkers across the MOD estate can be found on www.gov.uk © Crown

Stakeholders discuss best practice on a site visit to Salisbury Plain © Crown

Following the conference, ART expressed similar concerns to those voiced to the Ramblers regarding a knowledge gap amongst members. The BHS agreed to post an informative article on their website, which took the public access safety messages 'Back to Basics'. The article consolidated the appropriate safety information pertaining to public access on MOD land, reaching BHS members and the wider equestrian community.

The long standing initiative, Operation Bright Eyes, was also revived, promoting the use of hi-visibility clothing by equestrian users and raising awareness of low flying aircraft and the possible disturbance this can cause to horses.

Trail Riders Fellowship
The Trail Riders Fellowship (TRF) is a national organisation promoting safe and sustainable off-road riding by trail bikes. The TRF often explore across the DIO estate, but Salisbury Plain in particular is a magnet for all-terrain vehicles. Most visit and enjoy the area responsibly, but sadly there is a minority of users that ride with little concern for their actions or impacts.

A positive working relationship has progressively formed between ART and the TRF, beginning with the endorsement of the Salisbury Plain Greenlaning Good Practice Guide.

More recently, seeking further guidance from DIO the TRF invited ART to attend regional meetings to deliver presentations and answer questions about responsible use of the MOD estate. This positive personal engagement has helped support delivery of a national message aided by an interview with ART for an article called 'Risky Riding'. Published online and shared across a range of social media, the clear messages have received much support and positively promote DIO.

DIO ART continue to look at ways to develop and further relations with external stakeholders and organisations and develop new methods to promote messages of enjoyable and responsible access across the estate. It is important that everyone is reached, from the daily dog walker to more niche interest groups such as cavers.

ART aim to ensure that a personal, joint working approach remains at the core of their work. Direct promotion of safe, responsible public access will be fundamental as the MOD estate becomes further rationalised and the use of the UK estate increases with the inevitable drawdown of Germany.

Scott Ashworth
Access and Recreation
Defence Infrastructure Organisation

Seals, sea shells and shifting shorelines A partnership approach to **Marine Protected Area** management

Blue mussels *Mytilus edulis* on the intertidal rock within the Murlough SAC © DAERA Marine Division

The Ballykinler Training Centre is located within the Murlough National Nature Reserve (NNR) beneath the Mourne Mountains near Dundrum, Co. Down. Designated in 1967, this site was the first Nature Reserve in Northern Ireland and is now also listed as an Area of Special Scientific Interest (ASSI) and a Special Area of Conservation (SAC). SACs are designated under the EC Habitats Directive and protect features which are important within a European context and listed in Annex I and II of the Habitats Directive.

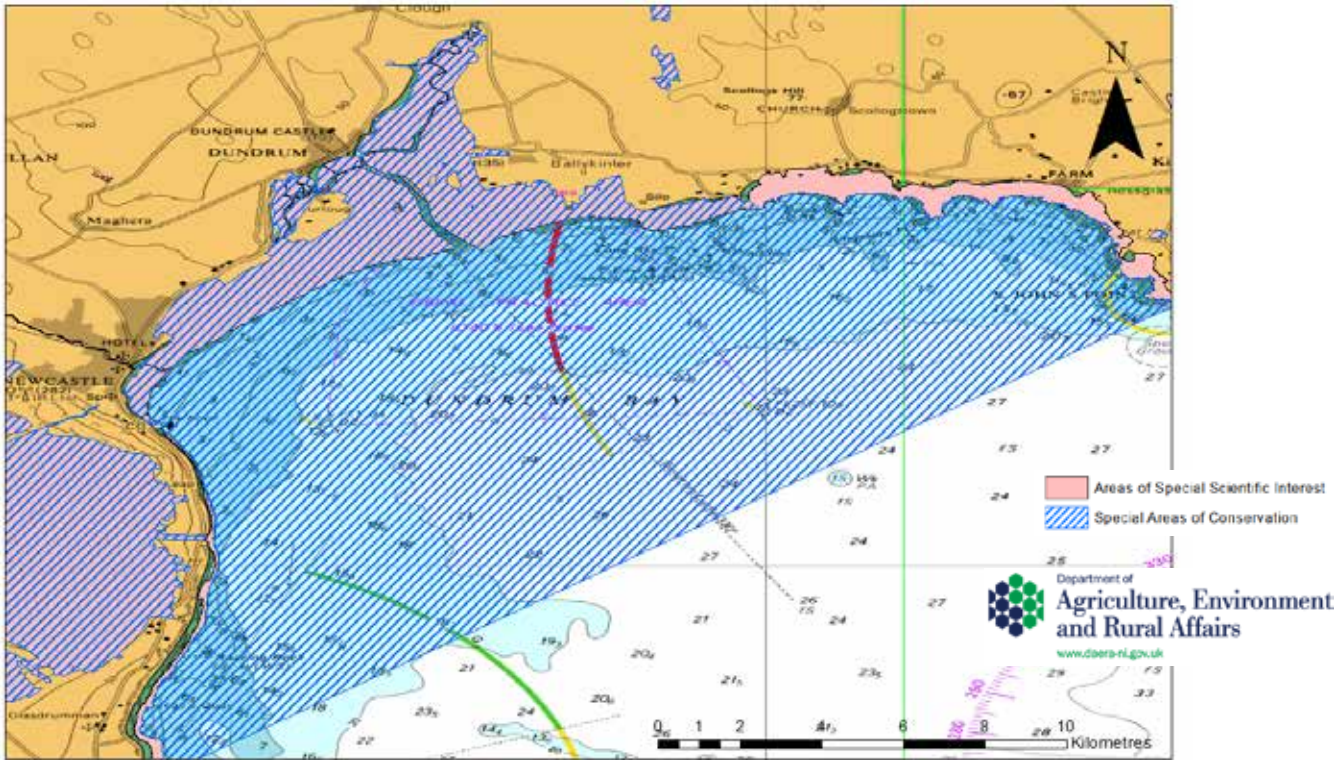
The primary feature of the Murlough SAC is a fragile, 6,000-year-old sand dune system which provides the best and most extensive example of dune heath within the island of Ireland, supporting over 600 species of butterflies and moths, including the rare marsh fritillary butterfly, as well as a wide range of plants and wildflowers such as the rare Shepherd's cress. These are primary features for which the site is designated, but the Murlough SAC also has a marine component, extending beyond the low water mark and encompassing Dundrum Bay.

Dundrum is home to the largest area of shallow sub-tidal sandbanks in Northern Ireland, an Annex I habitat which provides vital nursery grounds and protection for juvenile fish as well as feeding grounds for seabirds. At low tide, extensive mudflats and sandflats are uncovered, allowing for flocks of waders and wildfowl to feast on the abundant worms, cockles, clams and sandhoppers that dwell within the sediment. The sandflats within the Murlough SAC are also home to a year-round population of harbour and grey seals, with the largest aggregation of hauled-out seals occurring at Ballykinler. Rocky outcrops separating the long stretches of sandy beaches support diverse intertidal communities and are afforded protection by various underlying ASSIs within the Murlough SAC.

Under the Conservation Regulations for Northern Ireland, the Department of Agriculture, Environment and Rural Affairs' (DAERA) Marine Division has a general duty to ensure that the Murlough SAC is maintained in a healthy state. As one of the principle landowners within the SAC, MOD acts as custodians for Ballykinler and partly due to its presence, public access to this section of the SAC is restricted. Therefore, aside from the occasional dog walker and horse rider on the foreshore, levels of human activity on this stretch of coastline is relatively low compared to elsewhere in Northern Ireland.

Major Tony Canniford oversees the conservation management at Ballykinler with support from Defence Infrastructure Organisation (DIO) specialists, working closely with DAERA Terrestrial and Marine conservation teams, the Northern Ireland Environment Agency, National Trust, Lecale AONB and Ulster Wildlife. It is this joint approach that ensures that the conservation objectives for the entire site are being met. Most management is funded as part of the MOD SSSI Condition Improvement Project.

In regards to the marine components of the Murlough SAC, the National Trust are responsible for monitoring the seal population and undertake regular seal counts at Ballykinler and elsewhere within the SAC. Counts are generally carried out from the shore but have also



Murlough ASSI and SAC map © DAERA

been conducted from aerial images collected by helicopter as part of a UK-wide study by the Sea Mammal Research Unit in Scotland. The monitoring programme has shown a general decline of harbour seals within the Murlough SAC, whilst the number of grey seals has increased. Ballykinler however still supports one of the largest aggregation of seals within Northern Ireland, as they appear to prefer the peace and quiet of this stretch of beach over the more accessible and busier sites nearby.

The DAERA Marine Conservation Team is responsible for monitoring the condition of the intertidal zone within the site. This includes annual surveys of the intertidal rock habitat that have revealed a diverse range and abundance of flora and fauna. The intertidal community is dominated by limpets, barnacles, sea snails and a variety of seaweeds, which thrive amongst the rocky crevices and rockpools. High densities of blue mussels also occur at the site. Blue mussel beds are listed as a 'Priority Marine Feature' in Northern Ireland and occur on the OSPAR list of threatened and declining species and habitats.

Common starfish *Asterias rubens* on the intertidal rock within the Murlough SAC © DAERA Marine Division

The special features of the Murlough SAC may however be under threat from the effects of coastal erosion as a result of unprecedented winter storms and changing weather patterns in recent years; a natural phenomenon which is occurring throughout Ireland.

A 2-3km stretch along the Murlough coastline has been affected, with some parts having lost between 5-10m of sand dune and the vast quantities of sand that has been stripped from these areas are being dumped on Ballykinler Beach. This mass deposition of sand is having a considerable effect on the shoreline at Ballykinler, as it begins to cloak the intertidal rock zone and change the overall structure of the beach. Analysis of aerial photographs taken from MOD aircraft show the beginnings of a lagoon forming and there is concern that the entrance to Inner Dundrum Bay may one day be closed off if the build-up of sand continues at current rates.

The MOD has recently completed a report into coastal dynamics that examined the sand movement within the Murlough SAC and the potential impacts on the local environment. The study will be used to inform the MOD and partner organisations on how best to manage the effects of coastal erosion at Ballykinler on military assets and ultimately protect the features of the Murlough SAC.

The dedication of the MOD at Ballykinler has been pivotal in maintaining it as one of Northern Ireland's best sites for nature conservation. The management of this site provides a prime example of how different parties can pull together, share resources and collaborate, and in doing so maintain precious parts of our coastline. Upholding this integrated, partnership approach and developing a long term management strategy is essential for the future protection of Ballykinler and the wider Murlough SAC.

Sally Stewart-Moore
Scientific Officer
DAERA Marine Division

Waste Management Innovations

Waste sensor vehicle © Aspire Defence Services Limited

During 2016 in a new initiative, Aspire Defence Services Limited (ADSL) introduced the Food Waste Recycling and Measuring Waste Sensor Technology Project Allenby/Connaught (PAC) within garrisons at Aldershot and on Salisbury Plain.

Under the 35 year PAC contract Aspire Defence Services (ADS) provides facilities management services and ADSL manages a number of these services on behalf of ADS, including the collection and disposal of general waste from offices, catering facilities, living accommodation and technical buildings.

One of ADSL's aims is to support the Army units based on PAC to meet their environmental targets and their contract enables long term partnerships with suppliers, leading the way for continual improvement.

Working with subcontractor Hills Waste Solutions (HWS), ADSL has ensured that no waste from the core waste contract has gone to landfill since April 2014. The recycling rate has increased from 25% in 2014 to 45% in 2016 and ADSL continues to take advantage of developments in recycling and reprocessing. During 2016, 6,048 tonnes of waste were managed by ADSL with the extraction of 2,742 tonnes of recyclables and 3,306 tonnes sent to power generation.

Food Waste Control and Recycling

Under the direction of ADSL and in partnership with Sodexo Defence who work alongside ADSL delivering catering, retail and living accommodation, HWS carried out a trial of a separate food waste collection at garrisons on Salisbury Plain identifying a potential 10% recycling increase.

Food waste is separated into colour coded containers reducing the amount of residual waste going to recovery and increasing recyclable material. Waste is taken to an anaerobic digestion facility in Westbury, Wiltshire for electricity and biofertiliser production.

Having achieved a good understanding of the food waste production journey, HWS supplied 74 specialised food waste containers to all PAC's major food producing assets across Salisbury Plain in October 2016.

Food waste reporting in each kitchen gives Sodexo team members a greater awareness of waste and overproduction. Systematic measurement of food waste and refining production control has significantly improved pre-consumed food waste levels, hotplate and kitchen waste with a reduction of 40% in one Junior Ranks' Mess.

Measuring Waste Sensors

In another initiative designed to reduce the garrison's carbon footprint, a 9-month trial of Measuring Waste Sensors was conducted at Aldershot Garrison. Information collected from small, battery-powered wireless sensors placed under the lids of bins allows HWS to identify those which need emptying.

The trial was confirmed a success and all the waste from Aldershot Garrison under the HWS contract is now collected using this system, the first commercial application of waste sensor technology. Following implementation at Aldershot, HWS was able to decrease core waste collection frequency, dropping CO^2e by 25%. ADSL and HWS are now assessing the application across PAC.

Measuring waste using sensors reduces environmental impacts and safety risks by reducing vehicle movements and places ADSL and the customer at the cutting edge in the application of smart technology.

Sébastien Jouan
Business Improvement Manager
Support Services
Aspire Defence Services Limited

Staff using a recycling centre © Geraldine Faulkner
Editor, Recycling and Waste World

Powered by Nature – vehicles overseas

Ascension Island solar powered electric vehicles © Interserve Support Services

Poor air quality is a serious public health issue. For example each year in the UK approximately 29,000 premature deaths are caused by exposure to particulate matter alone. For those affected, poor air quality may reduce life expectancy by up to eleven years.

Ascension is a small island with only 40km of roads and an ideal location for electric vehicles. However, the island electricity supply is relatively expensive in UK terms and provided by a mix of wind and diesel generators with the diesel often used in the evening when vehicles would be on charge. As such a standard vehicle charger might only displace emissions.

Ascension does have a key resource – it is located just south of the equator and benefits from over 2,600 hours of sunshine per year (compared to 1,400 hours in Sutton Coldfield). When Defence Infrastructure Organisation (DIO) and Interserve looked for a sustainable way to introduce electric vehicles an innovative solution was developed; an off-grid, solar powered, energy storage, vehicle charging unit that fits in a standard 20ft ISO container. The bespoke design was developed by Energy Solutions. Each unit collects and stores energy during the day and charges four, totally emission free, vehicles overnight to support operational delivery for Ascension Island Base.

Jenny Colfer DIO Sustainability Manager said *"This is an excellent and innovative project, finding means to reduce unnecessary emissions across the Defence Estate both in the UK and abroad and is key to making the MOD a more sustainable organisation. Through reducing vehicle emissions associated with the operation of the Defence Estate we can protect public health and improve the environment."*

The next project phase will identify the best users for the vehicles based on job requirements and current mileage data and monitor the vehicle use and input/output of the charger units to identify opportunities to optimise performance. The total operational cost including fuel and maintenance savings will be captured to present a comprehensive benefit assessment and refine the current seven year payback calculation.

Peter Smith
Energy and Sustainability Director
Interserve

Pedal power at British Army Training and Support Unit Belize (BATSUB)

Really useful, no emissions, and a great way to keep fit – DIO in Belize have the answer for moving their tools and equipment around camp in a more sustainable way.

BATSUB now has a fleet of seventeen tricycles used by staff, they cost BZ$706 (circa £283) and are easily maintained. Captain Kev Bartram said *"the team find them very useful, we have expanded the fleet recently as they are perfect for taking your tools around camp rather than using larger vehicles, these tricycles are sourced from Quans Trading Ltd based in Belize, we will ask if they can export them."*

Richard Snow
Environmental Planning
Defence Infrastructure Organisation

One of the seventeen tricycles used by staff at BATSUB © Crown

Acacia Management
on the British Sovereign Bases Cyprus

The non-native *Acacia saligna* in flower © Crown

One of the main issues facing nature conservation management in natural habitats is that of invasive non-native species. Often these species freed from natural control in their home ranges, and often being better adapted to local conditions, are able to invade and dominate natural habitats. One such invasive species in Cyprus is *Acacia saligna*; introduced from Australia, where it grows in an arid low rainfall environment, enabling it to invade and spread into our valued Mediterranean woodlands, scrub and open habitats that support our often unique flora and fauna.

Although the issue of the acacia has been recognised as a problem for some time, action to control it has often only been possible indirectly through funded infrastructure projects. Historically conservation funding has been limited and mainly directed to smaller more targeted projects.

The acacia was introduced in Cyprus in the 1880s for good reasons as seen at the time in order to create shade in the arid lowlands in the vicinity of towns, create fuelwood and fodder, drain swamps for the control of malaria, reclaim sand dunes that were otherwise seen as having limited value and to stabilise steep slopes.

Acacia is by far the most invasive exotic species in Cyprus and constitutes the main threat to natural habitats. It has a wide range of negative effects on biodiversity and ecosystems.

On the 30th December 2015, The British Sovereign Bases in Cyprus (SBA) announced the designation of almost half their total territory on the island as Special Areas of Conservation (SAC) under the Habitats Directive. Five sites totalling an area of over 12,000ha have been identified and designated. With the designation comes a commitment for its future management. The Habitats Directive system aims to maintain protected habitats at a favourable conservation status, a set of standards to define the character that these habitats should possess.

Since 2013 the Defence Infrastructure Organisation (DIO) has invested significant amounts of funding in removing 139.79ha of *Acacia saligna* from the SAC in the SBA. A large part of the funding has been secured through DIO's Environmental Support and Compliance team (ES&C), who negotiated taking the lead for managing an existing UK environmental budget in 2013. Extra funding has been secured to extend this to the overseas territories where similar issues occur. This has been developed into the MOD Overseas Conservation Stewardship Funding, dedicated to environmental projects overseas.

Acacia under stress after illegal irrigation pipes removed by the SBAA Police and the Army on Cape Pyla © Crown

To assess the scale of management required to address the acacia problem, a range of large scale mapping programmes have been initiated. Working in collaboration with the SBA Environmental Department, DIO and its industry partners Interserve Defence Ltd (IDL) and Cyprus Service Provider (CSP), a simple mapping exercise was carried out in spring 2013 to record the extent of acacia on the designated sites; this included prioritising the most sensitive sites and identifying seed-sources adjacent to the sites, these were included in the control programme. Further work was carried out on mapping acacia on the Akrotiri Peninsular. The Cyprus Technical University in co-operation with the SBAA Environment Department, Akrotiri Environmental Education Centre and DIO mapped acacia using remote sensing methods.

The next step was to develop a strategy to tackle the problem. The initial control methodology was based on the guidelines published by the Cyprus Department of Forests 'Guide for the Control of Invasive Trees in Natural Areas in Cyprus December 2013'.

Targeted chemical control techniques include, drill-fill, cut-stump, frilling, stem-scrape and ring-barking. Currently the cut-stump technique has been applied in the SBA, with limited trials with the drill-fill technique. With the cut-stump technique the trunks are cut down prior to herbicide application.

Recently removed and impounded pipework from Cape Pyla © Crown

The work to date has been targeted at RAF Akrotiri, Dhekelia and Episkopi and includes cutting, removal and disposing of all arising off-site and one application of chemical treatment. The following areas have been treated at these sites, RAF Akrotiri 92ha, Dhekelia 31ha and Episkopi 16ha. The work at Dhekelia has focused on Cape Pyla removing cover used by illegal bird trappers, and the removal of irrigation pipes that have been used by the trappers to water blocks of acacia.

Monitoring success is essential to identify where the best results are achieved and to give feedback to adapt techniques. Initial post assessments of the presence of re-sprouting of cut stumps have been carried out at regular intervals since treatment. If properly treated, one can expect control rates of 80-95% after the first application.

Follow-up control can give near 100% mortality rates. Recent control rates are in line with the 80–95% predicted.

Feedback from monitoring has been very important in informing how we go forward. Applying the cut-stump methodology proved difficult; especially, when faced with a dense copse or multi-stemmed individuals. For health and safety reasons it was impossible to cut the trunk and treat the stump within the recommended 10 second rule. Where such areas are now encountered, the trunks are cut at a height of > 30cm, this allows for the trunk to be further reduced to ground level and the stump to be treated within 10 seconds, in a more controlled manner. This methodology has been monitored and is showing to be successful.

Looking forward, work will continue in collaboration with the Republic of Cyprus Forestry Services and other interested stakeholders. It is through this forum that knowledge and experience can be shared and new techniques developed for managing acacia. It is also hoped to develop a bespoke training package for all contractors working in acacia management. More research is required in tackling seed banks but the outlook for the future is looking positive.

With special thanks to Maria Michaelidou (CSP Grounds Maintenance Officer) for providing all the facts and figures.

Davy Reynolds
Environmental Planner (Overseas)
Defence Infrastructure Organisation

The foreground has been cleared of acacia at Cape Pyla encouraging the regeneration of native species © Crown

The Dstl Porton Down **Stone-curlew Conservation Project**

The electric fence providing protection to a stone-curlew and her eggs. Can you spot the fox looking longingly through the fence? © Dstl

The stone-curlew is a summer migrant bird to the UK. Since the start of the 20th century, its numbers have declined dramatically, leading to the population being included on the Red List of Birds of Conservation Concern. Recent conservation measures have brought about an increase in the population and a consequent move to Amber status. However, they are still listed on Annex 1 of the Directive on the Conservation of Wild Birds and Schedule 1 of the Wildlife and Countryside Act 1981.

In the UK, stone-curlew breed in two core areas; East Anglia and Wessex. The core of the Wessex population is centred on Salisbury Plain Training Area and Porton Down. The Defence Science and Technology Laboratory's (Dstl) Porton Down Site of Special Scientific Interest is also designated as a Special Protection Area (SPA) specifically for stone-curlew.

Birds nesting on the open grassland within the SPA are vulnerable to predation by badgers and foxes; due to its exceptionally large rabbit population Porton Down supports very large numbers of these predators. As a consequence, stone-curlew breeding productivity (the number of chicks fledged per breeding pair) at Porton Down has always been low compared to other Wessex sites. For example, no stone-curlew chicks fledged in 2012. In contrast the number of breeding pairs at the site has remained relatively stable.

To address the issue of low productivity, the Dstl Porton Down Stone-curlew Conservation Project was started in 2014. The project aimed to deliver a robust and sustainable stone-curlew breeding population across the Porton Down estate by reducing the levels of nest predation. The project has initially targeted eight specifically created stone-curlew breeding plots within areas of established unmanaged agricultural grassland where electric fencing could be installed, along with trail cameras to record success and failures.

Fencing was first used in the 2014 breeding season when either a permanent or temporary electric fence was erected around each plot. Evidence later showed that permanent fences were more successful and so the temporary fencing was replaced in subsequent years. An analysis of the results showed that, where fencing is used, more breeding attempts hatched compared with attempts that were not fenced and if chicks remained inside the fenced plot they were more likely to survive to the fledging stage.

In 2016, nesting attempts on the plots showed that out of the 14 protected nesting attempts, 12 hatched; the two unsuccessful were due to infertile eggs. These protected nesting sites produced five confirmed fledged young. This compares to the non-protected nests where, out of the ten attempts, only one hatched; the SPA had five breeding pairs and no fledged young. Restrictions on ground disturbance, due to historic MOD activities within the SPA, have meant that fencing cannot be erected around nests on the open grassland without significant disturbance to nesting birds. Trials with innovative non-ground penetrating fencing have been undertaken in 2017.

Productivity is affected by a number of environmental factors but the increased effort by Dstl to protect nests is clearly beneficial. The five-year productivity average, which is taken as the measure of success, has increased as the number of chicks fledging each year is higher than before the commencement of Dstl's Stone-curlew Conservation Project. In the three years prior to fencing, an average of two chicks fledged across the whole site each year, compared to the three

years post-fencing when nine chicks on average were fledged.

Dstl has collected sufficient evidence over the past three breeding seasons to show that erecting permanent electric fences around the plots increases hatching success. However, this does not reduce the risk of predation at the chick stage when birds leave the plots. Dstl continues to work towards significantly improving fledgling success; encouraging the birds to remain on the protected plots is a priority.

Terry Jeanes and Sarah Atkinson
Dstl Facilities Management Services
Rural Team

Nick Tomalin and Sarah Atkinson ringing a stone-curlew © Dstl

What to Do When the Plot Thickens

The last couple of years have seen new challenges for the RSPB Wessex Stone-curlew Project. The LIFE+ grant funding for stone-curlew conservation has focused on getting more birds off cropped habitat (where nests are vulnerable to mechanical operations) onto specially-created nesting plots. Stone-curlew nest on bare ground in open areas and they can breed into late summer. To ensure bare ground is available throughout the breeding season some management of the plots is required during the summer to control vegetation growth.

Across Salisbury Plain Training Area (SPTA), close liaison between Defence Infrastructure Organisation, RSPB and Landmarc is essential to deliver the right management at the right time. With over 30 plots on SPTA there's lots of in-season plot management needed, funded by the MOD SSSI Condition Improvement Project. To avoid damaging nests or disturbing birds at critical times, up to date records of breeding activity are required before work can be carried out.

Immediately prior to the work RSPB staff identify nest locations, allowing Landmarc to cultivate the half of the plot without the nest on to open up bare ground for later nesting attempts. If the chicks have already hatched they will move around the plot, so it may be necessary for RSPB staff to be present to locate the chicks before machinery moves on to the plot.

Although this can be a very intensive process, the results are worth the effort. The population on SPTA has been stable for some years, and although productivity has varied each year, the early indications suggest that 2017 has been a very good breeding season for stone-curlew.

Nick Tomalin
RSPB Wessex Stone Curlew Project

Stone-curlews caught on camera having fun bathing © Dstl

Headley's Roman Sarcophagus

The Roman sarcophagus after cleaning © Crown

Headley Court is an imposing Victorian mansion which has been used for over 60 years as the premier rehabilitation facility for injured service personnel. It was originally founded after World War II for the treatment of injured RAF Aircrew and today it is the home of the Defence Medical Rehabilitation Centre (DMRC) as part of the Joint Medical Command.

Within the grounds there are a group of interesting historic objects, many of which are listed in their own right. These include two sun-dials, a fountain with four sculpted dolphins, a winged lion seat, and an ornate planter which stood in-front of the Officers' Mess. Despite being of national interest and all listed Grade II in 2001, almost nothing is known about these intriguing objects.

The ornate planter, which was filled with earth and plants, came to the attention of the Historic Buildings Team of Defence Infrastructure Organisation (DIO) when damage to the stone planter was reported. Nothing was known about its history but at some point in the past the sarcophagus had been broken into several large pieces and iron pins had been used to pin the broken pieces back into place. Over time water seeping into the cracks corroded the iron pins, causing the pins to expand and 'blow' one small section of stonework apart. There were other iron pins and a debate ensued on the best action to restore the sarcophagus. One school of thought was to take apart all the previously broken sections, remove the pins, and then replace the sections. Whilst this would be the ideal solution, the pins were so embedded that their removal would be highly likely to cause further serious damage to the stonework.

After consultation with the local Council Conservation Officer and Historic England it was decided that the sarcophagus should be repaired by leaving the pins in place and filling the cracks with a hydraulic lime mixture. The sarcophagus was also covered with an algae organic growth which it was agreed should be carefully removed.

The cleaning and the conservation of the sarcophagus was funded through the DIO Conservation Stewardship Fund.

All the surfaces were hand cleaned to remove the biological growth from the surface using non-metallic brushes. The small fragments which had come off were fixed in place with a lime mortar grout and all the cracks were filled with lime mortar specifically matched with appropriate sands and stone dusts to match the fabric, colour and texture.

Firstly the soil and flowers had to be removed. The friable topsoil was quickly taken out, but lower down the highly compacted clay and stones proved tricky to remove. Eventually the bottom of the sarcophagus was reached, revealing an original raised section for the head and drainage channels cut into the stone.

Detailed features of the lion after restoration © Crown

The planter was decorated with an image of a lion at one end attacking a horse, and elsewhere there are patterns, masks and drapery. In order to find out more about the planter the listing description was consulted, but it was highly circumspect about its importance, merely mentioning that it was a 'flower trough in the form of a classical sarcophagus'. Rich Victorians in particular had a penchant for classical gardens and ornaments and there was a suspicion that the planter could have been a good Victorian replica of an original Roman sarcophagus.

The Roman sarcophagus before cleaning © Crown

Whilst the conservation was underway the Historic Buildings Team made enquiries to the British Museum as to whether the sarcophagus was Roman or a Victorian copy. The reply from the British Museum's Department of Greece and Rome was illuminating, as it was confirmed that the planter was in fact a genuine Roman sarcophagus. The British Museum had passed the query to Dr Ben Russell in Edinburgh University, the UK expert on Roman sarcophagi and he gave further information about it. The lion depicted on the end is a common Roman motif and the sarcophagus itself is a 'lenos' i.e. a 'tub' sarcophagus, a well known Roman style of sarcophagus. Experts thought that it is most likely to be either Thasian or Prokonnesian marble. There are other examples in the UK, but the greatest number are in Italy and it is highly likely that the Headley Court sarcophagus was made in Italy.

The question then arises as to how a Roman Italian sarcophagus ended up at Headley Court. The answer probably lies with one of the former owners of Headley Court, Lord Walter Cunliffe. Walter was given the original farmhouse by his grandfather, James, who had made the family fortune by his development of the North Eastern Railway, but only on the condition that Walter should go into banking, rather than farming. Walter became Chairman of the Bank of England and built the current imposing building on the foundation of the earlier farmhouse and the current mansion was completed in 1899. Lord Cunliffe was an avid collector of architectural features and so the mansion has an eclectic mix of older items. The architectural features included within the house include 17th century panelling rescued from demolished buildings, Elizabethan panelling and chimney piece and even panelling and a chimney piece from Cromwell's sister's house in St Ives, within the old county of Huntingdonshire.

Chris Daniell
Senior Historic Buildings Adviser
Defence Infrastructure Organisation

Headley Court rehabilitation centre © Crown

Studying dolphins of the kelp Falkland Islands

One of the researchers collects photographic identification data of Commerson's dolphins in Port Howard © Maria Garcia, SAERI

In October 2016, researchers from the South Atlantic Environmental Research Institute (SAERI) undertook a two-year research project focusing on cetaceans inhabiting the Falkland Islands' coastal water. The 'Dolphins of the Kelp' project is funded by the UK Darwin Initiative, and is being implemented in collaboration with the Falkland Islands Government, Falklands Conservation, Austral Biodiversity Ltd, Shallow Marine Surveys Group, Oregon State University (USA), and University of St. Andrews (Scotland).

The project aims to gather information on the abundance, distribution, habitat use and genetic diversity of the Commerson's *Cephalorhynchus commersonii* and Peale's *Lagenorhynchus australis* dolphins, whose conservation status is still considered as Data Deficient from the International Union for Conservation of Nature and Natural Resources (IUCN). A boat survey was carried out in summer 2016 and winter 2017 in three different locations to investigate dolphin presence and group size, and to collect individual photographic identification data. These methods allow the 'capture' and 'recapture' of individuals using pictures (instead of physical handling) and have proven to be a successful way to investigate population parameters such as abundance, survival probability, growth and juvenile recruitment rates as well as residency and movement patterns. Preliminary analysis suggests that the two species only partially overlap, with Commerson's dolphins being distributed in the inner part of the bays/sounds and Peale's in the outer part. During daylight in summer, large groups of Commerson's dolphins have been observed in Port Howard with more than 350 individuals already identified based on the presence of natural markings on their dorsal fin. During winter only a few small groups of Commerson's have been observed in the same area, suggesting a different seasonal distribution.

Researchers also observed a change in the faeces colour from orange-reddish (likely crustaceans) to white (likely fish or squids), suggesting seasonal difference

HMS Enterprise supporting SAERI © Crown

in prey availability might be among the causes of the change in the distribution observed. Peale's dolphins have been primarily observed in Port Williams in both winter and summer and although 19% of the 37 individuals have been re-captured, new animals are continually observed during the surveys indicating that not all the marked dolphins using the area have been identified. Body tissues from both species have also been collected to provide the first genetic characterisation of Commerson's and Peale's dolphins around the Falkland Islands. The project also included an aerial survey carried out in the coastal waters around the Falkland Islands within 10km from the coast. The survey will provide the first data about abundance estimates for the species encountered and information about how the animals' distribution might be driven by environmental variables such as temperature, primary productivity and depth, and by the geography and morphology of the coast.

The Baltic Warrior used for the vessel survey anchored at the East Cove Military Port. Commander W. Dawson of the Royal Navy offered the use of the Harbour facilities and acted as the safety body in place of a coastal guard during the project © Marina Costa, SAERI.

The dolphin research was carried out in a very remote area, scarcely inhabited, where the importance of safety at sea is still being recognised. Therefore, the support provided by the MOD was essential for the implementation of the study. Commander W. Dawson from the Royal Navy, Queen's Harbour Master at the East Cove Military Port offered the use of the Harbour facilities and to act as the safety body as the country does not have a coastguard. In addition, during the study HMS Enterprise (H88) was displaced at the Falklands for a few months. Commanding Officer Philip Harper and Executive Officer Matthew Warren supported the dolphin project by providing information about depth and tides in the area. They also shared cetacean data collected by the Royal Navy wildlife watch programme.

This information will be added to the overall project findings to deliver a better description of cetacean in the area. Researchers were also invited to join the HMS Enterprise crew for a 10-day trip to South Georgia in order to collect cetacean observations.

The support of the MOD has been very welcome and has been very important in ensuring the continued success of this exciting project.

Marina Costa
SAERI
www.south-atlantic-research.org/research/current-research/dolphins-of-the-kelp

Commerson's dolphin, photographed off Port Howard, West Falkland © Maria Garcia, SAERI

Tree Health
Sennybridge and the wider MOD Estate

Sennybridge Training Area showing potentially infected plantation blocks © Crown

Few of us remember the impact of Dutch elm disease and the role it played in changing the landscape of lowland Britain. It was caused by a fungi spread by a beetle. However, it warned of an increasing threat to our native trees and plantation woodlands that is only now becoming understood by the wider public as a major issue that needs to be managed much more actively.

Diseases, pathogens and pests are all part of the natural world and in any natural ecosystem have an essential role to play in recycling dead material back into useful nutrients. Sometimes however, these pests and pathogens become too aggressive and can kill their hosts, so plants must adapt to the evolution of these diseases. This is usually achieved by natural genetic diversity within the species and the complex mix of species in a woodland.

This delicate balance of natural integration and adaptation however, can be undermined by the introduction of pests and pathogens that have been taken out of different often complex ecosystems in other parts of the world and spread to ecosystems that have not been exposed to them. This is what is happening in our modern world as goods and services are spread around by modern travel and commerce.

International trade can bring new pests, diseases and pathogens into the UK, some of which can harm wildlife. The movement of young trees around the UK for planting can speed up the spread of infection, as has been reported with ash saplings imported from the continent carrying a fungi called Chalara which is now widespread in the UK.

A dramatic example, as part of our national response to plant and animal health issues across the MOD estate, has been our management of *Phytophthora ramorum* on Sennybridge Training Area (SENTA). *Phytophthora ramorum* is a fungus-like pathogen called a water mould. It causes extensive damage and death to a wide range of trees and other plants. In the USA it is known as 'sudden oak death' because different genetic forms have caused significant damage to North American oak species. The good news is that the outbreaks in the United Kingdom have had little effect on Britain's two native oak species.

Unfortunately, larch trees, which are widely grown in the UK for the timber market, are particularly susceptible to Ramorum disease, and large numbers have been affected. 8% of Welsh forests consist of larch trees, which is equivalent to approximately 24,000ha.

The disease is detected by a combination of visual inspection using both interpretation of aerial photograph, and field visits, followed by field tests of bark and needles showing symptoms of the disease using test kits. Currently 38% of this larch falls within a control instruction known as a 'Special Plant Health Notice' or SPHN, which is issued to owners of diseased trees. This means that the infected trees in the area must be felled. So far 699 'notices' have been issued in Wales and the total area affected is just over 9,000ha. Across the SENTA four SPHNs have been issued to date. If we add areas where there has been no confirmation, but which look to be clearly infected, then around 70ha may be affected. Timber from infected larch can still be used and a harvesting programme is currently underway to ensure that the income from timber sales is reinvested into the estate to establish new woodlands.

As well as forest operations, additional biosecurity requirements are needed to reduce the risk of further infection.

These have been put in place through collaboration with Defence Infrastructure Organisation (DIO) foresters, Landmarc, Natural Resources Wales and the Forestry Commission Plant Health Team. As *P. ramorum* can be spread through water, soil, timber harvesting produce and residue, it is important to keep access routes clear so that machinery and vehicles avoid contamination and spread the disease to other parts of the estate. Portable test kits have recently been used in the larch areas and the vehicle wash-down at SENTA. The test kit results so far have been negative, though the practical challenge of working with the outbreak is likely to be an on-going issue.

Infected larch needles © Crown

Looking to the future, threats on our doorstep include a pathogenic bacterium, *Xylella fastidiosa* which causes disease in many plant species and is transmitted from plant to plant by sap sucking insects, such as the common froghopper. It affects a range of tree species including oak, maple, elm and plane. Rising from relative international obscurity, it is now becoming a very serious economic threat in southern Italy and Spain eliminating thousands of hectares of commercial olive trees. Further spread and damage is hard to predict and the disease is now subject to EU emergency measures. Although it is not known to be present in the UK there is a heightened risk of it being accidentally introduced, especially from imported live plants.

To address these biosecurity threats, quarterly biosecurity working group meetings are held that include representatives from the Forestry Commission, Animal and Plant Health Agency, the GB 'Non Native Species Secretariat', DIO and the MOD. This enables some of the country's leading experts in pests and diseases to update and advise the MOD on all the current biosecurity threats.

As restocking felled areas is planned, the DIO forestry team must consider diversifying the species mix in the forestry plans using less commonly planted species such as western red cedar and silver fir, which appear more resilient to current threats and potential climate change. Forests and forest plans will need to adapt because the actions taken today will have long term consequences for the survival of trees, woods and forests across the MOD estate for years to come.

DIO foresters and ecologists are working together with the military to redesign the forest resource at SENTA. This process is designed to ensure that the woodland at SENTA is better equipped to serve training requirements and more resilient when faced with the challenges of climate change. The redesign will also result in the restoration of some ex-plantation areas to open habitat. While natural regeneration along water courses and stream gullies will also provide valuable corridors reconnecting higher ground with lowland, yielding benefits for wildlife.

Steve Holdsworth
Regional Head Forester
Defence Infrastructure Organisation

Clearing plantations of Phytophthora infected trees © Crown

Aspire creates a new Dukedom at Larkhill Garrison

Duke of Burgundy © Crown

Situated on the southern fringes of Salisbury Plain, Larkhill Garrison attracts a wide variety of wildlife and is particularly rich in insect fauna. Four UK Butterfly Monitoring Scheme transects have been monitored on the garrison since 2010 and produced no less than 37 different species of butterfly; the highlight being the Duke of Burgundy, first seen along the edge of a small wood in May 2011 and annually since.

Following the announcement of the Army Basing Programme (ABP) and proposals to redevelop the former motocross site, a Species Action Plan was drawn up in November 2014 with the principal aims of conserving the prime locality of the Duke and creating a new habitat nearby which would remain undisturbed. Work began in August 2015 on cutting three large scallops (10-12m diameter bays) into invasive cherry saplings on the north-west facing border of a wood in Horne Barracks. During the next few months around 300 cowslip plants (the caterpillars foodplant) were rescued from areas of the garrison due to be developed for ABP and transplanted into the scallops.

Over 50 Duke of Burgundy eggs were found at the motocross site in 2016 and in July four turves containing around 20 eggs were dug up from a threatened part of the site and relocated in the Horne scallops. During May 2017 two Dukes were observed in the central scallop and later three eggs were found on the underside of cowslip leaves.

The spring of 2017 was dry and many of the cowslip plants became distressed but some larval feeding damage was evident on at least one clump. Further cowslip planting is planned in the autumn, especially on the adjacent grassland which was used for a reptile translocation scheme the previous year.

An interesting discovery in 2016 was that caterpillars of another local butterfly the brown hairstreak were using cherry plum as an alternative food-plant to the more usual blackthorn. Plenty of the butterflies' eggs were found on plum bushes during the winter months and some of the saplings have been transplanted in the Horne scallops. Another project is now underway to propagate cherry plum from pits gathered from the summer fruit and plant at various locations along woodland borders elsewhere on the garrison.

Despite pressure on existing habitats within the camp, it is hoped that enough new ones will be created to help sustain the wildlife that has chosen to make Larkhill Garrison its home.

Mike Lockwood
Aspire Defence Captial Works

Cherry plum at Larkhill. Inset, a female brown hairstreak © Mike Lockwood

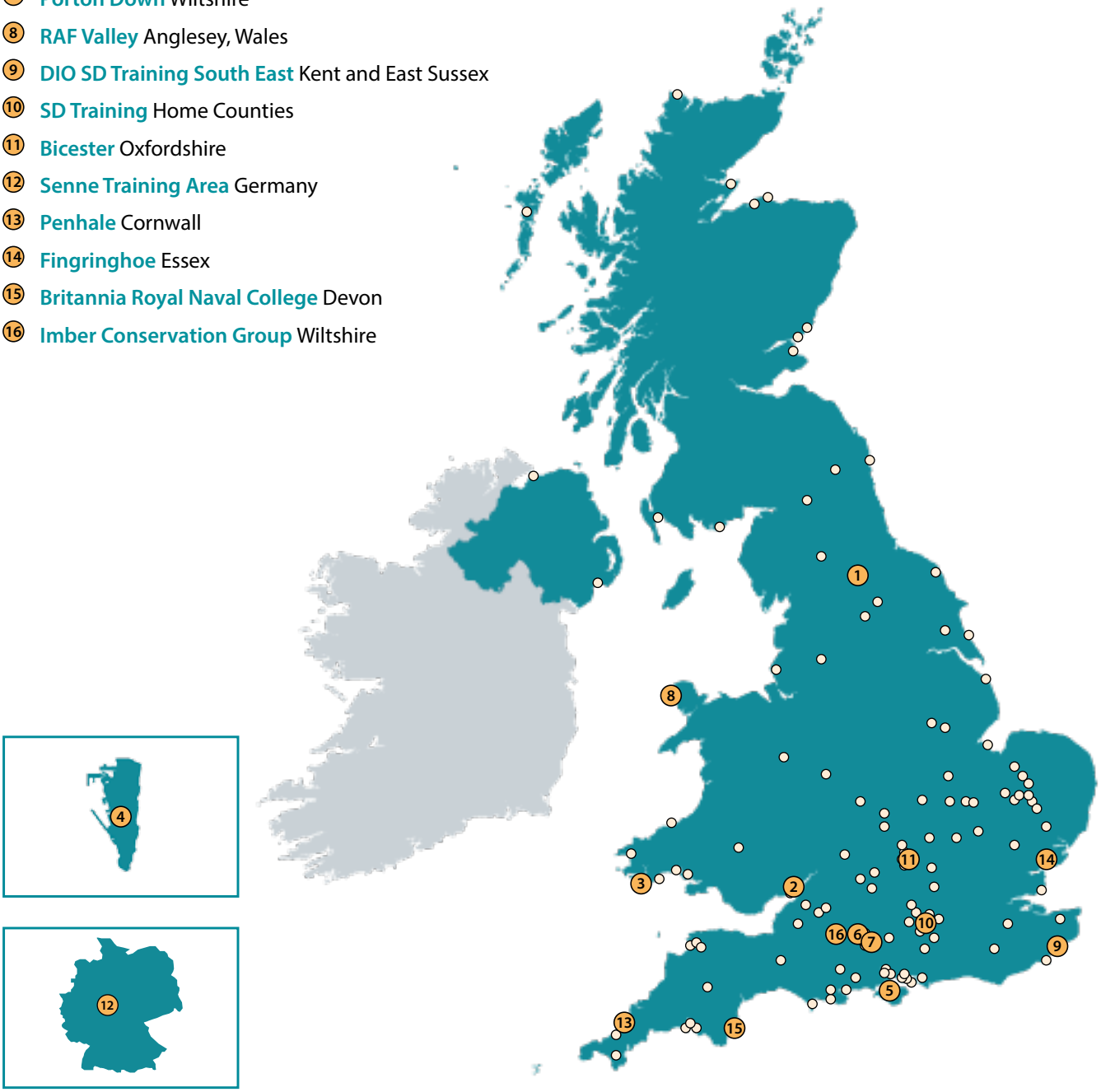
Around the regions
with the Conservation Groups

There are over 125 Conservation Groups operating across the MOD.
The following section provides an update on the dedicated work of some of these groups.

1. Spotlight on... **Foxglove Covert** North Yorkshire
2. **Caerwent** Monmouthshire
3. **Castlemartin** Pembrokeshire
4. **Gibraltar** Raptor Unit
5. **Newtown Range** Isle of Wight
6. **Larkhill and Westdown** Wiltshire
7. **Porton Down** Wiltshire
8. **RAF Valley** Anglesey, Wales
9. **DIO SD Training South East** Kent and East Sussex
10. **SD Training** Home Counties
11. **Bicester** Oxfordshire
12. **Senne Training Area** Germany
13. **Penhale** Cornwall
14. **Fingringhoe** Essex
15. **Britannia Royal Naval College** Devon
16. **Imber Conservation Group** Wiltshire

KEY: UK MAP

- 1 Featured Regional Conservation Group
- Other Regional Conservation Group



Spotlight on...
Foxglove Covert

Birds-eye view of Foxglove Covert © Foxglove

Foxglove Covert Local Nature Reserve operates within the boundaries of the British Army's largest garrison and reaches out to Catterick Training Area, one of the major training facilities in the UK. Situated on the eastern boundary of the Yorkshire Dales, the area consists of large expanses of heather moorland, ancient deciduous woodland, moorland fringe, wetlands, rivers and becks, and extensive areas of recently created plantations.

This year the reserve celebrated 25 years, which is a huge achievement by all those involved. A special weekend event was held at the reserve and guests included the Lord Lieutenant of North Yorkshire, Barry Dodd, Richmond MP Rishi Sunak and the reserve's patron, Lord Zetland, who planted trees to mark the occasion. The weekend of activities was rounded off with a BBQ for volunteers, staff and visitors to enjoy.

Her Majesty's Lord Lieutenant of North Yorkshire having planted his commemorative tree.
L to R: Maj (Retd) Tony Crease; Lord Lieutenant, Mr Barry Dodd; MP for Richmondshire, Mr Rishi Sunak; Chairperson FGC LNR, Sophie Rainer; and Patron of the Reserve, Lord Zetland © Colin Lyne

Managing and recording the rich diversity of species associated with this large expanse of North Yorkshire is virtually a full time occupation. Fortunately, a large number of skilled and knowledgeable volunteers assist with the management and contribute on a daily basis. New projects are routine, for example, a recently established wildflower meadow is nurtured to retain its authenticity within the larger dales habitat, and a large shallow pool has recently been profiled providing essential muddy fringes for breeding waders. Coppicing and pollarding takes place annually, and the overarching preservation of everything from grouse moors, to sensitive SSSI plots, wetlands and orchid banks are all part of the programme.

Throughout the year, regular transects are covered to assess and record the precarious black grouse population which benefits from the extensive white grass and in-bye land. The moorland habitat hosts important numbers of upland wading birds, which are often ringed as juveniles providing invaluable data on their migratory movements.

Female kestrel hovering © John Hayden

These include golden and green plover, redshank, oystercatcher, curlew and snipe. Hundreds, often thousands, of meadow pipits are mist netted in the autumn, along the Pennine fringe, and recoveries have been recorded recently from the south coast and the continent. 225,000 birds have been caught and the data inputted to the national British Trust for Ornithology database by the dedicated ringing team who work from dawn to dusk throughout much of the year.

In total 800 nest boxes have been constructed, erected and maintained by volunteers. Long-eared, short-eared, tawny, barn and little owls have bred successfully and have been ringed within the environs of the estate covered by the group. Populations of pied flycatcher, redstart and dipper have benefited from the extensive nest box initiative. Managed wetlands are fed by water from an aquifer and have recently been acclaimed for their high quality; these wetlands host several rare species, including water vole, otter, great-crested newt, spectacular numbers of breeding common frog and toad, dragonflies and damselflies, and rare plants, including marsh stitchwort and pillwort. Other rare species are micro managed to ensure their survival. The ponds are of national importance.

On a typical 'worky day', volunteers include both military and civilian personnel who offer a wide range of abilities, skills and knowledge; their ages range across the spectrum. Visitors include garrison personnel and their families, school children, the Help for Heroes Pathfinders programme, Dales tourists, the local community and others from further afield.

People with a variety of specialisms are encouraged to observe and take part in the many organised activities available. These have included willow weaving, arts and crafts days, owl-pellet sessions, botanical walks and numerous other innovative opportunities.

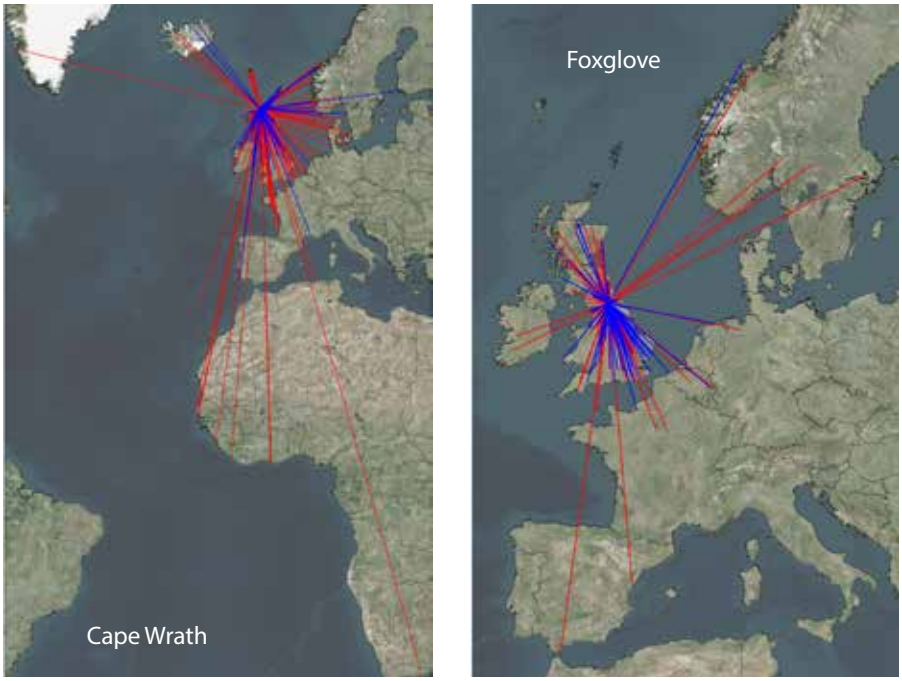
Dr Roger Key gives the outgoing Chief of Staff 4 Infantry Brigade, and his family, a lesson on sweep netting invertebrates © Colin Lyne

Volunteers at Foxglove © Foxglove

Visiting school children benefit from working in the natural environment with volunteers. A monthly Eco Club, and holiday activities are organised for local children and groups from many organisations are welcomed. Individuals with special needs join the volunteers every week making a valuable contribution. Other working parties meet to maintain the tools and machinery.

There are initiatives throughout the year to record flowers, butterflies, fungi and lichens, and all findings are verified and added to the species lists that are forwarded to the national data centres via county recorders. Moth traps are set weekly in various habitats and at the height of summer it will take most of the day to identify and record the catch! An observation bee hive is maintained by volunteer bee keepers within the group, who link in with the local Beekeepers Association. Visitors can observe the daily workings of the hive with the help of informative literature and charts and may also purchase the honey.

The activities and achievements of Foxglove Covert are publicised regularly in the local newspapers, the team's own magazine 'Undergrowth', through regular workshops and open days and in a seasonal display in the local Garrison Health Centre. Several families have become involved as a result of this. Catterick Training Area has published its own hard backed book on the area and every copy has sold.



Two maps of recoveries from birds ringed at Catterick (Foxglove Covert) and Cape Wrath. The red lines are for birds ringed at these two sites and subsequently found elsewhere, the blue lines are for birds ringed elsewhere and subsequently found at Catterick/Cape Wrath © Dr Rob Robinson BTO

Funds are raised by grant seeking, an adopt-a-bird-box scheme, raffles, quizzes, coffee mornings and social functions. A dawn chorus breakfast, Burn's Night, 'Light and Inspiration' photographic extravaganzas, dinners and seasonal festivities have all generated much needed income and promoted the Reserve's aspirations.

Publicity material such as display boards are constructed and maintained by volunteers to the highest possible standards. Qualified and experienced volunteers give talks within the local community to illustrate the successful conservation results being achieved, to involve the local population, promote the MOD, and to raise awareness of conservation on MOD land.

Mallards on the 'Tony Robinson' tree © Foxglove

The Foxglove Covert volunteers, friends and managers consist of individuals willing to share a vast skill base. This group is without doubt one of the most effective and credible conservation organisations within the MOD, if not the UK. It engenders a tight camaraderie across a mixed garrison community and does much for the natural world across the estate and for the reputation of the MOD in the North of England. It also contributes substantially to nationwide research.

Maj (Retd) AJ Crease, late SCOTS DG
Deputy Commander - Executive Officer
DIO Service Delivery - Training North

Monmouthshire
Dinham Meadows, Caerwent

Crick Wildlife and Environment Project volunteers help with scrub management © Kay Swift

Dinham Meadows, sits within the DIO SD Training's Caerwent Training Area in Monmouthshire and used mainly for low level infantry dry training exercises, is a Site of Special Scientific Interest (SSSI), comprising of five grassland areas that have been traditionally managed as hay meadows and pasture since the 1930s and together they constitute the largest area of unimproved grassland in the county.

The site is underlain by calcareous bedrock which influences the plant communities found there, a beautiful mix of neutral grassland with plants such as common knapweed, birds-foot trefoil, field scabious and agrimony as well as areas of calcareous grassland harbouring plants such as salad burnet, dwarf thistle, lady's bedstraw and hairy violet. Species rich grassland across the wider base is important for rare insects like the grizzled skipper *Pyrgus malvae* butterfly, whose caterpillars feed on plants like agrimony, barren strawberry, salad burnet and tormentil.

Bird's-foot trefoil © Crown

These grasslands in the past have witnessed different management approaches, hay cuts, pony grazing, sheep grazing and cattle grazing but scrub encroachment is an ongoing issue. Left for too long the scrub will shade out the rarer grassland plants which can then take a long time to re-colonise. Over recent years a managed grazing scheme has been implemented and in certain areas there has been a need to remove ragwort from grazing/hay meadow areas.

This is where the Crick Wildlife and Environment Project (CWEP) come in. Crick is a village immediately adjacent to the training area and residents formed a group with the aim of improving the local environment, managing an area of young woodland and developing a community wildflower meadow adjacent to the village. CWEP has benefited previously from links with the training area and so members have been only too willing to lend a hand.

CWEP helped with scrub management in some of the most diverse areas of grassland highlighted by Defence Infrastructure Organisation (DIO), Butterfly Conservation, and Natural Resources Wales. We used hand tools including 'tree poppers', bought from the DIO Conservation Group Grant, which were a great success as they removed the scrub 'roots and all'. This will hopefully slow the rate the scrub returns, especially helpful in hard to reach spots and areas with yellow meadow ant *Lasius flavus* hills, where the use of machinery is not an option.

Physical help is not the only advantage for the team running the training area; this is another route to strengthen their relationship with the local community, something they work hard to do. In the past CWEP have received help from the training area in turn and together we helped with a wildlife project at a local playgroup, so the relationship is more like a partnership rather than simply volunteers turning up to do a shift. CWEP are not experts like the representatives of the bodies mentioned above, but we have all learnt more about our local environment by working on this project and better understand the important work undertaken on the training area. Already more plans are in the pipeline.

Brian Williams and Kay Swift
Crick Wildlife and Environment Project

Robert Bacon
Conservation Officer
Natural Resources Wales

Grizzled skipper © Crown

Pembrokeshire
Castlemartin

Marsh fritillary found on Castlemartin Range © Crown

The Pembrokeshire Ranges Conservation Group has had another busy year; some of which was spent in the sand dunes on Castlemartin Range on two different projects. Over the winter the group repeated a survey of scrambled-egg lichen *Fulgensia fulgens*, as it was thought the species was in decline. A survey had been carried out in 2007 and the same locations were visited, however new, detailed and repeatable methodology had to be agreed on first. Initial results suggest that there have been changes in the amount and distribution of *Fulgensia* but that it is not a disastrous picture at all.

Marsh fritillary caterpillars and web © Lynne Houlston

The calcareous dune system on Castlemartin Range is the largest intact dune system in Pembrokeshire and is of European importance for the diversity of animal and plant communities it supports. However an increase in vegetation is creating a static rather than mobile system. In order to re-mobilise the dunes Defence Infrastructure Organisation (DIO) and Natural Resources Wales carried out a large vegetation removal project and the debris was used to sculpt new dunes. This opened up bare sand to the effects of the wind allowing it to be mobilised and moved around. The vegetation removal was a slow task due to the constant checks for and removal of unexploded ordnance.

The marsh fritillary *Euphydryas aurinia* is threatened not only in the UK but across Europe and is therefore the object of much conservation effort. However, this species is doing really well on Castlemartin which has the largest population in Wales.

In early summer the local butterfly recorder repeated transect routes and counted 487 adults in 45 minutes; equating to 11 adults/minute. A recent transect survey for marsh fritillary caterpillar webs resulted in thousands of webs being recorded.

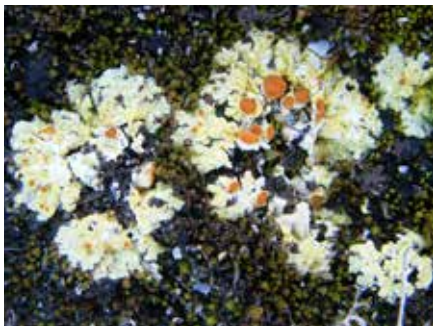
A monitoring project by Amphibian and Reptile Conservation (ARC), funded by DIO's Conservation Stewardship Fund, recorded slow worms, grass snakes and common lizard on Castlemartin Range, but rather surprisingly, no adders. However, once ARC's Officer reached the eastern end of the range he recorded a number of adder hibernacular. It is thought the reason for this could be the number of fires that occur across the western side of the range caused by the heat of the illuminating rounds within the ammunition fired.

Also as part of ARC's project 49 rotting hay bales were moved from Brownslade Orchard on Castlemartin to four different locations near ponds to create habitat for grass snakes.

A quick survey of Manorbier Range to assess its potential for an official monitoring project revealed seven different species of bumblebee, including garden, early and red-tailed. More monitoring by the Bumblebee Conservation Trust will now take place.

And finally, ending on a rather sad note, our old chough, born in 1995, did not return to Castlemartin this year. His lady was with a new gentleman chough and they raised one chick.

Lynne Houlston
Ranger for the Military Estate



Scrambled-egg lichen © Lynne Houlston

Gibraltar
Raptor Unit

The Barbary partridge Gibraltar's flagship species © Aaron Baglietto

The MOD still holds a significant amount of land in Gibraltar, including areas that have special scientific interest. However, whilst the importance of MOD land to Gibraltar's biodiversity frequently receives attention, less is known about the Gibraltar Ornithological & Natural History Society's (GONHS) Raptor Unit's installations on MOD land. These are vital for the conservation, not only of birds of prey, but also other important species in Gibraltar.

The GONHS Raptor Unit was born in the 1990s, when experienced Gibraltarian falconers decided to dedicate all of their efforts towards the conservation of their beloved birds of prey.

The importance of the Strait of Gibraltar for migrating birds is well known. Hundreds of thousands of soaring birds cross the Strait every year, many of these past Gibraltar itself. Some arrive exhausted, especially during the Spring migration, when the sea crossing can be quite a test for birds that rely on thermals to fly. Furthermore, Gibraltar's enormous colony of yellow-legged gulls and high density of Peregrine falcons can pose a hazard to other birds of prey, which are often viciously mobbed and sometimes grounded. Large species are most commonly targeted and a number of short-toed eagles and griffon vultures in particular are rehabilitated on an annual basis. Juveniles of Gibraltar's breeding falcon populations are also retrieved regularly.

The GONHS Raptor Unit rehabilitates many birds every year. Moreover, some of these birds are used in studies on their survivorship and movements. Years ago, radio tracking of two short-toed eagles demonstrated, not only that the birds survived for a significant period, but also their movements in Spain and Morocco. More recently, GONHS has taken to wing-tagging released birds, rather than ringing them. This has led to a drastic increase in reports of our griffon vultures in particular, which have been reported from as far afield as northern Spain.

Some of the birds suffer irreversible injuries and cannot be released. In the case of breeding species in Gibraltar, particularly lesser kestrels and Peregrines, such birds are kept by the Unit and used in breeding programmes. This is important for lesser kestrels especially as Gibraltar's breeding population has suffered a sharp and worrying decline. Young birds reared by the Unit are regularly released.

But the activities of the Raptor Unit are no longer limited to birds of prey. The Barbary partridge is Gibraltar's flagship species, but factors such as predation by feral cats and habitat loss led to a recent decrease. With additional land made available by the MOD, the GONHS Raptor Unit embarked on a partridge breeding programme, using birds sourced from Morocco. This work continues and many young birds are released annually, including onto Windmill Hill Flats, which is MOD land and is the most important site in Gibraltar, and therefore mainland Europe, for this species of partridge. Barbary partridges are once again common on The Rock, and will continue to be so for as long as the MOD continues to be involved in land management for conservation purposes.

Dr Keith Bensusan
Section Head
Strait of Gibraltar Bird Observatory
Gibraltar Ornithological and Natural History Society (GONHS)

Two wing-tagged Griffon vultures waiting to be released © Gilbert Gonzalez

Isle of Wight
Newtown Range

It has been a successful year for Newtown Range Conservation Group, with bookings for the facility up from the previous period showing usage at 85%. Not to rest on our laurels the Chief Executive has directed that we try and encourage more use of the camp and Training Area by both military and civilian factions during the lean months of November, January and February.

We held our annual wildlife open day in May. Traditionally the event was called the Orchid Walk as we were fortunate to have the largest show of green wing orchids on the Isle of Wight. Through the years the number of orchids has varied and recently has dropped to an all-time low. The orchids grow on a small section of the range meadow and produce a carpet of purple. Now they have spread out across the range and even appear in neighbouring land belonging to the National Trust.

We still arrange our event for about the second week in May in the hope that the orchids will put on a good show; still there is always plenty to see around the range area which pleases the public who enjoy the two hour walk-about guided by our Conservation Group experts with their knowledge of flora and fauna.

Sometimes parties request to see beyond the range onto the training area and when possible we are quite willing to show them what there is of interest. The public are not normally permitted onto the training area or the range so organised groups led by the Range staff are the best way to see the area. In fact there was a request for a tour from a local senior citizen walking group, this was arranged for September. Feedback was positive and although tiring it was a most enjoyable visit.

Gold case bearer © Dave Maidment

Injured buzzard found on the range meadow © Dave Maidment

Moths are the topic of conversation at the moment. Our Lepidoptera experts Barry Angell and Ian Merrifield, equipped with the moth trap bought from donations to the conservation fund, found six species of rare micro moth on the range meadow, all of national importance. In particular are *Colyophora vibricella* the gold case bearer and *Syncopacmo vinelle*, which was thought to have been extinct since 1990, all thrive on our plentiful crop of dyers greenweed. Three other rare micro moth larvae, which also feed on the plant, have been found.

In June the osprey platforms were refurbished with the help of Scottish & Southern Electric and their cherry picker. New nests were built by John Wilmott during the winter months and placed on top of the existing ones. Again we still hope to attract osprey, but a pair of peregrines nested again on one of the platforms, although unfortunately the nest was unsuccessful due to predation.

The AGM bade farewell to our chairman Lt Col (Retd) Chris Booth, who enjoyed his appointment in the chair keeping the peace between the conservation experts and their management aspirations, John Coupland also attended his last AGM and their input to the Group over the years has been appreciated. The Chairman, on behalf of Defence Infrastructure Organisation Environmental Support and Compliance Team, presented certificates for outstanding contribution to conservation to a number of conservation group members.

A knock on my office window attracted me to our Range Warden Stuart Hersey holding a Buzzard! He had picked it up on the range meadow, the bird was not well and spent some time with the local RSPCA before being released back on the range some days later.

There is always something going on here, some years we are busier than others, in particular the field of expertise this year was Lepidoptera. Who knows what next year will bring and what might be found. An amazing place to be part of.

Maj (Retd) Dave Maidment
Range Officer & Training Estate Manager

Wiltshire
Larkhill and Westdown

A male broken-belted bumblebee *Bombus soroeensis* on tuberous thistle *Cirsium tuberous* © Mark Arbuckle

Tony Rowlands has completed a comprehensive GIS survey of Salisbury Plain including map features from 1773 onwards, survey records from Christopher Beese (a conservation group member), archaeological and biodiversity records. Initial analysis has revealed that the Plain was more intensively farmed in the 19th century than was appreciated. The biodiversity records from the Plain have been added to the Wiltshire and Swindon Biological Records and are available for research.

Mark Khan has logged the armoured vehicles used as targets on the artillery ranges to allow their historical significance to be ascertained and possibly to preserve some. The Army Rebasing project is building new married quarters near Larkhill camp. In 2017 the foundation work revealed an unexpected World War I training trench system with underground tunnels – and a quantity of unexploded ordnance!

Collecting entomological data from Salisbury Plain is a challenge due to military activity. Marc Arbuckle ran a series of Beewalks in 2016 with mixed success due to the poor weather.

After a good start in 2016 with hibernators appearing in early March, the April cold discouraged many butterfly species. Mike Lockwood noted a flurry of activity in early May when green hairstreak, orange tip and holly blue appeared. Despite better weather in June few butterflies were seen apart from the familiar 'browns'. Comma and red admiral were plentiful in the Autumn. Chalkhill blue, clouded yellow and brown hairstreak were generally not seen although numerous eggs of the latter were found in October, which is the usual way to monitor this species.

Salisbury Plain has a remarkably rich orchid flora hosting some twenty species as the vast majority of the Plain has never been subjected to modern intensive farming techniques. Tony Rowlands has produced a Provisional Atlas of the Orchids of the Salisbury Plain Training Area showing the distribution.

As our contribution to Citizen Science and the British Trust for Ornithology's national bird population monitoring programme, Phil Deacon ran a 'Constant Effort Site' project at Westdown. The object was to carry out regular visits from May to August 2016, setting mist nets in the same location for a timed period and comparing the results with previous years. This season was one for the late arrival of migrants and failed early nests, but numbers, although down, were just under a five year average and on par for a ten year average.

2016 was a very poor breeding year for barn owls mainly due to a vole crash. Many females failed to reach breeding weight and, for those that did, only one or two chicks were recorded by Nigel Lewis. However the owls cashed in on the autumnal harvest of small mammals and many reached a good weight to face the Winter months. As a result 2017 looks like being a very successful breeding season for owls and kestrels.

Lt Col (Retd) Richard Clayton
Secretary
Larkhill and Westdown CG

A green hairstreak © Crown

A grizzled skipper © Crown

A male common carder bee *Bombus pascuorum* © Mark Arbuckle

Wiltshire
Dstl Porton Down

The Dstl Porton Down site is rich in ecology and there are always a number of projects running each year both on and off its Site of Special Scientific Interest (SSSI). Some of the key projects this year were:

Turtle Doves
Turtle doves have been recorded nesting at Porton Down for a number of years but more recently in a plantation on the edge of the SSSI. In 2014, trail cameras captured images of the birds using a pond specially created for stone-curlew.

This year, to further encourage and increase the turtle dove population at Porton, a new habitat was created closer to the birds nesting site which incorporated another pond and an area sown with a turtle dove feed seed mix. This is already showing signs of success.

Archaeology
In 1916 Porton Down was purchased by the Ministry of Defence (MOD) at which time agricultural use of the land was almost entirely abandoned. As a consequence the landscape has been undamaged by modern agricultural activity which has helped to preserve the prehistoric features including many Neolithic, Bronze Age and Iron Age remains. Over 200 monuments have been discovered and recorded to date.


Netting a monument for rabbit and badger protection © Dstl

A number are designated as Scheduled Monuments and although their condition has remained relatively stable over the years, there is a concern that rabbit and badger activities may now be putting some of these monuments at risk. As a consequence a programme of monument 'protection', covering the monuments in netting has commenced which will be carried out each year until works on all those monuments identified as 'At Risk' are complete. This will bring considerable future management challenges as for over a 100 years rabbits have been encouraged as the primary grazer of the SSSI. Those monuments which have been protected will be carefully monitored to assess the benefits of netting within this heavily rabbited environment.


Creation of a turtle dove pond © Dstl

Spiders
In its SSSI citation Porton Down was noted as an important site for its spider fauna with 194, or 30%, of the total number of British spiders recorded at that time. Richard Coleman, a local arachnologist, has been surveying and identifying the spiders at Porton Down since the 1970s. Samples are now collected using pitfall traps by the Dstl Rural Team and supplied to Richard for identification. This year the total number of spiders identified has reached over 325, which means that 50% of the total number of British spiders can be found at Porton Down. Samples collected from an 11 acre invertebrate enhancement area next to the SSSI has revealed 114 species which demonstrates how managing ex-arable land for wildlife can increase biodiversity. The survey continues and the number of spiders identified is expected to increase.

Terry Jeanes and Sarah Atkinson
Dstl Porton Down

Post Note: *Stone-curlew at Dstl Porton Down continue to ignore the 'Rule Book' and, as they did last year, have once again nested within a major construction site although this year there were three nesting pairs!*

Anglesey, Wales
RAF Valley

Starting in a new role, which includes responsibility for the Station's Environmental Impacts and Aspects, I was truly amazed and surprised as to the sheer amount of wildlife and nature within such close proximity to our airfield at RAF Valley.

To improve my own-self-awareness the first port of call was meeting Ian Hawkins (Site Manager, North Wales Wetlands RSPB Reserves), who kindly took me around the local area which the RSPB manage and protect, including Ynys Feurig and Valley Wetlands.

Ynys Feurig is the name for a set of three small inter-connected low-lying inshore tidal rocky islets (3.1ha in extent), lying off the west coast of Anglesey and south of RAF Valley airfield. They are also known by the English name Starvation Island. The islets are accessible from the mainland at mid-to low tide.

The islands are important for their tern colony, in particular for roseate tern, for which this is the most regular breeding site on Anglesey. Ynys Feurig is a Site of Special Scientific Interest (SSSI).

Valley Wetlands is a nature reserve with an area of lakes and reedbeds to the south-east of Valley in Llanfair-yn-Neubwll community, adjacent to RAF Valley airfield. Much of the reserve is included within two SSSIs. Breeding birds include good numbers of sedge and reed warblers which have been joined in recent years by Cetti's warbler and several species of duck including shoveler, gadwall and pochard. Outside the breeding season, duck numbers increase and bittern and marsh harrier are regularly seen. The reserve is rich in wetland plants with large areas of reed and willow and uncommon species such as eight-stamened waterwort, flowering rush, marsh fern and hop sedge. Among the insects are hairy dragonfly, variable damselfly and various water beetles. Mammals include otter and water vole.

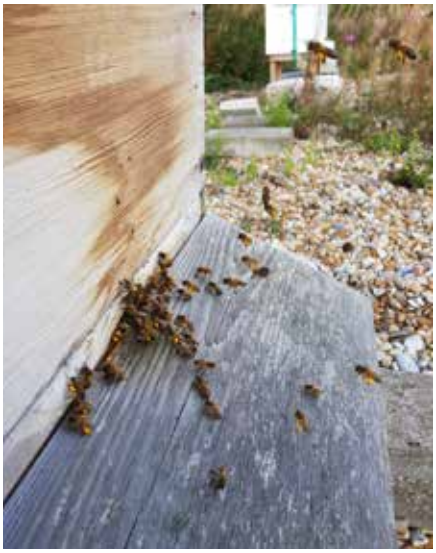
'Sharing the load' - a large pipe was recovered and removed by a 'Whole Force' volunteer group during the recent Annual Anglesey Coastal Path beach clean event. © RAF Valley Photographic Section

Volunteers from across RAF Valley, military, civil servant and industry partners successfully collected, bagged and removed an estimated 750kg of waste from the path and nearby beach © RAF Valley Photographic Section

I continued my self-development with meeting Sioned Jones (Anglesey Coastal path co-ordinator) to discuss further the Memorandum of Understanding between our organisations of the adopted coastal path section that we (RAF Valley) are responsible for, which includes annual surveys to monitor the condition of the path plus Annual Coastal Clean events. Station Commander, Group Captain Nick Tucker– Lowe said of the beach clean event *"Today has been a great team effort by our personnel – military, civilian and industry partners. It's been good to take a few hours out together to give the beach an early spring clean. RAF Valley has been a key part of the island of Anglesey for over 75 years and we take our responsibilities to the island and its environment seriously. Cymyran beach is a beautiful stretch of the coastline, right on our doorstep, so it is vital that we do our bit to keep it in first class condition for everyone to enjoy."*

Aled Rowlands
Total Safety Officer
RAF Valley

Kent and East Sussex
DIO SD Training South East



Range Officer's bees, Hythe ranges © Mick Delieu

It has been another year of interesting conservation work at Cinque Ports Training Area (CPTA). We completed the all-weather Reinden Wood circular walk in February 2016, providing a first class path next to Hawkinge. Our intention is that this facility will mean the public no longer trespass on the military training area. The walk is being nominated for a Kent Wildlife Trust Richard Neame local wildlife site award.

On 7th June 2016 Alfie Gay and Sue Buckingham led the CPTA spider orchid conservation walk on Arpinge Downs. No spider orchids were encountered but it was an enjoyable day, ending with lunch at the pub. Peter and Alfie Gay, who have long been studying orchids on Arpinge Downs, reported that green-winged orchids had an excellent year with 600+ flowering in a range of colours. Hundreds of early purple orchid flowers were seen plus an occasional greater butterfly orchid. Only 15 early spider orchids were seen however and the late spider orchid failed to flower for the second year in succession, although blind plants were seen in late spring. It was a poor year for adonis blue, chalk hill blue and wall brown butterflies.

Small red damselfly © Crown

On 13th July 2016 David Chelmick, of Crowborough Conservation Group, led the Pippingford Conservation Walk to look at damselflies and dragonflies on the ponds and lakes of Pippingford Park Dry Training Area, a haven with 22 of Britain's 50 species. A total of ten people attended, including Lt Colonel Dickie Bishop, Comd DIO SD Training South East. Twelve species were seen during the walk, with nine recorded at the ponds including: common blue damsel *Enallagma cyathigerum*, small red damsel *Ceriagrion tenellum*, brilliant emerald *Somatochlora metallica*, blue tail damsel *Ischnura elegans* and large red damsel *Pyrrhosomma nymphula*. The group observed a male emperor dragonfly patrolling over a pond whilst a female tried to evade him to lay her eggs. Concerns were raised about the number of Canada geese on the ponds as these feed on water plants that provide habitat for the damselflies and dragonflies. Three species were seen patrolling the lakes: black tailed skimmer *Orthetrum cancellatum*, brown hawker *Aeshna grandis* and the downy emerald *Cordulia aenea*.

The small red damsel is a Pippingford speciality and is very rare and local in Sussex. The brilliant emerald dragonfly is another Pippingford specialty. It is quite common in the Forest in the High Weald but local elsewhere in southern England. The downy emerald is the rarer of the two emerald dragonflies found at Pippingford, although it is the commoner species nationally.

On the evening of 20th July 2016, six members of the CPTA Conservation Group spent three hours 'mothing' with David Gardner at Lydd Ranges. Blue lights were used to attract 61 species. The most interesting was *Coleophora adspersella*, which has not been seen at Lydd or Dungeness before. In addition four *Aristotelia brizella* were recorded, probably because thrift, on which they feed, was nearby.

The Broomhill Sands section of Folkestone to Cliff's End Coastal Defences (FOCES), including a section around Jury's Gap Lookout at Lydd Ranges, was completed in the summer of 2016. The Environment Agency (EA) and their contractors are now undertaking more detailed planning for the construction of the Hythe and Lydd Ranges sections and the MOD has committed to the future of Lydd and Hythe Ranges for the next 50 years. As part of the planning process for the proposed sea defences the MOD, Environment Agency (EA) and Natural England have agreed potential areas of compensatory habitat at Hythe Ranges for habitat lost during construction of the sea defences. Of note, the EA now wish to start at Hythe Ranges first, possibly in 2019. We await their detailed plans.

Maj Rick Beven
Senior Training Safety Officer
Cinque Ports Training Area

Hythe Environmental Community Group conducting a beach clean of the Hythe Ranges foreshore as part of a national beach cleaning event. © Sue Turnbull

Moray, Scotland
RAF Lossiemouth

The graves at the remains of Drainie Parish Church © Crown

The Station Commander at RAF Lossiemouth is one of the few in the Royal Air Force to have a graveyard on his airfield; the remains of Drainie Parish Church and graveyard are in the middle of the Typhoon Main Operating Base. Routine airfield ground maintenance ensures that the site does not become overgrown, but nature does take its course and the graves slowly become enveloped in a swath of grass.

It is the dedication of one man that keeps the graves in such good condition, to a much higher standard than is required by the aircraft flying on Quick Reaction Alert scrambles or training sorties. Warrant Officer Andy Kidd regularly organises a group of Station volunteers, supported by Moray Burial Ground Research Group, to halt nature's encroachment over the 67 graves in the Drainie yard.

A volunteer hand scrubbing a grave stone © Crown

The team of volunteers recently spent two days restoring the site from where the remains of the church were demolished and the upright gravestones were laid flat in 1952. With the graves and foundations now being over 300 years old great care was needed to ensure that this historical site was not damaged - no metal tools could be used on the stones in case the concrete cap or ornamental patterns were damaged. A border had to be carefully dug around each of the graves and the grass removed so that the weeds could be controlled. The graves were cleared of grass cuttings using a stiff broom and then scrubbed with wooden bristled hand brushes before the lettering was cleaned with a wooden skewer. Each grave was also photographed for posterity. The same care was taken along the concrete capped church and graveyard wall foundations.

Warrant Officer Kidd is determined that the graves in the Old Drainie graveyard are maintained and respected, he said:

"The site is over 350 years old, and as the custodians the Royal Air Force has a responsibility to future generations to ensure that the rich history of the Kirktoun of Drainie is not lost or forgotten."

Media and Communications Office
RAF Lossiemouth

A newly cleared grave stone © Crown

Home Counties
SD Training

Lichen rich heathland at Longmoor Training Area © Crown

It's been another busy year for Conservation Group (CG) members in the Home Counties, helping SD Training to deliver a high quality military training environment whilst protecting and enhancing our commitments to wildlife, historic environment and public accessibility. The agri-environment schemes managed by Surrey Wildlife Trust (SWT), Hampshire & Isle of Wight Wildlife Trust (HIWWT) and Amphibian and Reptile Conservation (ARC) cover extensive areas around Longmoor and Aldershot. These continue to deliver practical habitat management to maintain and improve lowland heathland/grassland/scrub mosaics,

Silver-studded blue © Crown

interspersed with smaller micro-habitat features such as bare ground scrapes. HIWWT have an article on page 30 on plant diversity, after many years of absence, from numerous recently made scrapes. All parties continue to work closely with annual reviews on site to 'walk and talk,' looking at and discussing the practicalities and results of previous works and those proposed for the year ahead. This ensures close integration with military needs, SSSI biodiversity objectives and partnership working across the wider landscape to benefit wildlife.

Similar efforts by tenant stock farmers at Otmoor are directed at protecting botanically rich hay meadows, high value hedgerows and damp grassland used by breeding waders or other priority bird species, such as grasshopper warbler. A wide array of CG members with extensive, specialist knowledge of the Otmoor Basin hydrology, wildlife and practical farming/land management have contributed greatly during 2016-2017 to help improve agri-environment scheme proposals. Despite very frustrating 'computer says no' problems for Natural England staff! A series of former scrapes interlinking paleo-water course lines were renewed and made more robust by simple flexi drain pipes to help improve the grassland for waders.

Birds such as curlew, which were once commonly heard, are in trouble and on the BTO/RSPB Red List and Near Threatened status 2016. One of the important elements of their preferred habitat is damp, bare muddy patches to support foraging chicks and so farmers annually rotavate a proportion of the rushy scrape margin, as well as maintaining beneficial cattle grazing and hay-rush cut. The fields at Otmoor are contributing to an exciting RSPB local research project, now in the 2nd year, looking at temperature and food availability in and around a curlew nest to improve understanding of critical breeding factors. Other ideas to compliment and develop such findings are cameras and radio tracking of chicks.

The Longmoor Conservation Group record activities of herptiles, flora, birds and invertebrates and continue to help inform military training works, including the new Range 4 project and on-going MOD funded or agri-environment scheme conservation habitat

management. The bird records for key species such as nightjar at Hankley help Defence Infrastructure Organisation/ Landmarc staff to manage, at macro and micro scales, the scrub-heath mosaic. This is achieved by coppicing only a proportion of birch stems on favoured nightjar breeding spots, on heathy slopes or within woodland glades and carefully maintaining low disturbance through habitat manipulation by retention of fire burnt scrub, woody debris and deep tussocky vegetation.

ARC staff and volunteers have significantly increased the extent and number of standardised herptile surveys on sites such as Hankley, which in the first few months of 2017 alone contributed very useful information as to the presence and distribution of species management. Adder hibernation foci were found in a small patch of dwarf shrubs and grass, adjacent to extensive drier heath on the slope, with humid heath and standing water pools in the lower lying valley. This larger and finer scale habitat mosaic also suits military training by providing similar requirements of cover, shelter, sight-lines and open ground which needs to be safely traversed.

Other CG members continued with annual butterfly surveys and input ideas for micro scale habitat management at Bramshott, where parts are designated as a Site of Special Scientific Interest (SSSI) for heathland and as Sites of Importance for Nature Conservation (SINCs) for the botanically diverse grassland/woodland landscape. The unusual mosaic of over-winter mown grassland, with small clumps of scruffy edged birch scrub, dry heathland and sunny grassy rides interspersed through the woodland, provide valuable inter-

Striped Lychnis moth © Stephen Evans

Discussing the integration of military training requirements within Tweseldown SSSI © Crown

linked habitats. This makes the site one of the most important in the locality for silver-studded blues. The weather plays a key role in the fortunes of butterflies each year with 2016 reported as the worst since 2007, although silver-studded blues and other priority species such as dingy skipper continue to do well, with occasional appearances of purple emperor and white admiral. The site contributed for the third year in 2017 another seven or so silver-studded blues to help the re-introduction at the National Trust Blackdown site, as supervised by our Butterfly Conservation Trust CG member.

Browndown CG members continue to actively support and inform habitat management works on the SSSI areas of vegetated shingle and heathland and at the Local Wildlife Site. Bird ringing of Dartford warbler and nightjar has resumed, contributing to national data recording and informing local site usage. This interacts with monitoring of proposed fenced enclosures to help reduce trampling disturbance to fragile shingle and scrub-heath habitats. Volunteers continue to survey for water vole, adder and small scale heath-grass sward translocations to benefit butterflies such as grayling. The MOD has been funding the phased removal of small patches of secondary woodland to enhance the transition between heathland and fen, with input from CG members including an exploratory site visit in pursuit of the possibly still extant great fen sedge.

Barton Stacey SSSI chalk rivers are valuable for aquatic vegetation and fish populations, with the associated bankside trees, scrub and fen providing habitat for breeding birds, water vole and otter. Over the past three years CG members have worked to produce a SSSI Management Plan that integrates fishing, estate management and biodiversity interests. The plan includes enhancements to the bank-side vegetation, to in-channel gravel / water flow dynamics through trialling woody debris installation and the removal of some shading trees besides a former tank wash pond. CG members continue to carry out botanical and butterfly surveys of woodland that has recently been cleared to enhance both open and sheltered habitat of damp ground plants. These include greater tussock sedge and suites of associated odonata, moths and an abundance of the nationally scarce Striped Lychnis moth, whose larvae feeds exclusively on dark mullein found alongside tracks and hard standing within open grassland. Barton Stacey may support circa 10% of the national population of this moth and so data helps inform the MOD's works, such as control of ragwort and steps to maintain botanically diverse verges through topping of rank grassland and encroaching dense scrub.

Sarah Jupp
Ecologist
Defence Infrastructure Organisation

Oxfordshire
Bicester

Kestrels in a nest box at Bicester Garrison, one of the many bird species surveyed on the site © Gary Beckett

Bicester Garrison Support Unit is the delivery arm of HQ Bicester Garrison and is responsible for coordinating military activity that is common to all units as well as delivering on behalf of these units' community engagement and base support. This includes accommodation, transport, logistics, education and conservation, amongst other areas.

St George's Barracks (SGB) Conservation Group sits within this Unit and in 2016 supported a conservation project at Arncott Wood, a Local Wildlife Site and two nearby additional areas of grassland and scrub owned by the Ministry of Defence thought to be of high conservation value.

Local Wildlife Sites (LWS) are areas identified as supporting habitats and species recognised as important at the County level. Whilst LWS are not a statutory designation they form vital links across the countryside creating a national network of habitats that provide refuges for our country's diverse flora and fauna. There are 42,000 LWS in England and the MOD takes its responsibility for managing their sites seriously.

The Project

The Oxfordshire Wildlife Sites Project is a joint project between Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust and Thames Valley Environmental Records Centre.

The project helps identify the best quality sites for wildlife across Oxfordshire, through surveys and assessment against a set of selection criteria. Support is offered to land managers to help them maintain habitat quality and create extra opportunities for wildlife on their sites. This may be through discussions on management techniques or by providing information on grant schemes.

The survey at Arncott Wood found that two additional areas contained species-rich grassland with locally abundant orchids. These included bee orchids and many other species typical of unimproved conditions, such as adder's tongue, bird's-foot-trefoil, dyer's greenweed, quaking grass, common knapweed, lady's bedstraw and ox-eye daisy. More indicative of calcareous influence were fairy flax and burnet saxifrage. The scrub has a mosaic of open patches of grassland and early successional vegetation on sections of degrading hard standing. In areas where there has been recent scrub clearance work key habitat is provided for butterflies including brown and black hairstreaks.

The areas of scrub are also important for birds with records of nightingale; one nightingale was ringed by members of the SGB Conservation Group on the nearby MOD site during 2017 surveys. A few of the many bird species recorded by the group include song thrush and grasshopper warbler, both listed as Red List Birds of Conservation Concern. Two kestrel pairs bred in nest boxes and all the chicks fledged successfully.

Thanks to the Trust for Oxfordshire's Environment (TOE2) who have been awarded funds from Grundon Waste Management, SGB Conservation Group are contributing to improving these areas for wildlife. Hand tools were purchased through the Defence Infrastructure Organisation Conservation Group Grant which were used to manage scrub. This particular project will run until March 2018 as part of a wider 10 year management plan. Through the autumn and winter months a number of volunteer days are arranged with the Chiltern Rangers to clear scrub thereby enhancing the habitat. As well as the more common species of butterfly, a number of less common species have been recorded such as purple emperor, purple, black and brown hairstreak, white admiral, dingy and grizzled skippers.

Gary Beckett
Estate Conservation and
Bicester Garrison & Support Unit

Volunteers survey in Arncott Wood © Gary Beckett

Germany
Senne Training Area

Evidence of a wolf bite © Hubertus Kaiser

On a cold morning in February 2017, a federal forester patrolling in the Senne Training Area spotted the carcass of a fallow deer lying in open woodland. Suspicious that the animal might have been shot outside of the hunting season, or killed by poachers, he went over to investigate, not knowing that this would be the start of an even more intriguing story. It was quickly apparent that the deer had been attacked by a predator and there seemed to be no obvious gunshot wound. These circumstances sparked an idea in the experienced forester that the fallow doe may have fallen prey to a wolf.

The Eurasian grey wolf *Canis Lupus* has been expanding westwards across Europe and there are now estimated to be a few hundred of these iconic predators living in Germany, astonishing in that 20 years ago there were no wild wolves at all in the country. It is considered only a matter of time before they settle in North-Rhine-Westphalia and on to the Senne Training Area.

The task of collecting evidence to confirm whether or not the deceased fallow deer had been killed by a wolf fell to a specially-trained 'wolf officer' of the federal forestry department.

The deer carcass had been bitten in the neck and partly eaten at the stomach. A measurement of the distance between canine teeth on the bite marks did seem to suggest a large dog or wolf. Tracks were also discovered nearby, but these were a few days old and had been washed-out by rainfall, so were not convincing proof of wolf. It was the result of swabs taken from the bites and sent for laboratory analysis that finally provided conclusive evidence that the deer had been killed by a wolf. Remarkably, the lab was also able to confirm that the recovered DNA precisely matched that of a male wolf that had previously been caught near Bremerhaven in the far north of Germany.

It is amazing to consider that our wolf had travelled over 300km from Schleswig-Holstein, crossing a number of busy autobahns, but I suppose less surprising knowing the keen instinct of these animals to avoid humans and their impressive ability to cover upwards of 70km per day at an energy efficient lope. It is speculated that this lone wolf was on the move in search of a new pack.

No-one actually saw the wolf on the Senne Training Area and a further search for evidence, such as tracks on sandy fire-breaks, proved fruitless. However, with the area so rich in wildlife and teeming with deer, wolves will certainly return at some stage to take-up their natural place in this environment.

Mark Johnson MSc
Land Management Services
Defence Infrastructure Organisation

Washed-out tracks © Hubertus Kaiser

Cornwall
Penhale

Spring squill © Jeremy Lawes

The coastal headlands at Penhale training area looked fantastic this spring. The show of colour started with carpets of Spring squill *Scilla verna* and was swiftly followed by kidney vetch *Anthyllis vulneraria*. I am positive the increase of grazing over the last five years or so has encouraged more flowers and played a hand in the display of colour.

We have increased the area grazed across the dunes with electric fenced compartments. Cornwall College Newquay students helped us with the fencing as part of their countryside management course. A small group of Shetland ponies kept on top of successional vegetation in the most floristically diverse area of the dunes known as Ellenglaze. This area is home to marsh fragrant-orchid *Gymnadenia densiflora,* marsh helleborine *Epipactis palustris*, flat-sedge *Blysmus compressus* and Cornish gentian *Gentianella* x *davidiana*. Ellenglaze contains a number of willow-dominated hollows that are classed as dune slacks being seasonally inundated with water, as long as we get enough rain. With the help of the conservation group we have been clearing willow in some slacks. We have followed this work up with a small excavator to remove soil build-up and root material to rejuvenate the slacks and create bare areas, allowing long-buried seeds to germinate. Results have been fantastic so far with a new colony of marsh helleborine appearing and skullcap *Scutellaria galericulata* being recorded.

Newquay College students putting in new fencing © Nicola Morris

Penhale is home to shore dock *Rumex rupestris,* one of Europe's most threatened endemic vascular plants. The population at Penhale is unusual as it is located inland on the edges of dune slacks - the more usual habitat is much closer to the sea on rocky, sandy and raised beaches, shore platforms and lower slopes of cliffs where there are freshwater seepages. As part of a European wide survey on the health of the population, conservation group member and the Botanical Society of Britain and Ireland East Cornwall recorder, Ian Bennallick carried out a survey of the plant at known locations in early September. Shore dock was found in most of the known locations. Numbers of the plant fluctuate and the population this year numbered 78 plants - in years gone by numbers have reached nearly 300 and in some years no plants have been recorded. In the past shore dock has responded well to scraping in the slacks as a means of opening up the seed bank.

Kidney vetch © Jon Cripps

We are hoping to try cutting and removing vegetation then following up with a rotavator in a couple of small areas to see if this reinvigorates populations of one of the most significant plant species on Penhale.

Jon Cripps
Penhale Dunes Ranger
Cornwall Wildlife Trust

Essex
Fingringhoe Ranges

John More and his team of volunteers amid the cherry laurel © EWT

Friday Wood
Over the last year and a half Essex Wildlife Trust (EWT) have been working with the Colchester branch of Help for Heroes based at Chavasse VC House Recovery Centre to set up a partnership that benefits our veterans, their families and the wildlife of Essex.

I have previously written about the work we have been doing in Friday Woods to remove the invasive cherry laurel choking parts of this stunning ancient woodland. This was a huge task and I was always short of manpower. Linking up with Help for Heroes based less than a mile away was a great solution.

The mental and physical benefits of being outside in the natural environment are well known. Combine this with practical conservation work and you cannot go wrong in my opinion. Our productivity at work parties has gone up due to the extra manpower and the feedback from the blokes and ladies has been great.

The second strand to this partnership is to improve the grounds at Chavasse VC House Recovery Centre in Colchester for wildlife. The centre already hosts the award-winning Hope on the Horizon garden. Plans for the remaining grounds include a woven hazel hurdle fence to provide screening while a mixed native species hedge is planted to replace a failing laurel hedge! The hazel will be coppiced from EWT reserves by volunteers from the recovery centre who will then construct the fence with the assistance of EWT staff. There are also plans for bee hives and more wild flowers to benefit our struggling pollinators.

This is a great partnership and one we look forward to continuing to expand as time goes on.

John More
EWT Local Wildlife Sites Officer and Conservation Group Member

Another interesting report this year is from Andy Field, the ornithologist for Friday Wood, who confirmed breeding grasshopper warbler for the first time along other highlights such as 114 singing male blackcaps and 37 singing male nightingales which was the same number recorded in 2012.

The recent closure of Bounstead Road car park has already made a positive impact for the Roman River Site of Special Scientific Interest along with providing better training for the military. Earlier this year a works party collected 14 large bin bags of rubbish with 95% dog waste.

Fingringhoe Ranges
Recent results from a set of ecological surveys have confirmed that water voles are doing well on the ranges.

During the great-crested newt (GCN) DNA survey, where water samples are sent to a laboratory to confirm the presence of GCNs, it was found that they favoured the water bodies on the higher ground on the grazing marsh rather than the borrowdykes, which are slightly more brackish.

At the same time a small aquatic invertebrate survey was undertaken which, thanks to the assistance of Robert Aquilina, showed the presence of a nationally scarce water beetle *Graptodytes bilineatus*.

Long time conservation group member and ornithologist Richard Hull, continues to regularly record and monitor the birds at Fingringhoe and believes that the marshes remain possibly the best spot for bearded tit in Essex; this year's highlights include three spoonbills and a glossy ibis.

Maj (Retd) Udaibahadur Gurung MBE
Training Safety Officer
DIO SD Training East

The nationally scarce water beetle © Robert Aquilina

Devon
Britannia Royal Naval College

International Officer cadets at Dawlish Nature Reserve © Crown

International Officer cadets from Britannia Royal Naval College Dartmouth took a day to help the Rangers at Dawlish Warren Nature Reserve as part of their Outreach project. The cadets are from Albania, Angola, Azerbaijan, Egypt, Qatar, Ukraine and the UAE. They are currently studying English language and Naval training in preparation for joining Initial Naval Training (Officer). They took a day away from their studies and used their fitness to clear large areas of overgrowth from the wetlands that had proved too difficult for the Rangers to access.

Chief Petty Officer Bill Amery, the Officer in Charge of the evolution, said "*These cadets are here to receive world class Naval training, it is important that they help the local community and demonstrate the RN Core Values. It also allows them to gain an understanding of how important the conservation of a natural wildlife habitat is*".

The Reserve is an area of grassland, sand dunes, mudflats and centres on a 1½ mile long sandspit/beach across the mouth of the Exe Estuary. It is one of the most important places for wildfowl and wading birds in the whole of the South West. Thousands of birds come to feed, on migration, or to spend the winter here.

Several thousand birds can gather on the Warren's shores, including important flocks of dunlin, grey plover, bar-tailed godwit and oystercatcher. Brent geese, wigeon and teal also shelter here.

The dunes and grassland have a host of special plants. Over 600 different types of flowering plants have been recorded on the Warren. The varied habitats include salt marsh, fresh water ponds, wet meadows and woodland.

Divisional Officer Lt Faye Derbyshire added, "*The International cadets find the Outreach project immensely satisfying. It allows them to engage with local people, improve their English language skills and support those in need of assistance. They have done an excellent job and we are very proud of them*".

Clearing areas of undergrowth from the wetlands © Crown

Chief Petty Officer (Warfare) Bill Amery
Britannia Royal Naval College
Royal Navy

Wiltshire
Imber Conservation Group

Now in its 40th year, it is my pleasure to introduce the following report.

After a very dry spring, we saw toads spawning three weeks early in fairy shrimp laden temporary ponds, but the rainfall was iratic and even after three spawning attempts between March and May the final success rate for toads this year was extremely low. But as we often see in nature, where there are losers there will also be winners; as it was one of the best years for breeding barn owls and similarly for the stone-curlew.

We held two entomology field trips, with experts and students from the Natural History Museum, local county recorders and ecologists. The visits gave the students a valuable opportunity to exercise their field study skills and in particular their ID skills. During the spring event one of the areas to cause excitement was the wonderful 2m wide band of viper's bugloss (which is said to be the one of the best producers of nectar) running down the side of the Berril Valley track; the wide range of species recorded included, 30+ narrow-bordered bee hawk-moth, three of the four species of bee-fly and early migrants such as the hummingbird hawk-moth. It was an entomologists' delight.

The summer event had the extra interest from dung beetle expert Sally-Ann

Local experts surveying on one of the entomology days in the Berril Valley © Crown

Vipers bugloss in the Berril Valley and a narrow-bordered bee hawk-moth (inset)© Crown

Spence, from the Dung Beetle UK Mapping Project, one of the aims of this project is to highlight the ecological, conservation and economic importance of dung beetles. Sally-Anne was very impressed with the dung and its contents that she found on Salisbury Plain.

The regular bee walks, led by Jenny Elvin, are still a popular activity and one of the recordings this year was a *B. humilis*, also known as the brown-banded carder-bee, not really an unusual one, but one we first recorded in June this year when we found two workers and a queen, and then in September when we found one queen, three workers and three males. It is a declining species, but has recently started to expand its range, which we hope our data shows. It is a particularly beautiful bumblebee, and we were very pleased to find it!

The group, along with members from the Infantry Shoot, worked together one morning to clear large patches of the invasive non-native species Canadian golden rod (possibly a result of fly-tipped garden waste) that has been spreading on the western side of the Plain.

During the 2016 breeding season, 19 whinchats, all first year males, were colour ringed and fitted with tiny tracking devices. The tags are the type that need to be removed from the bird in order to download the data, so the colour ringed birds that returned to their natal sites this summer had to be located, caught and the tags removed. Group members assisted BTO staff and tags were recovered from 10 of the 19 birds - an excellent return. The data will be analysed in due course. We hope that this will be a feature in the next Sanctuary magazine.

Andrew Bray
Chairman
Imber Conservation Group

Richard Brooks © Crown

So – the 2017 Sanctuary Magazine has been published and the 2017 Award Ceremony is complete! Yet again the breadth and depth of topics, projects, innovation and individual and team effort that are showcased in these two arenas continues to astound me. As the lead of DIO's Environmental Support and Compliance team (ES&C) I have the honour of sitting on both the Sanctuary Magazine Editorial Board and on the Sanctuary Award Judging Panel. It is a privilege to see so many examples of the good environment and sustainability works being delivered across the MOD through the Sanctuary submissions and nominations. It is a real pity that we cannot include every submission in these pages and present every nomination an award, but hopefully Sanctuary 46 (2017) continues to demonstrate a wide range of the best practice and novel thinking occurring across defence environmental and sustainability delivery.

Sanctuary 46 really demonstrates the far reaching influence of MOD in terms of stewardship and sustainability overseas. It has been hugely rewarding to receive articles from across the world including from Kenya, Nepal and Belize and to see Sanctuary Award winners from Cyprus and the Falkland Islands. Sustainability really is part of the MOD's international business and because of this the Conservation Stewardship Fund (CSF) managed by ES&C has been used to not only fund projects, partnership working and equipment in the UK but also in Belize and Cyprus.

The CSF supports a wide range of projects across the MOD estate relating to ecology, archaeology, historic buildings, public access, landscape and sustainable community. The specialists within ES&C ensure that the limited funds are targeted at the most deserving projects which assist the MOD in fulfilling its environmental policies and maintaining the MOD's good reputation for environmental land management. Throughout Sanctuary 46 there are numerous articles which represent delivery supported by the CSF.

If you are undertaking environmental or sustainability activity on the MOD estate then think about the above…. Does your project warrant an article in Sanctuary Magazine? Should you nominate it for a Sanctuary Award? Do you have ideas or plans which may be eligible for CSF funding? If the answer to any of these questions is yes then please contact the DIO SEE Environmental Support and Compliance Team as per the contact details opposite.

Finally I would like to take this opportunity to thank all of the contributors, sponsors and DIO and wider MOD staff who have made Sanctuary (46) possible. In particular my thanks go to the DIO ES&C Sanctuary editorial team of Iain Perkins, Hannah Mintram and Holly Broomfield supported by Tilly Gregory from the Army Publications Team. The magazine is, as always, a credit to their efforts!

Richard Brooks
Principal Environmental Advisor
Defence Infrastructure Organisation

DIO ES&C specialists provide in-house expertise to DIO and the wider MOD by providing advice and guidance in the fields of:

Access & Recreation
- Technical & legal support on access & recreation legislation and management of the public on the MOD estate. Provides part of the 'Safe Place to Train' assurance.

Forestry & Woodland
- Providing and maintaining woodlands and trees for military training and capability whilst unlocking the sustainable economic returns. Legislation, policy, audit/ assurance, industry best practice and safe working practices across the estate to ensure compliance and liability management.

Historic Environment
- Advice and expertise allowing MOD to sympathetically manage the archaeological monuments and landscapes on the estate whilst enabling training capability.
- Providing support to meet Departmental Government targets, including heritage appreciation, training and preservation of historic MOD archives. Advice and support relating to historic buildings and gardens to allow for the best use of the buildings for MOD capability.

Natural Environment
- Statutory assessments and approvals for development processes, fulfilling statutory duties through SSSI, Stewardship and Integrated Rural Management Plan programmes, Specialist ecological support/ advice including Habitat Regulations Assessments and Protected Species management. Integrating training into designated landscapes.

Conservation Groups & Sanctuary
- The ES&C also supports MOD Conservation Groups across the estate and is responsible for the Sanctuary Awards and the production of Sanctuary Magazine. We would encourage all areas of MOD business including project partners and individuals to suggest articles for the 2017 Sanctuary magazine and to consider putting forward projects and individuals for the 2017 Awards.

Sustainable Development Support & Environmental Planning
- Advice & support regarding the implementation and integration of sustainable development and environmental planning best practice into estate management.

As the magazine highlights, we actively encourage organisational collaboration and project partnership and we would be happy to discuss any ideas you have to further integrate conservation / sustainability into our business.

Please see the opposite page for all contact details.

Pupping time for grey seals at Donna Nook Air Weapons Range on the Lincolnshire coast © Crown

Defence Infrastructure Organisation (DIO)

DIO manages the MOD's property infrastructure and ensures strategic management of the Defence estate as a whole, optimising investment and providing best support possible to the military.

Secretariat maintains the long-term strategy for the estate and develops policy on estate management issues. It is the policy lead for sustainable estate.

Safety, Environment and Engineering (SEE)

The SEE provides direct support to Project & Programme Delivery and Service Delivery by providing a front line support, a safety assurance function, technical oversight to ensure MOD/DIO discharges its duties and corporate responsibilities under the Health and Safety at Work etc Act 1974, Environment Protection Act, other relevant legislations and Regulatory Articles; and also by providing the DIO intelligent client interface with industry.

Environment and Planning Support (EPS)

The EPS team is the focal point for all your environmental and planning needs and enquiries across the Defence Estate. It includes professional ecological, archaeological and planning support to the MOD. Specialists and experts maintain communications and liaison with a large number of statutory and non-governmental organisations.

Environmental Support and Compliance
Building 21
Westdown Camp
Tilshead, Salisbury, SP3 4RS

ES&C Ecology
Tel: 01980 674820

ES&C Historic Environment
Tel: 01980 674718

ES&C Access and Recreation
Tel: 01980674782

ES&C Scottish Environmental Liaison
Tel: 01383 648042

ES&C Forestry
Tel: 01748 875076

EPS Environmental Planning
Tel: 01980 674665

Energy, Utilities & Sustainability Team (EUS)

The EUS team is responsible for Energy Management, Energy Delivery and Payment, along with Water and Waste Policy Implementation and Data across the MOD estate in the UK and Overseas.

Energy Management Team
Tel: 0121 311 2017

Energy Delivery and Payment Team
Tel: 0121 311 3854

Water and Waste Policy Implementation and Data Team
Tel: 0121 311 2137

Sustainable Development Support
Tel: 01980 674887

FMC Cap Infra

FMC Cap Infra acts as the strategic infrastructure planners and policy makers for Defence; taking a defence-wide perspective on estate assets and construction, and advice for capability planning for estate and infrastructure.

Including agriculture, forestry, natural and historic environments, access, planning and strategic engagement, waste management, energy, and environmental protection, Greening Governments Commitments and MOD's sustainability strategy.

Ministry of Defence

SUBMISSIONS

If you would like to contribute to Sanctuary Magazine or enter future Sanctuary Awards please contact the Sanctuary team at:

dio-sanctuary@mod.uk

The opinions expressed in the magazine are not necessarily those of the Ministry of Defence.

Editorial Message

Dear Readers, the Sanctuary team hope you enjoy this years magazine. We are always interested in your views on how we could improve it.

Please could we ask, with sustainability in mind, that you pass the magazine on for others to enjoy and only recycle as a last resort. Thank you.

COVER IMAGE: Greater Flamingo *Phoenicopterus roseus* Akrotiri Salt Lake, Sovereign Bases Areas, Cyprus, 2010

Photographer: Thomas Hadjikyriakou, Manager Akrotiri Environmental Education Centre (AEEC)

Greater Flamingo is a regular wintering species at Akrotiri Salt Lake, typically between October and February, when wetlands are covered by water after the first rains. Numbers can reach up to twenty thousands. Excellent views of the Flamingoes can be enjoyed from AEEC observation platform.

Ministry
of Defence