

Ogof Ffynnon Ddu Cave Advisory Group
Minutes

The meeting was held at South Wales Caving Club on the 3rd December 2023
starting at 0930

The meeting was held in person and by Zoom

Apologies

Mike James, George Linnane, Claire Vivian, Ken Perry, Jules Carter.

Present

Tony Baker, Allan Richardson, Andrew McLeod, Jill Brunson, Jo White, Duncan Hornby, Tomasz Zalewski, Si Lewis, Dave Dobson, Andrew Dobson, Vince Allkins, Tom Partridge, Luke Ashton, Paul Dann, Christina Byrne.

Chairmans Report

The Chairman welcomed everyone to the meeting and apologised for not attending the last meeting. Other than that he had nothing to report.

Appointment of new Wardens

None

The meeting agreed that we recommend to SWCC Committee that more wardens are needed, this has been due to the increased use of the SRT route into Column Hall, hence having to monitor two gates.as given in the MOU, need to be recirculated and to be on the website.

Correspondence received

None

Hon. Secretary's Report

Nothing to report other than the normal administration.

OFD Access Review Group Report

See document below

The chairman spoke to the report, he will write a report distilling out thoughts and circulate it.

Vince Allkins and Andrew McLeod are in discussion re lock replacement.

Memorandum of Understanding (MOU) between NRW and SWCC

See document below

SWCC Permit Secretary's Report

- Further updates to DIM permit document have been completed.
- The development of an electronic permit application form has been postponed until 2024.
Electronic key booking for annual permit holders has undergone further developments and

enhancements and is being pushed to access permit holders as the primary means of requesting keys.

- Cave usage statistics prior to 2021 have been fully transcribed. Statistics can be made available to NRW and the OFDCAG upon request.
- One key has been identified as missing which is due to be replaced. The club that lost the key has paid the key replacement fee.
- No further access issues have been noted in the past 6 months.

Period 20/05/2023 – 15/11/2023

Number of cavers via all entrances – 1105

Year	No. of Date Specific Permits (OFD) Issued
2023	50
2022	76
2021	(no data)
Year	No. of Annual Permits (OFD) Issued
2023	33
2022	30
2021	20

Luke Ashton – 26/11/2023

Conservation Officers Report

Very little has happened conservation wise recently, due to the SWCC roof works, the usual cleaning and re-taping was carried out earlier in the year.

Fixed Aids Officers Report

An OFD padlock has failed and been replaced by the spare; Vince is investigating whether we can purchase a new lock with the same coding.

The Maypole Chain has been reported as very worn; a new chain has been purchased and this will be replaced soon.

The Cwm Dwr entrance still needs some stabilising work but this is likely to have to wait until summer 2024.

The scaffold poles in OFD1 require new anchors and may require some new chain.

Fixed Aids that require regular inspection (e.g. the Bolt Traverse) will be inspected in due course.

All users are expected to inspect Fixed Aids before use.

A review of Fixed Aids has taken place. Many of the existing Fixed Aids anchors are now rusted and old and not up to modern standards. Some fixed aids have been delisted, but not removed, where installation of new resin anchors is not currently justified or planned. These are:

Midnight Passage P30 bolt (rawlbolt)

Maypole Step Bolt (rawlbolt)

Arete Climb bolts (rawlbolts)

The 'SWCC/NRW' tags will be removed from these anchors in due course.

I (as SWCC Fixed Aids Officer) have recommended to Cambrian Caving Council (CCC) that a number of locations within OFD are considered for resin anchor installation under the BCA Anchor Scheme. These installations have been recommended by the SWCC Fixed Aids Working Group.

BCA anchors are already installed in a number of locations in the cave, such as the Columns pitch (due for installation of additional anchors) and the Nave pitches. Any installation agreed with CCC would be subject to final approval with SWCC. All installations are ultimately subject to practicality with regards to rock quality etc.

We have recently received SSSI consent from NRW which includes consent for installation of resin anchors and drilled threads, as well as the via ferrata steps previously agreed by OFDCAG. This requires notification of any works to NRW; we intend to provide notification in advance of any works.

The following Official Fixed Aids are being proposed for installation of resin anchors or drilled threads to replace existing fixed aids; we would propose that these are considered 'routine maintenance'.

- 1) Low's Chain: installation of Via Ferrata steps and suitable belay anchors; previously agreed by OFDCAG and provided with explicit SSSI consent.
- 2) Letterbox bolt: replacement of single rawlbolt with chain with pair of resin anchors and chain.
- 3) Fault Aven bolts: replacement of older anchors with resin anchors as appropriate.

The following locations are not official fixed aids, but have existing anchors.

- 4) Skyhook pitch: replacement of existing rawlbolt and throughbolts with resin anchors, possibly at a higher level than currently to give a safer exit from the top of the pitch.
- 5) Swamp Creek SRT route: replacement of existing spit anchors with resin anchors
- 6) Gnome Passage abseil from Bedding Chambers: replacement of existing pull-through spit anchors with resin anchors. Likely to remain a pull-through only route unless conversion to a rub-free route is straightforward.
- 7) p8 and p20 pitches in the Great Oxbow series, above the start of Splash Inlet, on the route from the Skyhook to Marble Showers. Replacement of existing spit and throughbolt anchors with resin anchors.
- 8) Chasm Passage pitches: replacement of existing spit anchors with resin anchors.

The following single location is suggested for installation of anchors where no previous anchors exist:

- 9) Awkward corner on the way to the Columns: this is on the standard route to the Columns between the end of the Mini Traverses and the start of the descent down the Cairn Chamber climb. It consists of a right-angled bend in the passage, where there is a deep pit on the corner itself and a slippery slope to ascend once this is passed. On Columns weekends, this is typically rigged with a handline due to the tricky nature of the corner and (more significantly) the potential consequences of a slip on the increasingly polished rock. There are two good natural threads on the Mini Traverses side, but the anchors at the top of the slope on the other side are very poor: two small boulders. This is the only route being suggested that does not already have anchors but due to the potential consequences of a slip, the poor quality of the available natural anchors and that it is regularly rigged, it would benefit from better anchors at the top of the climb. These could be discreet drilled threads, but resin anchors would provide a robust easy-to-use solution.

Andrew McLeod
SWCC Fixed Aids Officer

The meeting agreed to all of the suggestions.

Reported Accidents

None

Rescue Liason Report

Things seem to be going smoother since the access discussions early this year, this year's OFD practice has been easy to organise on both sides, there was also no issue organising the advanced first aid assessment which needed access to OFD.

George Linnane

Allocated Columns duties

1/1/24, 31/3/24, 5/5/24, 26/5/24, 25/8/24, 1/1/25

These have been published on the SWCC notice board and on the OFDCAG webpage.

Cave Management Plan

Ongoing

Update on safety advice

Nothing to report

Possible changes to TOR's

These are part of the MOU, they are ongoing.

OFDCAG digital interface-update

The Columns open days and wardens names have been updated.

AOB

Vince Allkins stated that anyone using or monitoring the Columns pitch needs to be SRT competent, agreed.

Andrew McLeod suggested that we could rig it at the start of the Open Day and then leave it, to be discussed.

A Columns keybox to be sited next to the signing in area is in progress.

Date of next meeting 26/5/24 at 0930

This will be a blended meeting held at SWCC.

There was a suggestion to change the meeting to an evening, to be discussed.

R. Allan Richardson

Hon. Secretary
OFDCAG

OFD ACCESS REVIEW GROUP REPORT

Report to the SWCC Committee – March 2022

INTRODUCTION

In November 2021 the SWCC Committee appointed Sam Moore to lead a review of the access arrangements for OFD. The review group consists of Sam Moore (Chairman), Martin Hoff and Andrew McLeod.

Remit

The remit of the group is to:

- Review the current arrangements for access to OFD via any of the entrances
- Consider whether these remain optimal, recognising among other factors that the structure of caving has changed considerably over the period since they were first put in place
- Produce options for further consideration by the SWCC Committee and other interested parties

The remit is limited to access to the cave and does not directly include activities carried out once the cave has been entered. However, caving activities are clearly a major factor affecting the conservation of the cave. Conservation is the driver for all access controls and so some areas for further consideration are highlighted in Appendix 1.

The group will not produce recommendations on preferred options. It is anticipated that the options identified will be referred by the SWCC Committee to the OFD Cave Advisory Group and the NRW for further advice before any substantive changes are implemented.

Driver for this Review

SWCC has concluded that it is no longer viable to undertake to provide a Duty Officer to issue cave keys from the HQ on every weekend. The current solution, driven in part by lessons learned in response to the covid pandemic, has been to store individual keys within a number of key safes. Access to those safes is gained via the SWCC Permit Secretary.

The system works, and is also effective for midweek caving, but there has been a loss of amenity to those wishing to cave in OFD, particularly to those who are members of Clubs which held Annual Permits. Previously, members of those clubs could enter the cave without prior notice. That is no longer possible and largely negates the utility of the Annual Permit approach.

Guiding Principle

The group has adopted the guiding principle that any new access arrangements should not make, or appear to make, access to the cave more restricted or more difficult or onerous to obtain than is necessary to meet landowner and SSSI requirements.

Any new system should therefore aim to provide more-or-less immediate access on demand to an extent that is at least the equivalent of the Annual Permit system as it operated before the covid pandemic.

BACKGROUND

The Status of OFD

The surface above virtually the whole of OFD and its presumed catchment is covered by the Ogof Ffynnon Ddu and the Ogof Ffynnon Ddu - Pant Mawr SSSIs, the only exception being that small part of the cave which is immediately upstream of the resurgence and underlies the lane to Rhongyr Uchaf.

The citations for the SSSIs include not only OFD but 'smaller, but related caves'. These would include, for example, CwmDwr 2, Twll Gwynt Oer and Zach's Dig/Ogof Dynion, all of which are covered and/or gated and locked but for which there are no formal access restrictions other than the need to obtain a key by visiting the HQ.

Within OFD, the citations refer to 'spectacular morphological features, some extremely fine calcite deposits and an historical record which may date back to pre-Pleistocene times'. The presence of 'rare crustacean species restricted to subterranean habitats' is noted. There is no direct reference within the citation to sediment sequences, but it is clear from other documentation that these are considered important.

The implications of SSSI status

There is nothing inherent in SSSI status that requires access to the cave to be controlled or the cave to be gated. There are many major caves in the UK which lie within SSSIs and for which there are no access controls at all. Locally, for example, Little Neath River Cave is specifically included within the Blaen Nedd SSSI citation, with the only procedural constraint to access being the requirement to pay an access fee to the landowner.

The requirement for and extent of access control for OFD must therefore first be assessed against the impact of caving on the conservation of the cave and in particular on the conservation of those features of the cave that are specifically mentioned within the SSSI citations and associated documents. All caving activities cause some degree of degradation of the cave, so the question becomes one of whether or not to limit or otherwise regulate footfall in the cave.

Within an SSSI, the landowner has a legal responsibility to ensure that no activity is carried out which could be construed as a Potentially Damaging Operation without the prior consent of NRW (as the successor to CCW). The second criterion against which caving activities must be judged is

therefore whether or not they represent a PDO. However, it is made explicitly clear within the lists of Potentially Damaging Operations for both the OFD and the OFD - Pant Mawr SSSIs that sport caving itself does not represent a PDO. Activities such as digging (whether underground or on the surface), bolting or the installation of fixed aids may, however, require consent and this is an area where it would be desirable to develop with NRW a clearer understanding of the limits of discretion.

The designation of part of the surface above the cave as a National Nature Reserve is not believed to add any constraints that are more restrictive than those that are imposed by SSSI status.

The SSSI and conservation-related drivers for gating and locking the cave and controlling access for sport caving purposes are therefore not entirely clear.

Landowner requirements

The NRW is the owner or leaseholder of the majority of the land that is directly above the cave. That land includes the Cwm Dwr entrance and the OFD 2 'Top Entrance'. SWCC owns much but not all of the other land above the cave, including the OFD 1 entrance. There are several other ownerships involved, but none of these currently includes an accessible entrance to the cave.

Top Entrance is close to a public footpath and is in CRoW Access Land. The Cwm Dwr entrance is not on Access Land but is very easily accessible to casual visiting by members of the public. The OFD 1 entrance is also not on Access Land. It is much less obvious, is very clearly on private land and is therefore probably very rarely visited by the general non-caving public.

Historically, a major concern of landowners across the UK in respect of caving activities was the possibility of legal liability. Those concerns now seem largely to have been allayed, for reasons which are not clear but which (and this is speculative) probably include the landowner liability cover which can be given under the BCA Public Liability scheme where there is an access agreement operated by a BCA member club. Nevertheless, liability remains a factor to be included when considering any revised access arrangements.

The NRW, as owner of two of the entrances, stipulates the access conditions and arrangements that apply to those entrances. The OFD Cave Advisory Group has been set up to advise NRW and SWCC on suitable arrangements, as well as on other matters. The NRW has delegated the implementation of those arrangements to SWCC but retains overall control.

SWCC, as the owner of the OFD 1 entrance, would be free to implement different access conditions but chooses not to do so in order to avoid confusion and in recognition that caving trips may use entrances in both ownerships.

OPTION IDENTIFICATION AND ASSESSMENT

A total of seven principal options has been identified and these are described, with their main advantages and disadvantages, on the following pages. The current position is also included, as Option 0, to provide a baseline.

Many variants on these options would be possible, including the combination of features from options described separately. For present purposes, the level of definition is considered adequate to enable a preferred ‘direction of travel’ to be established. However, further work on detail would be expected to be necessary in most cases.

Sam Moore Chairman,

OFD Access Review Group

8 March 2022

Option 0 – the current position

The cave is gated and locked with conventional security-keyed padlocks. SWCC members have immediate access, subject only to there being enough keys in the members’ key safe. Non-member leaders must obtain a key from one of the corridor key-safes by contacting the Permit Secretary for a keysafe access code. Access conditions include a requirement for 14 days notice to be given (not usually enforced) and membership of a caving club which is affiliated to BCA or another appropriate national or international body. Annual Permits are available for BCA member-clubs that use the cave regularly, but leaders are still required to contact the Permit Secretary for a keysafe code.

Disadvantages	Advantages
<p>The Annual Permit system no longer has obvious benefits for either the SWCC Permit Secretary or the Permit-holding club. No route now available for non-members to simply turn up and cave.</p> <p>Tracking usage of the cave relies upon leaders correctly completing the key log sheets and including party size. (common to all options – historically, has been addressed by using call-out information)</p>	<p>Known system, familiar to the caving community. All hardware and other requirements are already in place.</p> <p>There is a record of who has used which key, helpful in the event of a key being found to be missing.</p>

<p>Enforcement of access conditions, including BCA membership requirement, is difficult.(common to all non-leader options)</p> <p>Gradual loss of keys over time lessens control of the cave and compromises the system, to the point eventually at which replacing the complete suite of locks and keys is necessary at an estimated cost of ~£500.(common to all options which use conventional security-keyed padlocks)</p> <p>Security keys are expensive to replace individually. (common to all options which use conventional security-keyed padlocks)</p>	<p>Requiring permits ensures that non-SWCC trip leaders have explicitly agreed to respect access conditions, which assists with cave conservation and the control of non-routine caving activities which might constitute a PDO, for example digging. (common to all Permit-based options)</p> <p>Cave is secured, preventing unauthorised access by cavers or other groups, with potential conservation benefits.(common to all locked-cave options)</p> <p>Cave is secured, preventing access by the general public, with arguable public safety and third party liability benefits.(common to all locked-cave options)</p>
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Option 1 – unlocked cave, without Permit system for normal caving activities

The gates may or may not be left in place but the cave is not locked.No attempt is made to control access, except perhaps to Column Hall as at present (sub-option common to all Permit-less options).

It is expected that (modified) access conditions would remain in place.

Cavers could be strongly encouraged, possibly as part of access conditions, to complete a log book and/or to use a call-out system to provide information to monitor cave usage. (common to all options).

A variant on this is the use of the ‘Derbyshire key’ – a large spanner – to gain access.

Disadvantages	Advantages
<p>Nothing to prevent the general public entering, with possible liability implications. Liability implications may be increased if the gates are removed since the entrances are artificial. (Liability risk in connection with experienced cavers is assumed to be low and to be covered by the BCA policy)</p> <p>Cave may be subject to pressures and levels of damage that it has not seen before due to visits from inexperienced persons and/or higher usage.</p> <p>There is no explicit agreement to comply with access conditions and the sanction of barring access to the cave in the event of breaches is effectively lost.</p>	<p>Minimises the administrative burden, although some system for controlling PDOs within the cave will still be needed.</p> <p>(OFDCAG may still be left in place for general advice on conservation, PDO assessment and liaison purposes)</p>

Option 2 – cheaper padlocks, not security-keyed (at next replacement)

Move to padlocks which are still keyed-alike but which do not have security keys. Physical security of the locks themselves need not be compromised.

Could be used as part of any key-based access system, with or without a Permit system.

Disadvantages	Advantages
<p>Keys can more easily be cut illicitly. Less of an issue for Permit-less access arrangements.</p>	<p>Key replacement becomes much less costly.</p>

<p>Does not entirely solve the issue of access on demand unless other relaxations are also implemented (eg, key safes used with publicised access codes)</p> <p>If permanent keys are issued it becomes more difficult to use the removal of access as a sanction for breaches of access conditions.</p>	<p>Facilitates the issue of permanent keys to regular users or clubs, which would reduce the administrative burden.</p>
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Option 3 – good quality combination padlocks

Move to 5-digit combination locks with physical security similar to the current padlocks.

Could be used as part of any locked-cave access arrangements, with or without a Permit system.

Disadvantages	Advantages
<p>Does not in itself change the administrative burden.</p> <p>Unauthorised sharing of the combination is easier than getting an unauthorised key cut.</p>	<p>No physical keys to administer, hence no key safes required and no keys to be lost or replaced.</p> <p>Access on demand can be restored, via Annual Permits or by other means.</p> <p>Locks can easily be replaced individually as needed.</p> <p>Combinations can be reset as frequently as desired, at no cost, if there is evidence of unauthorised sharing of the code.</p> <p>Facilitates on-line access systems.</p>

Option 4 – access for all BCA-affiliated cavers via a modified Permit system to restore on-demand access

This option is envisaged as removing the specific requirement to be a member of a caving club and would include BCA DIMs, but is otherwise indistinguishable from the status quo (Option 0) unless changes which facilitate on-demand access are made to the mechanics of entering the cave. Changes which would facilitate this include (but are not necessarily limited to):

- retention of the current security key system but with (most) keys held in a bulk key safe to which the combination is widely known
- changing to a cheaper keyed-alike system, again with a key safe and/or with keys permanently issued to frequent visitors, at individual or club level
- changing to a combination lock system

Disadvantages	Advantages
<p>None identified that are specific to this option, although key tracking for key-based systems would be more difficult.</p>	<p>On-demand access is restored to at least the extent that was available prior to the discontinuation of key issuing by the Duty Officer.</p> <p>Some reduction in the administrative burden is possible via Annual permits and combination locks or permanent key issue.</p> <p>It <i>may</i> in future be possible (in principle) to automate the process by using a look-up facility interfaced with the BCA website and membership list.</p>

Option 5 – access for all cavers via a modified Permit system to restore on-demand access

This option differs from Option 4 only in that the requirement for persons entering the cave to be BCA members is dropped. Access conditions are otherwise unchanged.

Disadvantages	Advantages
<p>Caver-against-caver liability is unlikely to be insured for non-BCA members. (Landowner and access-controller liability will remain insured via the BCA policy)</p>	<p>Makes the cave available to all cavers.</p>

Option 6 – access without Permit system for normal caving activities

(with or without a requirement for BCA membership)

Implies changes to the mechanics of obtaining entry to the cave – see Option 4 – although the cave remains gated and locked. One option would be to use combination locks (whether directly on the cave or as key safes) and to agree with BCA that a BCA members-only section of their website could be used to provide the access code. An alternative, if BCA membership is not required, would be to continue the development of the Digital Destination Board to provide an access code.

Disadvantages	Advantages
<p>None identified that are specific to this option.</p>	<p>Minimises the administrative burden, as for Option 1.</p> <p>Access on demand.</p>

Option 7 – Leader-based system

Replaces the current Permit system with one in which all trips must be led by an official Leader. A register of Leaders is maintained, with Leaders being accredited according to criteria to be defined elsewhere. Leaders would not have to pre-notify an intent to use the cave.

SWCC members may or may not be given automatic Leader status, but there is no formal expectation that SWCC will provide Leaders for other clubs or individuals.

Would work best with either combination locks or a non-security keyed system in which all leaders are issued with keys at their own expense.

Disadvantages	Advantages
<p>Significant one-time effort to set up and publicise. The popularity of OFD is such that a large number of leaders would be needed.</p> <p>Smaller clubs, and those where continuity of membership is limited, may struggle to find leaders. Presentationally, may be seen as a regressive step.</p>	<p>Once set up, requires only a low level of administration to maintain leader lists and deal with PDOs within the cave.</p> <p>Leaders are more likely to be fully familiar with the access rules and there is some transfer of responsibility from club to individual leader level.</p>

APPENDIX 1 – Related Aspects

The Review Group has identified the following areas which are outside the remit but which it believes to be worthy of further consideration:

Party Size The origin of the current limit of a maximum of 6 persons in any party is not clear. An alternative approach would be to set a minimum ratio of experienced leaders to other party members, possibly still within an overall maximum party size limit.

Trade Routes

Many parties restrict themselves to well-established routes within the cave. Since this minimises the new damage caused by routine sport caving there is an argument that it should be positively encouraged. One way to do this would be to devise and publish good descriptions for recommended routes. In association with this, additional fixed aids could be installed on such routes to 'nudge' behaviour.

Fixed Aids

Installation or modification of any Fixed Aid could in some circumstances be a PDO. It is unclear to what extent, if any, the SWCC Fixed Aids Officer has freedom of action to make such changes. It would be desirable to develop an understanding with NRW on this.

Bolting

It is explicitly stated by NRW that routine caving is not a PDO. However, it is not clear where the boundary lies between routine caving and, for example, exploration by means of bolt-assisted climbing. It would be desirable to develop an understanding with NRW on this and to establish to what extent permission for such activities could be given by SWCC without further reference.

Digging

Annex 3 of the Memorandum of Understanding between NRW and SWCC states that permission is required from SWCC and NRW, via the OFDCAG, before digging (with or without the use of explosives) commences on the surface or underground. It would be desirable to establish with NRW whether there is any scope for permission to be given directly by SWCC for limited exploratory/scoping digs.

Sam Moore Chairman,

OFD Access Review Group

8 March 2022

Memorandum of Understanding

Partnership Agreement between Natural Resources Wales and South Wales Caving Club

Dated: 11 July 2019

MEMORANDUM OF UNDERSTANDING between Natural Resources Body for Wales (NRW) of 29 Newport Road, Cardiff, CF24 0TP and South Wales Caving Club (SWCC), of 1-10 Powell Street, Penwyllt, Pen-y-Cae, Swansea SA9 1GQ

- **Aim and purpose of the Memorandum**

- This Memorandum records the understanding of NRW and SWCC (including their advisory body, Ogof Ffynnon Ddu Cave Advisory Group (OFDCAG)) in respect of their common objectives relating to matters of mutual interest. This Memorandum is primarily in the relation to access, use and the conservation of the cave and all karst and natural features within the Ogof Ffynnon Ddu (OFD) cave SSSI, which includes the OFD National Nature Reserve (NNR) and all entrances to OFD. Additionally, this Memorandum will be scheduled with a cave access agreement for provisions for access to, use and conservation of Tooth Cave (Parkwood, Gower) which forms part of the wider Parkmill Woodlands and Llethrid Valley SSSI. This will be added in due course. It sets out a framework through which the parties seek to enhance the delivery of mutual objectives by sharing knowledge and information.
- This Memorandum recites the responsibilities of the parties and establishes the general principles for their cooperation.
- This Memorandum shall be effective from the date recorded above and it will be regularly reviewed in accordance with paragraph [6] of this Memorandum.
- This Memorandum is to be read in conjunction with the following documents (which form annexes 1 – 7 of this Memorandum):
 - OFDCAG Terms of Reference (Annex 1)
 - OFD Access and Entry: Conditions, Procedures and Rules (Annex 2)
 - Policy on Digging and the Use of Explosives (Annex 3)
 - Duties of Cave Wardens (Annex 4)
 - Radon in OFD (Annex 5)
 - Tooth Cave Access Agreement and Entry: Conditions, Procedures and Rules (to be reviewed and added following the first review and appraisal meeting held every 6 months)

- **Roles and functions of the signatories**

- ***NRW***

2.1.1 NRW is a Welsh Government Sponsored Body. NRW's purpose is to ensure that the natural resources of Wales are sustainably maintained, enhanced and used, now and in the future.

2.1.2 The roles and responsibilities include, amongst others:

- A principal adviser to the Welsh Government on the environment and natural resources and a statutory consultee to planning applications per year;
- Acting as a regulator using over 40 different sets of regulation including those for designated sites, the marine environment, forestry and the nuclear, waste and water industries;
- A land manager for 7% of the land area of Wales including woodlands, water and National Nature Reserves;
- An environmental operator managing over 120,000 hectares of woodland and maintaining almost 2,000 miles of flood defences;
- As an incident responder dealing with approximately 9,000 reported incidents and issuing flood warnings to over 100,000 people;
- Promoting enterprise activities on the estate it manages, including energy projects and the harvesting and marketing of timber

- ***SWCC***

- SWCC is an un-incorporated private members' club based in the Swansea Valley. The objects of SWCC are set out in club's Constitution as follows:

- The discovery, exploration and survey of caves,
- The scientific study and research in caves and cave entrances,
- The conservation of caves,
- The support of an effective cave rescue organisation,
- The furtherance of any other activities associated with caving.

- The Policies of SWCC include:

- To be a respected voice in matters speleological.
- To support the wider community where practical and maintain friendly relations with its neighbours.
- To be a responsible landlord and landowner.
- To support and promote the safe, and responsible, enjoyment of the outdoor and underground environment through the voluntary ethos of club based caving and other 'not for profit' organisations which are open to all who have the necessary interest and initiative.
- To encourage Members who are planning digging and new exploration to consult landowners / regulatory authorities and to seek appropriate permissions.
- To work with partner organisations to the best of its ability and to be considered as a valued contributor to those partnerships

- **Principles of working together**

- At the request of NRW, SWCC has agreed to control access to OFD cave on behalf of NRW.
- At the request of NRW, SWCC has agreed to offer advice with respect to the management of the surface above OFD and in particular with karst features and processes which may impact on the cave below.
- NRW and SWCC each recognise the independent remit of the other party and the requirement for each party to exercise its own discretion in all decision making, but will aim to:
 - collaborate and cooperate where appropriate in the achievement of their shared and respective objectives in the access to, use and conservation of OFD cave SSSI and NNR;
 - engage in open discussion in areas of mutual interest to achieve their respective objectives in contributing to the sustainable management in the access to, use and conservation of OFD cave SSSI and NNR;
 - collaborate and cooperate where appropriate in the achievement of their shared and respective objectives in the access to, use and conservation of Tooth Cave within the Parkmill Woodlands and Llethrid Valley SSSI;
 - operate in a transparent way while undertaking their responsibilities;
 - involve and work with each other in areas of shared interest or concern, with other relevant delivery partners included, where appropriate and agreed;
 - share and keep each other informed of any data, research, collected information or other work or development that either party believes would be helpful to the other in connection with the decisions or activities of either party, taking account of their respective obligations under the General Data Protection Regulation and the Data Protection Act 2018 and subject to any intellectual property or confidentiality restrictions placed on the parties; explore further opportunities to develop shared working practices and reduce duplication of effort. Where such opportunities are identified, the specific terms on which the parties will share working practices will be negotiated and agreed outside the terms of this Memorandum; and
 - seek to deliver consistent and coordinated messages when working together on projects and when working with Government, delivery partners and the public.

- **Status**

- NRW, as a Welsh Government Sponsored Body, is accountable to Ministers and the Welsh Government, as set out in the Establishment Order for the Body and the agreed Governance Framework. The parties recognise that any relevant requirements in these governance arrangements take precedence over this Memorandum.
- The parties agree that this Memorandum is not legally binding between them and does not create any form of partnership or legal rights or obligations. It is however a statement of their shared intention to work together in a spirit of co-operation in pursuance of the matters outlined above.
- Nothing in this Memorandum of Understanding shall fetter the discretion of NRW and its duties to be impartial, fair to all affected persons and to exercise (and be seen to exercise) its functions in accordance with the requirements of relevant legislation at

all times. Accordingly, nothing in this Memorandum is to be taken as limiting or affecting in any NRW's exercise of its powers and duties.

- **Announcements**

The parties will endeavour to keep each other informed in advance (taking into account confidentiality and other obligations owed to third parties) of any forthcoming significant public of policy announcements on material matters of mutual interest including, for example only, early notice of non-restricted significant business developments and non-routine asset sales.

- **Review and appraisal of the Memorandum**

- In addition to ad hoc meetings as business dictates, NRW and SWCC will also meet approximately every year (these meetings, to be held Monday - Friday, may be in person, via video conferencing or telephone conferencing) ("the annual Meeting") to review the shared wider strategic context of the environments in which they operate and explore opportunities for the improvement of joint working practices.
- This Memorandum will be reviewed:
 - (a) at the annual Meeting; and
 - (b) whenever substantial changes occur to the policies, external relationships and structures of the parties concerned, or to the interaction between governments within the UK;
 - (c) Otherwise at intervals of not greater than five years.and any amendments to this Memorandum consequent upon those reviews will be incorporated into it by the parties by mutual agreement.

- **Primary Contacts**

NRW and SWCC will each nominate a primary contact. These primary contacts will be responsible for encouraging a fluent and (where the commercial interests of the parties allow) transparent relationship between NRW and SWCC, resolving difficulties and monitoring the smooth operation of this Memorandum. Substitute primary contacts, for both NRW and SWCC, should be agreed in the event of absences.

- **Signatories**

- The parties agree to the terms set out in this Memorandum.

Signature	Signature
Name	
Position Head of Operations South West	Chairman
Natural Resources Body for Wales	South Wales Caving Club

Annex 1 - OFDCAG Terms of Reference

1. This Document

This document should be read in conjunction with the Memorandum of Understanding which sets out the relationship between National Resources Wales (NRW) and South Wales Caving Club (SWCC) in relation to Ogof Ffynnon Ddu (OFD).

2. Role of the Group

a) The Ogof Ffynnon Ddu Cave Advisory Group (OFDCAG) advises and assists Natural Resources Wales and the South Wales Caving Club in matters concerning access to, use of and exploration of caves within the Ogof Ffynnon Ddu cave SSSI.

b) The OFDCAG’s primary concern is the conservation of caves and all-natural cave related features within the Ogof Ffynnon Ddu cave SSSI.

c) The OFDCAG’s may also be asked to advise on conservation of cave related surface features within the Ogof Ffynnon Ddu cave SSSI.

d) For the reasons set out in (b) and (c) above, it is the role of the OFDCAG to:

- advise on conservation measures
- advise on access to the cave and on the access rules
- support and work with the NRW in its role as a landowner of a part of the SSSI
- support and work with the NRW in its role as regulatory authority over the whole of the SSSI
- support and work with SWCC in its role as a landowner of part of the SSSI, as the Access Controlling Body for OFD and as a source of caving expertise.

e) By agreement with NRW, the access controlling body for OFD is SWCC. SWCC is charged with the management of access to all caves within the Ogof Ffynnon Ddu cave SSSI. To Assist SWCC and NRW in this regard, the OFDCAG provides a forum at which policy and other matters are discussed, taking account of the interests of cavers and the interests and obligations of and to NRW and SWCC.

g) The OFDCAG, in advising NRW and SWCC, aims to provide consistent advice in relation to caving interests in the Ogof Ffynnon Ddu cave SSSI, based on accumulated knowledge and experience of the area, of relationships with neighbouring landowners and with other caving bodies, and of circumstances and access requests that call for special consideration.

3. Group Structure

a) Chairman

The Chairman of OFDCAG is appointed by SWCC Committee. In the case of unavoidable absence from a meeting the Secretary may nominate a substitute Chairman. In addition to chairing meetings, unless NRW are in attendance (see 6b below), the role of the Chairman is to provide formal feedback to NRW, along with representation of the interests of NRW (submitted either verbally or in writing prior to OFDCAG meetings) which can include associated advice on policy and other relevant issues.

b) Secretary

The Secretary of OFDCAG is appointed by the SWCC Committee. The role of the Secretary is in the administration of meetings, preparation of minutes, filing of all relevant documents, dealing with relevant correspondence, and provision of information on relevant policy issues.

c) Appointment of Chairman and Secretary

Annually, immediately following the SWCC AGM, SWCC Committee appoints the Chairman and Secretary. In doing so, SWCC Committee should seek, as far as is reasonable, to provide continuity and to ensure that the persons nominated have sufficient background knowledge to fulfil the requirements of these roles.

If a vacancy for Chairman or Secretary arises at any other time SWCC Committee shall appoint a replacement

d) Ex-officio Positions

A key role of the ex-officio representatives from SWCC is to ensure active information flow between the SWCC Committee and the OFDCAG. The following are ex-officio members of the OFDCAG:

- The SWCC member appointed to advise SWCC on matters of Conservation,
- The SWCC member appointed to advise SWCC on matters of Fixed Aids
- The SWCC Permit Secretary

e) Substitutes for Ex-Officio Members

If they are unable to attend or if a conflict of interest arises, the above ex-officio members may be replaced at OFDCAG meetings by substitutes nominated on a meeting-by-meeting basis by SWCC Committee.

f) Additional Caver Representation

Whilst SWCC has obligations on behalf of NRW, and as landowners with its own rights and obligations, for reasons of transparency, bodies with other interests in the cave are also represented.

- The Cambrian Caving Council is entitled to send a representative.

In addition, given that many clubs visiting the cave are from outside Wales, all clubs that hold and have held an annual OFD permit for at least the previous three consecutive years shall be invited to seek representation on the OFDCAG. Clubs wishing to be represented shall be entered into a random ballot from which three are selected. Those clubs will then each be invited to nominate a representative to serve for a period of three years, after which a new ballot will be held.

- Three annual permit holding clubs are entitled to each send a representative.

The presence of a representative of the cave rescue team which has responsibility for the area helps resolve potential conflicts of interest between conservation, access, and the requirements of cave rescue.

- The South & Mid Wales Cave Rescue Team is entitled to send a representative.

g) Substitutes for Additional Caver Representation

If they are unable to attend or if a conflict of interest arises, the additional caver representatives identified in **f)** above, may be replaced at OFDCAG meetings by substitutes nominated on a meeting-by-meeting by the organisations they represent.

h) Cave Wardens

Cave Wardens are appointed by SWCC Committee. In relation to execution of their voluntary duties as Wardens (see associated document: Duties of Cave Wardens) Wardens are responsible directly to the SWCC Caving Manager.

Cave Wardens are members of the OFDCAG, ex-officio, to provide input on issues affecting the cave, gained during the performance of their voluntary duties.

Nominations for Cave Wardens may be made by the OFDCAG or by SWCC Committee. Warden appointments are made by SWCC Committee for a period of three years. A brief statement as to why the person is considered suitable to undertake the duties of a Warden must be included in the relevant OFDCAG and SWCC minutes. Only persons who are BCA members are eligible to hold the position of Cave Warden.

All appointments will be added to the Cave Warden List, which is maintained by the OFDCAG Secretary, The OFDCAG Secretary shall notify SWCC Secretary and NRW of changes to the Cave Warden List. Wardens wishing to resign their position should do so in writing directly to the SWCC Caving Manager and cc'd to Secretary of the OFDCAG.

[Note that persons holding ex-officio positions in 3d above do not automatically become Wardens and neither do representatives of other organisations set out in 3f above.]

4. Scientific Research in the Caves

Proposals for research should be made to the SWCC Secretary who shall inform both the OFDCAG Secretary and NRW. The decision on approval rests with SWCC, taking account of the advice of the OFDCAG, with NRW input, and is subject to SSSI compliance.

5. Management Plan

a) The OFDCAG shall co-operate with NRW and SWCC in the maintenance of the Management Plan for the Reserve and the remainder of the SSSI.

b) The OFDCAG shall work with NRW and SWCC to ensure that proper consent is in place for potentially damaging operations over the whole of the OFD SSSI.

6. Meetings of the OFDCAG

a) The OFDCAG shall meet in May or June (the 'Summer Meeting') and in November or December (the 'Winter Meeting').

b) The meetings may be held physically, Virtually or Blended (a mix of physical and virtual).

c) The Chairman and Secretary may agree to call additional meetings provided members of the Committee are given notice in writing, by email or otherwise, a minimum of four weeks prior to the intended date of the meeting, or two weeks in the case of unexpected issues that are particularly urgent.

d) For each meeting there shall be a quorum of six that must include at least one ex-officio or nominated representative of SWCC. In addition, the NRW shall be invited to send a representative to attend and observe each meeting and to provide advice on the current NRW position. The NRW representative is not entitled to vote

e) At the meetings, brief reports are to be presented by the Chairman, Secretary, the SWCC Permit Secretary and the SWCC member appointed to advise SWCC on matters of Conservation. There should be an update from the member appointed to advise SWCC on matters of Fixed Aids confirming that regular checks have been carried out and highlighting any issues that need to be drawn to the attention of the Group.

f) The OFDCAG may resolve to make recommendations concerning the caves within the OFD SSSI and the land surface. Such resolutions require a simple majority of those present and voting.

g) At meetings, the results of each vote taken shall be recorded and included in the minutes. The minutes shall be circulated to NRW, SWCC Secretary and all other OFDCAG members within a reasonable period following the meeting.

h) Between the regular meetings, the Chairman and Secretary may, together, deal with urgent business that in their opinion does not require a meeting to be called. In doing so, they shall consult with all other members of the OFDCAG by email or other appropriate means. Such matters and any resulting recommendations shall be reported directly to NRW, SWCC Secretary and OFDCAG members and shall also be recorded at the next OFDCAG meeting for inclusion in the minutes.

7. Changes to these Terms of Reference

a) These Terms of Reference should normally be reviewed every three years in a process involving NRW, SWCC and the OFDCAG but changes may be suggested at any time.

b) The OFDCAG is bound by the interests and obligations of NRW and SWCC. Consequently, all changes to these Terms of Reference require only the formal approval of NRW and of SWCC Committee.

c) Any changes suggested by the OFDCAG should be passed to SWCC Secretary for consideration by SWCC Committee in conjunction with NRW.

8. Associated Documents

The following documents are to be read in conjunction with these Terms of Reference:

- OFD Access and Entry: Conditions, Procedures and Rules
- Policy on Digging and the Use of Explosives
- Duties of Cave Wardens
- Radon in Ogof Ffynnon Ddu

9. Freedom of Information

These Terms of Reference and associated documents, minutes of meetings and any other key documents are to be publicly available via an appropriate website with hard copies held in the SWCC library.

10. Assets

The OFDCAG owns neither funds nor property of any kind. Any required expenditure in relation to the cave is the responsibility of either SWCC or NRW, or both, and is subject to their agreement as appropriate. Proposals for expenditure should be passed to SWCC Secretary in the first instance.

Annex 2 - OFD Access and Entry: Conditions, Procedures and Rules

- The following applies to all parts of and all entrances to Ogof Ffynnon Ddu (OFD) and are to be read in conjunction with the Terms of Reference of the Ogof Ffynnon Ddu Cave Advisory Group (OFDCAG) (Annex 1).

Access and Entry Conditions

- By agreement with NRW, the access controlling body for OFD is the South Wales Caving Club (SWCC); the SWCC Permit Secretary administers access, taking advice from the OFD Cave Advisory Group (OFDCAG). The entire cave is a Site of Special Scientific Interest (SSSI) and a large part of it is a National Nature Reserve. Access to the cave is subject to the obligations placed upon the landowners by its special status.
- Entrances to the cave are gated and permits for entry are obtained from the SWCC Permit Secretary by following the procedures set out here. Conservation of the cave and its flora and fauna is a priority and cavers are expected to act responsibly and adhere to the entry conditions and rules.
- Access is available to members of *bona fide* caving clubs who have read, and are prepared to abide by, the Conditions of Entry and Rules published by NRW and SWCC. *Bona fide* caving clubs are defined as those affiliated to the British Caving Association or another appropriate national or international body.

Access and Entry Procedures

- Applications for permits must be made by an officer of the club and be received by the Permit Secretary at least two weeks prior to the proposed caving trip. Applications may be made either by email to ofdaccess@hotmail.co.uk or by post, in which case a stamped addressed envelope would be appreciated.
- A permit covers a single party of up to 6 people. If more than 6 people from the applying club will be in the cave at the same time, then multiple permits must be requested.
- Permit holders may obtain keys to the cave from SWCC headquarters.
- The Permit Secretary shall have absolute discretion in interpreting these conditions and may refuse a permit, in which case the applicant will be informed of the reason for refusal. The applicant may appeal, in writing, to SWCC secretary.
- There is a facility for Annual Permits to be issued to clubs that have demonstrated a regular and conscientious interest in Ogof Ffynnon Ddu. Applications for Annual Permits should be made to the SWCC Permit Secretary. Clubs who have a rapid turnover of members (such as University caving clubs) are not normally granted annual permits.

- Access to the Columns area is restricted in the interests of conservation. Parties may visit the Columns only when a Cave Warden is present. Wardens will normally be available for visits to the Columns between noon and 3pm on the Sundays of Easter, May Day, Spring and August Bank Holidays, and New Year's Day, for which there will be a rota of Wardens. Parties wishing to visit the Columns at these times do not need to make any prior arrangements but should make themselves known to a Warden by 10 am on the day. Parties must ensure that they have their own leaders; Wardens do not act as leaders for visiting parties.
- The 'Entry Conditions and Rules' are listed on the reverse of each permit.

Access and Entry Rules

- All cavers visiting OFD shall ensure that they have made adequate provision with respect to rescue callout. SWCC currently provides the Digital Destination Board for this purpose and parties using this application shall be deemed to have complied with the requirement with respect to rescue call out.
- Parties using visiting OFD shall obtain a cave key from cottage 3 of the SWCC HQ. The use of keys shall be logged on the 'Key User Logsheets' provided in cottage No. 3.
- For reasons of cave conservation and adequate supervision of less-experienced cavers, the maximum permitted party size is 6 including the leader. Parties must not join up underground and should deliberately maintain separation from other parties.
- The leader is responsible for the conduct and safety of the party AND for the provision of the equipment necessary to complete the trip. The leader must draw to the party's attention the conditions relating to the use of any fixed equipment within the cave, which are displayed on the board in cottage 3 of SWCC HQ.
- The leader is responsible for the cave key. Lost keys will incur a charge of £50.
- ONLY electric lighting is to be used. Carbide MUST NOT be taken into the cave.
- This permit is for ENTRY ONLY. Camping, commercial filming, digging and the use of explosives, dye tracing and other research projects require special permission, for which application is to be made via the South Wales Caving Club Permit Secretary.
- Conservation of the cave is very important and those who enter the cave are responsible for its welfare. Some areas are taped off for conservation reasons. Marker tapes must not be crossed or moved, under any circumstances other than in extreme emergency. Observe all tapes and route markings in the cave. If there is no tape, proceed only if there is a clearly defined path. If in doubt, STOP. Any damage to formations must be reported to SWCC Permit Secretary.
- Smoking and vaping is prohibited throughout the cave and no litter whatsoever is to be left either inside or outside the cave.
- Cavers visiting OFD 1 must park vehicles in approved locations and approach the cave entrance by approved routes. Details of locations and routes can be found on the notice board in cottage No. 3 of SWCC HQ.

- The gates are to be kept locked and closed at all times except when entering or leaving the cave.
- Cavers enter at their own risk. Many sections of the cave are arduous. For safety reasons, adequate experience and suitable clothing and equipment are required throughout the cave and especially in the further reaches of the cave and in the streamway.
- Installations, apparatus and equipment must not be damaged. If accidental damage occurs this should be reported immediately on return to SWCC HQ to an OFD Warden (if available) and by email to the South Wales Caving Club Permit Secretary.
- Access to the land surface of the NNR and of much of the remainder of the SSSI is unrestricted but visitors are asked to help protect the wildlife and natural beauty and avoid disturbance to grazing animals.
- Failure to observe these conditions may result in the refusal of any future application for entry.
- These Entry Conditions and Rules may be revised from time to time.

Annex 3 - Policy on Digging and the Use of Explosives

This policy is to be read in conjunction with the Terms of Reference of the Ogof Ffynnon Ddu Cave Advisory Group (OFDCAG) (Annex 1).

- Digging and the use of explosives are recognised as valid techniques for cave exploration, however the conservation of the known cave is of paramount importance.
- This policy applies to the use of all explosive materials and expansive chemicals, regardless of whether or not their use requires a licence.
- The cave is a Site of Special Scientific Interest (SSSI), which places specific obligations on its owners and those undertaking operations within, or related to, the cave.
- Each SSSI has a formal list of Operations Likely to Damage to the Special Interest. The owners and occupiers of that land have a legal requirement not to carry out or permit others to carry out operations on this list unless they have obtained formal SSSI Consent from Natural Resources Wales (NRW). Whilst NRW consider it helpful to have a system providing delegated authority to specific person(s) with expert knowledge (so as to consider, vet and control proposals for digging and use of explosives) the legal requirement for SSSI Consent remains on the owners. Applications in the first instance may be submitted to the Secretary of the OFD Cave Advisory Group (OFDCAG).
- The principal owners of the land within the OFD SSSI are NRW and the South Wales Caving Club. By agreement with NRW, SWCC controls access to the entire cave, with advice from the OFDCAG.
- Permission is to be obtained from SWCC and NRW, via the OFDCAG, before explosives are used or digging commences on the surface or underground. NRW specialists (e.g. geologist, ecologist etc.) may give permission in straightforward cases, provided an appropriate SSSI Consent is held by the appropriate landowner.
- The permission will be given to a specific person or persons who shall be responsible for their own safety, and that of all others in the vicinity. To comply with the legal requirements in

relation to SSSI status, the person(s) authorised must not permit anyone to carry out an operation on SSSI land unless the owner or occupier of that land has a current SSSI Consent, as above.

- Any permission given is on the basis that the person has knowledge of and complies with all relevant legislation.
- The type and quantity of explosive and the technique used should aim to reduce extraneous damage to a minimum.
- All digs must be kept in a safe condition and no explosives may be left in the cave or on the SSSI. Safety measures must be agreed via the OFDCAG prior to the dig commencing.
- Any failure of a charge to detonate fully must be dealt with in accordance with recognised safety procedures. If the misfire has not been rectified and the site is left unsafe when vacated, the situation must be reported immediately to the OFDCAG Secretary or SWCC Permit Secretary who will endeavour to ensure that normal access to the area is prevented until the misfire has been dealt with successfully by a suitably qualified person.
- A record must be kept, by the authorised person, of the location and nature of all operations permitted under this policy, and must be available to NRW, SWCC and OFDCAG on request.

Annex 4 - Duties of Cave Wardens

This document is to be read in conjunction with the Terms of Reference of the Ogof Ffynnon Ddu Cave Advisory Group (OFDCAG) (Annex 1).

The Cave Wardens are responsible to the SWCC Caving Manager. Their duties relate to all caves within the OFD SSSI and are as follows:

- To monitor and report on conservation matters relating to caves.
- In consultation with the SWCC member appointed to advise SWCC on matters of Conservation and the OFDCAG, to mark off sensitive areas of the cave (normally with tape) and to maintain existing markers and other conservation aids.
- As far as is reasonably practicable to rectify damage, in consultation with the SWCC member appointed to advise SWCC on matters of Conservation and the OFDCAG.
- To remove litter.
- To attempt to ensure those using the cave adhere to the current rules of access and use.
- To participate in or otherwise contribute to meetings of the OFDCAG.
- To be present during visits to the Columns, and other areas of restricted access, arranged according to the appropriate procedures. Wardens' responsibilities do not extend to acting as leaders for parties.
- To observe the condition of fixed aids within the cave, to report any concerns and, if requested, to assist with their maintenance.
- To undertake such other duties as may be reasonably expected to protect and preserve the scientific and sporting aspects of the cave.

Annex 5 – Radon in OFD

The presence of radioactive radon gas in cave and mines has long been recognised and it is accepted that exposure to any radioactive source should be as limited as possible. Presently, there is no indisputable proof that cavers' health has been adversely affected by exposure to radon daughters during caving activities. However, research in uranium mines worldwide has shown that a risk does exist. It was in response to this risk that the National Caving Association (NCA) commissioned their document: *Radon Exposure During Underground trips: a set of Guidelines for Caving and Mine Exploration*. This provides a background to the problem; an assessment of the risk from exposure to radon in caves and mines; a brief review of the legislation; and guidance on meeting legal requirements. Whilst no professional caving activities take place within the Ogof Ffynnon Ddu system, it is emphasised that the legal requirements are quite different from those undertaking recreational activities. Professionals, and those in positions of responsibility, are advised to refer to the Ionising Radiations Regulations (1999) and the information in the NCA Guidelines (1996), which is to be considered in conjunction with the requirements of the *Cave Instructor Certificate* and the *Local Cave and Mine Leader Assessment Scheme* both administered by the NCA.

The measurement of received radiation dose is a complicated issue for several reasons. Normally, the quantity of radon in air is measured by detecting the number of alpha particles emitted from a given volume of air over a period of time. There is a very complex relationship between this quantity and radon concentration. In working mines, the potential dose has historically been measured in a unit known as the Working Level. The formal SI unit of activity is the Becquerel (Bq), a Becquerel being the disintegration of one atom in one second. More conveniently, activity concentrations per cubic metre (Bq m^{-3}) are used to describe the concentration of radioactivity in air. The approximate relation between the Becquerel and the Working Level is taken to be 1 WL is equivalent to 3700 Bq m^{-3} of radon at equilibrium. However, the equilibrium factor, F, is a time-consuming parameter to measure and its value varies considerably (e.g. Kendall et al., 1994). For this reason and the fact that relatively robust radon monitors could be used, the NRPB recommendation to recreational cavers was to use concentration in a time integrated manner quoted as $\text{Bq m}^{-3} \text{ h}^{-1}$ (e.g. Kendall & Dixon, 1997). In this, and the advice given by NCA (1996), an equilibrium factor of 0.5 was used as a representative value for all calculations. However, the recent legislation (IRR, 1999) now requires that dose should be measured in milliSieverts (mSv) which simplifies matters as it gives a direct conversion from concentrations of radon gas in Bq m^{-3} without recourse to a measured equilibrium factor. This conversion formula is:

$$\text{Dose (mSv)} = \frac{(\text{Concentration } \text{Bq m}^{-3}) \times \text{duration}}{254000}$$

The ICRP recommendation for the general public is an annual dose not to exceed 1 mSv (ICRP 1993). Therefore, using the calculated mean concentrations obtained from the Ogof Ffynnon Ddu system and the separate traverses of the main parts of the system (Friend & Gooding 2001), expected doses have been calculated from the above formula (Table 1). It must be understood that for the most part the concentration measurements were made in open parts of the cave system, on frequently used routes. It is possible that in remote parts of the system that have poor ventilation, concentrations may be higher than those used here. Using the highest mean concentration of 3094 Bq m^{-3} obtained from OFD II as the constant value for a trip of 10 hours duration, the expected dose is thus in the order of 0.12 mSv. Therefore, it would take about 80 hours, or approximately 8 trips of 10 hours duration in the cave system at this concentration, to reach the recommended dose of 1

mSv. As the vast majority of caving trips in the system is closer to 5 hours long, the total number of trips taken to reach the ICRP level, at maximum concentration, would be nearer to 16. Most average cavers go underground about twice a month, therefore, using the maximum OFD system mean (2844 Bq m⁻³, Table 2), would take say 90 hours underground to get to the recommended 1mSv limit. These calculations are all based on the highest values obtained and, assuming that the concentration encountered will not continually be at such high levels, there is a margin of error on the side of safety.

Apart from caving trips, most recreational cavers will otherwise only encounter radiation from radon in a background or domestic setting. Geographically, background radon concentration over Britain varies considerably, from known high areas such as Cornwall with an average annual dose of 6.3 mSv, to low areas such as London where the dose is about 1.2 mSv. In a domestic dwelling the average concentration is taken as about 20 Bq m⁻³ which equates to an annual dose of about 1 mSv (O’Riordan, 1990), the ICRP recommendation for members of the public (ICRP 1993). This average radon concentration of 20 Bq m⁻³ for a dwelling can be compared with the values for the SWCC HQ, a building constructed on and from the local limestone. A range of 70 Bq m⁻³ (winter) to 170 Bq m⁻³ (summer) was obtained (Friend & Gooding 2001). Using these values as 6 monthly averages, this crudely leads to an average concentration of 120 Bq m⁻³. This value is towards the recommended action level in Britain set at 200 Bq m⁻³, (based on three-monthly average measurements in two rooms) corresponding to an annual dose of 10 mSv (O’Riordan, 1990).

Therefore, whilst not minimising the importance to limit any exposure to radiation, the exposure to radon likely to be encountered in the Ogof Ffynnon Ddu cave system can be individually controlled so that it is within the current NRPB recommendations without unduly hampering underground activities.

Table 1. Estimated doses calculated from the statistical means of winter and summer radon concentration in the Ogof Ffynnon Ddu system and for the individual traverses of parts of the system. Data from Friend & Gooding (2001).

	Winter			Summer		
	Bq m ⁻³	mSv*	hours†	Bq m ⁻³	mSv*	hours†
OFD whole system	2318	0.09	110	2844	0.11	89
separate traverses						
OFDI – Cwm Dwr	1946	0.08	131	3094	0.12	82
OFD II2876	0.11	88	2667	0.11	95	

*A trip of a nominal 10-hour duration is used in the calculation. To calculate the likely dose for any trip, divide the estimated dose by 10 and multiply by the duration in hours.

† Number of hours required to reach the 1 mSv dose limit (to nearest whole hour).

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Natural Resources Wales
Cambria House
29 Newport Road
Cardiff
CF24 0TP

0300 065 3000 (Mon-Fri, 8am - 6pm)

enquiries@naturalresourceswales.gov.uk
www.naturalresources.wales

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