

CAVES AND KARST FEATURES OF THE NORTH BRISTOL OUTCROP

BY

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ABSTRACT

This article considers an area of carboniferous limestone north of Bristol. It sets out the known sites of speleological interest, considers the sinkholes and swallets, summarises previously described cave passages and identifies other features typical of a karst landscape.

INTRODUCTION

Derek Ford and Paul Williams (2007) described Karst thus “... areas characterised by sinking streams, caves, enclosed depressions, fluted rock outcrops and large springs”. The area north of Bristol and particularly the ridge giving rise to the name Rudgeway, which the A38 follows northwards from the city, is shown on Geological maps (British Geological Survey, 1981) as an outcrop of Clifton Down Limestone. This is continuous, except for later overlaying layers, from Durdham Downs, Clifton, to between Cromhall and Charfield where it appears to arch round and continue south through Wickwar to Chipping Sodbury. This represents the edges of a basin which contains the northern portion of the Bristol Coalfield. Upon initial consideration of the area, it does not appear to be a classic landscape made of limestone and the suggested features for a Karst Landscape seems to be absent. This article sets out the known sites of speleological interest, considering the sinkholes and swallets, summarises known cave passages that have been previously described as well as other features typical of a karst landscape. In each section the features are described in a clockwise direction around the horse-shoe shape which forms the edge of the basin, i.e. from Almondsbury to Chipping Sodbury. Information is drawn from a wide variety of sources and collated here along with new information from the author’s own research. A gazetteer of the sites identified has been prepared and is available separately online.

One of the things most obviously missing from the North Bristol limestone are notable sinks and risings. The permeability and soluble nature of the Clifton Down Limestone is such that it could be reasonably expected to dissolve at a similar rate to other nearby outcrops such as in the Mendips, South Wales, the Forest of Dean and the area around Chepstow. All of those have well know resurgences and associated with these are caves and underground stream passages. No such large resurgences are known of in the area being considered. The area consider is approximately 238 km² (17km E to W x 14 km N to S) of which approximately 23.3 km² is shown on geological maps as exposed limestone.

SWALLETS AND SINKHOLES

The Alveston Whirly Holes

“.... In a direction bearing nearly east and west, in a line pointing to the Severn, a number of sinkings and pits are observable, like abandoned shafts,

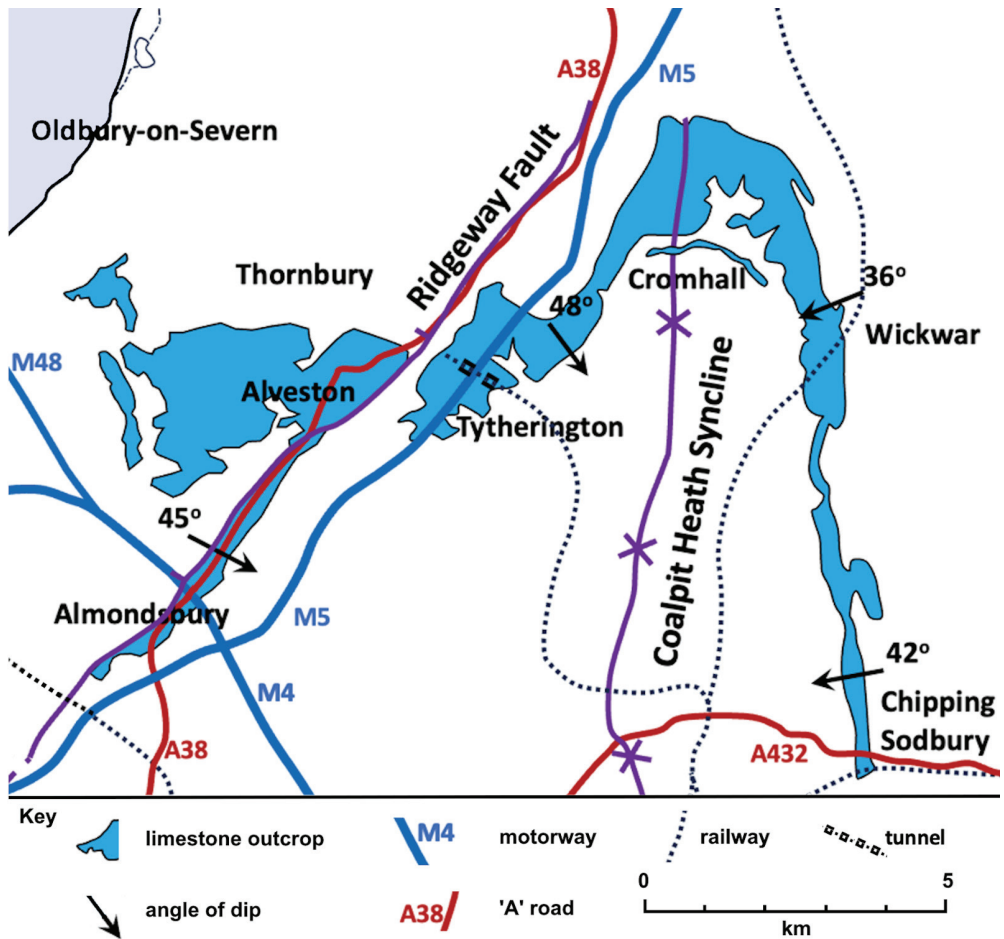


Figure 1. *The North Bristol Outcrop – Plan view of area discussed in this article. Based on BGS Survey (n.d.) and Tringham (2022).*

or the commencement of mines. They are called by the country people “whirly pits.” In some instances the bottoms of them are not visible, owing to the tortuous irregularity of the passages; in other cases they are only deep hollows, covered with turf. These sinkings are evidently occasioned by the lowering of the surface in consequence of the removal of the support beneath. Where the under parts have been entirely displaced, the upper have fallen in, and formed a chasm; where only partially removed, deep, turfy hollows are formed. These removals have been occasioned, probably, by a stream of water running far beneath, and washing away the support; and in part by the superfluous water from the ditches and water courses above draining into the fissures of the rock, and so gradually mining or wearing away a passage, for they are now frequently the receivers of all the running water from the land,

which seems naturally to drain into them, and apparently has been so conducted for a long course of years."

From 'The Journal of a Naturalist (Knapp, 1828).

John Leonard Knapp (9 May 1767 – 29 April 1845) started his career in the Navy but, for health reasons, subsequently served with the militias of both Herefordshire and Northamptonshire, as a Lieutenant and Captain respectively (Boulger, 1892). It is however his work as a botanist for which he is better known. He published 'Gramina Britannica, or Representations of the British Grasses on 119 coloured plates, with Descriptions,' in 1804, and between 1820 and 1830 he wrote 'The Naturalist's Diary,' in the 'Time's Telescope', an annual almanac. He was living at Alveston Old House in 1813 (King, 2011) having moved there from Llanfoist, near Abergavenny and it was whilst in Alveston that he produced his best-known work, 'The Journal of a Naturalist'. (Knapp, 1828).

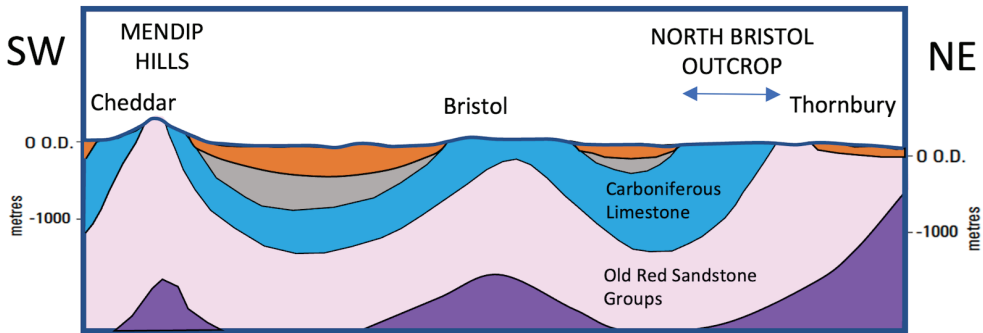


Figure 2. *Indicative geological section from southwest to northeast (vertical scale is exaggerated).*

Based on Bristol and Gloucester Regional Geology Figure 4.

The "whirly pits" he mentions are also described in the publication "Alveston: Our village within living memory" produced by the Alveston Women's Institute (WI) in 1957 as part of a national competition (Alveston Women's Institute, 1957). The location of what were believed to be four of these features that remained at that time were given as follows:

"To the right of the church path as one passes "The Lawns" on the left, is one of several "whirly hole" in the parish, now dry but some years ago with water that swirled around with the force of the springs feeding it. Others may be found, usually concealed by brambles, in a field below Wolfridge on its south west side, midway between the new church and Shellards Lane and to the east of the Black and White Garage. They are not now very deep although about five years ago [i.e. c1954] a farmer had great difficulty, even with the help of a tractor, in extricating a cow from one. Their sides have crumbled and filled them in so that they no longer merit the description of "frightful chasms" given them by the Alveston Naturalist more than a hundred years ago."

The four sites mentioned in the WI publication can be summarised as follows:

1. The site described as to the left of the path by The Lawns (subsequently The Loans and renamed in 2022 as The Manor House), is the sink now known as Fishmonger's Swallet (NGR ST 6331 8720). This is discussed below under known cave passage and also papers in volume 29 (1) of these *Proceedings*.
2. The site described as "in a field below Wolfridge on its south west side" is more likely to be a spring than a swallet. The most likely location is at ST 6264 8779, (close to "Dropping Well" (see below). The WI account suggested that the water swirls in these features because of underground springs feeding into them. This may have been the case regarding this feature which is different from the others described here.
3. The site "midway between the new church and Shellards Lane" (ST 6375 8753) was excavated by Alan Clarke in the late 1970s and described in "The Swallow Hole on Forty Acre Farm, Alveston, Avon" (Clarke and Levitan, 1987). It is also discussed below under known cave passage, although very little actual underground passage was found.
4. "The Black and White Garage" was a petrol filling station and vehicle repair shop on the south bound side of the A38. It ceased trading in the early 2000s and the site is currently (2023) used as a hand car washing facility. "East" of this, and clearly the site referred to, is a swallet on the left-hand side of the access road to Briarlands Office Park (ST 63065 87028). This swallet takes field drainage and surface water from the business park but has not been excavated. It was initially proposed that this would be explored using a mechanical excavator as the cameo for the Time Team programme filmed at Fishmonger's Swallet in 2000. This was not carried out, partly because of the farmer's concerns about the wet ground following heavy rain, which also resulted in the postponing of the filming, but also subsequently because of a change in focus by the production team to a recreation of a Romano-British votive dog sculpture, based on their initial analysis of the material already recovered from Fishmonger's Swallet. (See also Briarlands Bore hole below)

The Journal of a Naturalist referred to the whirly holes as being "in a line". Figure 3 shows three of the sites mentioned in the WI publication and it is notable that these sites are aligned although not actually "pointing to the Severn" as stated. These lie along the boundary between an overlying mudstone from the Penarth Group and the carboniferous limestone. Previously this mudstone was described as Rhaetic or Rhaetic Beds overlaid with White and Blue Lias (British Geological Survey, 2019). At each of these three sites surface water from field ditches flows off the impermeable mudstone, in a general north-west direction before being captured into a narrow descending gully cutting into the Limestone, which is dipping at approx. 30° in the opposite direction and disappearing underground.

Between Fishmonger's Swallet and the Black and White Garage sink, also on the same alignment, is a shallow depression in the corner of the field where water pools in wet weather before subsequently draining away. This is on the same geological boundary and may therefore be another sink, possibly one of Knapp's "deep hollows, covered with turf". The depression shown on Figure 3 in the field north of Forty Acre Lane also takes water in wet weather and this drains away quickly. It is also approximately on the same alignment as the swallets but is not fed by a surface stream nor ditch. It is considered likely that this is a more recent collapse feature rather than a true swallet, or locally "whirly hole" and is discussed further later (see "the Hollows").



Figure 3. Diagram showing location of stream sinks in Alveston - Note the linear orientation along the boundary of the carboniferous limestone.

The Hope Farm/M5 Whirly Holes (ST 6767 9009)

A further feature also referred to locally as a whirly hole existed near Hope Farm, Buckover, prior to the construction of the section of the M5 between the Almondsbury interchange and Junction 14 at Falfield. It was said to be 20 ft (6 m) deep and about 40 ft (12 m) in diameter and “taking a good stream” when inspected by Mr Bennett who was working on the construction of the motorway (Bennett, 1970). Before being cleared by bulldozers the site was wooded, with the water sinking into a layer of silt and leaves but in wet weather water was seen to form a whirlpool in the middle. The fishmonger, Clive Grace, after whom Fishmonger’s Swallet is named, said that he and his father had once dye tested it to the River Severn at Oldbury although the details of how this was achieved are not known. It has also been indicated that around 40 lorry-loads of concrete were poured into this at the time of the motorway construction in an attempt to seal and stabilise it.

This was the largest of a number of features described by Bennett in his letter to the editor of *Speleo*—The Newsletter of the South West Essex Technical College Caving Club (Bennett, 1970). A little further south along the line of the motorway, opposite Hope Farm, was a pond (ST 6757 8995) which overflowed via a deep channel into a sink “about 15 feet below ground level and 25 feet across” (Bennett, 1970 p. 13). This sink is now beneath the footing of

the west pier of the bridge taking Cromhall Lane over the motorway (ST 6757 8998). At the time of the Bennett's visit they were still excavating through loose rocks and an adjacent bore hole had hit a "5-foot cavity" at a depth of 28 ft (8.5 m).

About halfway between the whirly hole and the sink below the bridge pier Bennett shows on his sketch an additional small sink that he describes as "taking water in wet weather" (Bennett, 1970 p. 12).

In a field to the west of the line of the motorway Bennett shows a "large hole in field filled in with several loads of stone" (Bennett, 1970 p. 12). In his letter he describes this as having appeared "some years ago" and that it was the shape of "an inverted funnel giving way at the edges if you stood there" (Bennett, 1970 p. 13). Although at the time he was writing it was apparently still possible to discern where it was, it is impossible now to accurately locate it from his sketch. There is however a small pond shown on the first series OS Map (Ordnance Survey, 1880c) at ST 6769 9029, which may be associated with the feature Bennett described.

Bennett also shows on his sketch and describes in his text several springs and places where he says "water rises in very wet weather". It was thought that these represented where the water from the other features reappeared but tests with fluorescein were negative.

The geology differs from the previously described whirly holes in Alveston in that this one is shown on the geological map as being in the Brinkmarsh Beds, a calcareous Mudstone, from the Silurian Period (British Geological Survey, nd).

The carriageway above the former swallet has been patch repaired on several occasions. The adjacent bridge taking Cromhall Lane across the M5 has had its pillars strengthened and has also been reduced to single way traffic. These works being necessary may be related to ground movement. The streams that previously sank at the swallets have been culverted and join the local field drainage.

SPRINGS

Tockington Spring (ST 61355 86440)

The stream originating from the Dropping Well (see below), flows west passing the village of Tockington as the Tockington Mill Rhine. A "Spring" is marked on the OS 1st edition (Ordnance Survey, 1881b) approximately halfway between this stream and Washingpool Hill Road, on the south facing slope of the valley. Near this spring, the OS map shows a single line running down to the stream. The OS usually show double lines to denote a watercourse although a single line can be used for a small stream (Ordnance Survey c.1923). There are three such linear features in this field, all starting part way up the slope and connecting to the stream. All of these appear to be streams coming from springs. The grid references for the start of these are (from west to east) ST 61140 86410, ST 61288 86555 and ST 61480 86410. Recent satellite imaging (Google Earth, 2020) indicates the first of these now appears further down the valley slope at ST 61145 86290 while the last one starts further up the slope at ST 61455 86440.

The Dropping Well (ST 62440 87795)

The term "Well" is used in several parts of the country for a natural water source such as a spring. This is particularly the case where some form of structure is constructed around the outlet as a holding tank into which buckets, and other vessels could be dipped, or "dropped". In South Gloucestershire the term usually relates to a vertical shaft to a water supply although there are examples of the word being used for a spring. The Dropping Well is probably one of these.

On the title map for Alveston (Osbourne, 1840) the head of a stream is shown at ST 6250 8783). This is relatively high on the hillside above Lower Hazel on the edge of Strode Common (later called Stroud Common). By the time of the first series OS map (Ordnance Survey, 1881d) the source of the stream appears to be shown approximately 100 m further west, i.e. upstream, (ST 6238 8782) and the previous stream head is shown as a pool. Between the two points but slightly to the south, the Dropping Well is marked and labelled. This appears to have been sunk to provide a chamber for dropping buckets etc. into but rather than being a deep well it is making use of the water from this spring. Access routes across the common to it from both Alveston Down and the settlement at Lower Hazel remain as public footpaths.



Figure 4. *The Dropping Well – 1st Series OS Map. Gloucestershire LXIII.10
Published 1881 (Surveyed 1879-80)*

The first series OS map also shows a pool further downstream at which a pump has by that time been installed (ST 6264 8779). This suggests that by that date the water supply at the Dropping Well might not have been reliable, possibly having been affected by 19th Century quarrying in Alveston. It is this feature that is listed as one of the whirly holes by the WI in 1957 described as “in a field below Wolfridge on its south west side”. If this is a lower resurgence of the spring that supplied the Dropping Well this would explain their confusion regarding whirly holes being fed by springs.

Other streams flowing into the Lower Hazel Valley from Wolfridge Woods and the North slope of the ridge that the A38 runs along may also have been from springs although none are specifically labelled as such on known maps.

Laden Well (ST 6620 8730)

A former rising on the South side of the Alveston area limestone ridge is shown on the 1st Edition OS map (Ordnance Survey, 1881c), 1st Revision (Ordnance Survey, 1903) and on the 1921 edition (Ordnance Survey, 1921c). An annotated version of this plan (Anon, Tytherington Roots, n.d.) held by the Tytherington Local History Group, incorporating the names on the tithe map (Sturge, 1838) indicates that this was called Laden Well.

There are other possible locations for springs along the lower part of the ridge on this Southern side, including in the Village of Itchington itself, but none are labelled as “Spring” or “Well” on either the tithe map or the early OS maps.

Moorleaze Spring (ST 6640 8778)

Part way between Tytherington and Itchington, is a former “Spring” shown on the 1st edition of the OS County Series map (Ordnance Survey, 1881a). This is not far from, and flows towards, the former remote dwelling called Moorleaze, now demolished, and was previously a “strong flowing spring” said to have been partially bricked over. This may have been one of the two sources of water that fed into a concrete cattle drinking trough at two levels, built by the farmer, Herbert Pearce, the upper flow of which ceased about 1914. The cause of this drying up has been attributed to increased pumping by the Waterworks at Frampton Cotterell and a consequent lowering of the water table (Anon, Lower Farm, 2022), it is however more likely to be due to the deepening of the quarry as for the Duck Street stream (see below). The Moorleaze spring is not shown on the 1921 edition Ordnance Survey map (Ordnance Survey, 1921b).

In a straight line between this spring and the current location of the rising in Duck Street there are three wells, two ponds and a pump marked on the 1881 OS map. Each appears to be providing a water source to the respective separate fields between West Street and Itchington Road. No details of these have been found but they are also not shown on the 1921 OS map. The extensive development of Castle Quarry, on West Street by Squire Hardwicke in the early 20th Century is again likely to have caused them to dry up.

Duck Street Rising - Tytherington (ST 6700 8825)

The stream running alongside Duck Street in Tytherington is all that remains of a water course that ran the length of the main road through the village, rising from a spring part way up Stowell Hill Road adjacent to Old Manor House (Approx. Grid Ref ST 6671 8853). The channels along both sides of the road are evident on the 1881 edition of the Ordnance Survey County Series map (Ordnance Survey, 1881a) and the spring appears to be marked as “Well”. The stream has subsequently been progressively culverted to now issue at a point opposite Nos 1-3 The Ponds. This stream only flows sporadically and it is believed that this is due to the quarries having excavated below the original source, so it now only occurs when the quarry is pumping water out of its lower workings into a higher outlet that feeds into the culverted section of the former stream.

This is one of the sites included in the dye testing of the Forty Acre Lane Swallet in March 1982 (Clarke and Levitan, 1987). The other two sites tested were streams rather than resurgences (i.e. at Washingpool Hill - ST 6165 8655 and near Thornbury Leisure Centre - ST 6350 8930). All three tests were negative.

Sibland Spring (ST 64990 89695)

Amongst the 1960s and 1970s housing estates of Thornbury, there is an area of public space running parallel to Morton Way. The stream that runs through this pleasant, wooded space flows northwards (i.e., from the Grovesend Road area to Crossways Road) but issues initially from a grilled concrete pipe located between the houses of Malvern Drive and those of Chiltern Park. This has the appearance of a modern culvert and the modern surface water drains from some of the adjacent houses are likely to be connected into this and contributing to its flow, but the source is a spring shown on the 25" Ordnance survey maps dating from before the modern estates were built (Ordnance Survey, 1880b)

This area was previously known as Sibland, having been a medieval settlement, and the spring is located at the rear of Eastend Farm. The Thornbury Tithe Map (Sturge, 1839) shows the spring, though not labelled, and a connected pond further to the east at ST 6493 8962 which appears to flow towards the spring, suggesting more than one spring at this location.



Figure 5. *St Arilds Well/Spring.*

Photo: © D Hardwick.

St. Arild's Well (ST 6175 9030)

This is also a natural water source where a cistern has been constructed to allow water collection, at Kington. The name is linked to the parish church at nearby Oldbury on Severn dedicated to its patron St. Arilda, a martyred virgin details of whom were given by the 16th century traveller and writer John Leland, (Toulmin-Smith, 1907-13). The legend that gives rise

to the naming of the spring is that the virtuous maiden Arild(a) refused the advances of Muncius, (three times according to the hymn telling her story) and as a result this tyrant had her beheaded. At the spot where her blood fell a spring arose which is said to flow red with her blood and has never dried up.

The red colour has been suggested as being due to red stones found in the stream bed and alternatively due to the freshwater alga *Hildebrandia rivularis* which grows there. (Bradshaw, 1998) From a speleological perspective the purity of the water could suggest a source from deep underground rather than one contaminated with surface run off and the oral tradition that it flows, even in the driest summers, also supports a source not solely dependent on local rainfall. In periods of excessive rainfall, even to the extent that Oldbury on Severn has been cut off by flood water, the stream has been observed to have the same constant trickle of water all year round.

Oldbury Power Station (ST 5992 9523)

When the Magnox Nuclear Power Station at Oldbury was completed in 1967, the design included cooling ponds built out into the Severn estuary. It was said by Clive Grace (*pers. comm.*) that it was (and presumably still is) possible to “get a drink of fresh water” in amongst the surrounding salt water where the cooling ponds are. It is to this location that he claimed that he and his father had dye tested the water sinking at the Hope Farm Whirly Hole (see above).

Ordnance Survey plans of the riverbed dated before the cooling ponds were constructed show an area of rock which would have been exposed at low tide and within this is an area of water called “Horse Pool” (Ordnance Survey, 1881e). It is tempting to assume this is so named as it was a place for watering horses and therefore a source of fresh water although it has not been possible to confirm the origin of this name.

The Severn Great Spring

In October 1879 during the construction of Severn Railway Tunnel work was significantly delayed when the Great Spring was spectacularly discovered and flooded the works. The spring broke in again in October 1884 with even more force and again necessitated the services of diver Alexander Lambert. Initially estimated at having a flow of over 20 million gallons per day this freshwater spring is still pumped with nearly 14 million gallons of water taken out per day (Railnews, 2008). A flooded natural fissure in the rock had been broken into which, when the water was subsequently pumped away revealed a significant void. This is described by the tunnels civil engineer who was contracted for the works, Thomas A. Walker, in his book about the construction of the tunnel:

“On opening out the full-sized tunnel, the fissure through which the Great Spring had passed was found to follow a most erratic course. In one place it passed directly across the tunnel from side to side, nearly at right angles to the center line of the work. At another place it passed from side to side in an oblique direction, running for some distance directly under one of the side walls.”

(Walker, 1888 p.152)

It is evident that the water is rising from depth as it was under pressure and Walker goes on to describe this as follows:

“At another point the water boiled up from a whole 18 feet [6 m.] in depth with such force that stones the size of a man’s fist, dropped into the water would descend about 10 feet [3m] and then began to flutter like a leaf in the wind, and then be thrown up again by the water.”

(Walker, 1888 p152)

It was assumed at the time that the source of the water was the Neddern [sic] Brook on the Welsh side of the river with attempts made by the Chief Engineer Sir John Hawkshaw to concrete the river base. The Nedern Brook was however, discredited as a main source for the Great Spring by Carpmael (1932) due to the clarity of the water. The source of the Great Spring was also considered in the study carried out in the 1960s (Drew, Newson, and Smith, 1970). This confirmed the Cas Troggy sink (ST 459 928) as a feeder into the Great Spring and that 75% of the flow was percolation water. Drew *et al* concluded that there was a three week delay between the local rainfall and the corresponding flows in the great spring and also that “.. 20 km². on the Welsh side of the Severn (probably the whole of the limestone outcrop west of the Moun-ton Brook) could be the catchment for the great spring.” No consideration was given at the time to the limestone on the East (English) side of the Severn possibly contributing nor was it known at that time that a significant proportion of the area which they considered feeds into the Otter Hole streamway as that system was not entered until 1974 (Elliott, Westlake, and Tringham, 1979; Hardwick, 2013).

The dye trace from the Cas Troggy sink to the Great Spring was repeated with a positive result by Clark and Aldous (1987) (cited in Yusoff and Rahim, 2008). In their modelling of the ground water feeding into the Great Spring Yusoff and Rahim (2008) also focus only on the Welsh side of the River Severn. The Otter Hole catchment area is recognised and their conclusion includes that the Nadern [sic] Fault has a significant influence in bringing the water to the spring.

Other Bristol Channel Springs

It has been reported that when dredging sand in the Bristol Channel in the vicinity of Flat Holm and Steep Holm, the salinity and the hardness of the water is lower than might be expected and that it reduces towards the riverbed. The Bristol Channel is tidal and although fed by both the River Wye and River Severn further upstream at this point it is primarily saltwater. Sand dredged in such conditions would normally be expected to have a high salt content but from here it is said to require no treatment to remove excess natural salt.

This occurrence was mentioned by Drew, Newson and Smith (1970) who suggested it was “evidence of a Severn-orientated karst system for fresh water” although they also indicated that it was “.. not however suggested that this is connected to the Great Spring”. They also comment that “submarine springs are common in the karst areas of Yugoslavia and Greece” citing Mistardis (1965).

Other Springs

Consideration of historic maps in the area, particularly on the inner slopes of the basin formed by the limestone horseshoe, has identified the commencement of numerous water-courses. Many of these will be simply the highest point of agricultural ditches fed by percolation water from surrounding fields. Others however will be springs emerging from the limestone. Owing to the seasonal nature of any flow and the lowering of the water table by quarrying it is impossible to determine which are of geological interest and it is not possible to

describe all such features here. Some of these are however included in the Gazetteer available online. Three that merit further consideration are described below.

The 1st Edition 25" Ordnance Survey plan (Ordnance Survey, 1880c) shows a stream running alongside Priestwood Lane, Cromhall. This starts at ST 68320 89740 but may have originally come from the adjacent pools (ST 68305 89720 and ST 68270 89680), now filled. In wet weather this stream has been seen to flow and flood the adjacent road. The stream goes beneath the road, (ST 68470 89630) and in 1881 followed a field boundary before entering what appears to be a culverted section at ST 68545 89775 then rising again at ST 68675 89920 to flow into the Cromhall Brook. The significance here is that this culverted section runs alongside a Roman Villa (ST 68565 89702) and is likely to have been its water source.

The Cromhall Brook flows into the man-made Tortworth Lake which is surrounded by limestone cliff faces, including Lovers Leap with its associated romantic story. There are also rumours of small caves (Grudgings, *pers comm.*). The land is however in private ownership and has not been investigated for this study. Historic references to the Cromhall Hermit indicate his "cell" was near the lake at Anchorite Hill, although whether there was a cave associated with this is not clear. Wicks (2014) suggests the cell may have been near Ankers well, (ST 69330 91430) shown on the 1st Edition OS map (Ordnance Survey, 1880a) with an additional spring (ST 69335 91435) shown on the 1921 edition (Ordnance Survey, 1921a). The location is close to the foot of the limestone cliffs at the South end of Tortworth Lake.

On the Eastern side of the study area a stream is shown on 1st series OS Map (Ordnance Survey, 1882) as starting at ST 71420 87395 alongside Frith Lane. This is another stream which is said to flow even in the driest periods (Isaac, *pers comm.*).

COLLAPSES

Forty Acre Farm – collapse (ST 6394 8718)

In the paper on the swallet on the north side of Forty Acre Lane (Clarke and Levitan, 1987) reference is made to "... a collapse near Forty Acre Farm, which occurred during the wet Christmas of 1985". The location of this is shown on their accompanying map (Approx. Grid Ref ST 6394 8718). This site was on agricultural land, so was backfilled by the farmer. During initial research other farmers also indicated that depressions had occurred in fields and had been similarly back filled due to the need to use the land.

The Lodge – collapse (ST634873)

Clarke and Levitan (1987) also refer to a further collapse that occurred "at The Lodge on Forty Acres [sic] Lane in 1978". The exact location of this has not been identified but since the house has not been rebuilt is assumed to be in the garden. The Lodge is at the start of the drive to the property now known as The Manor House approximately halfway between Forty Acre Lane Swallet and Fishmonger's Swallet. It lies on the same geological boundary and therefore may potentially be the site of another swallet although the only information available is of a collapse occurring. A further possible site between The Lodge and Fishmonger's Swallet was noted where water was seen to collect at an area of fill including a partially buried cast iron bath. This was initially named "Bath Water" Sink (ST 6335 8725) but has since been excavated with a mini digger by the land's new owner, Hades CC member Chris Mealing (*pers comm.*), and no evidence of cave development was found.

The “Hollows” (ST6370 8745)

The location plan in Clarke and Levitan (1987) also includes the word “Hollows” in the field between the lane and the swallet. These are very notable as shadows on the aerial photographs taken by the RAF just after the second world war (RAF, 1946). Local historian Roland Harley recalled these being filled in “the late 1970s” (Harley, *pers comm.*) which matches the comment by Clarke and Levitan that two depressions “in the adjacent field” were filled in September 1979 (Clarke and Levitan, 1987, p.129). A further minor collapse occurred in the winter of 1999/2000 in this field and a depression is still evident (approx. location shown on Figure 3.)



Figure 6. RAF Aerial photograph taken 30 Dec 1946 showing hollows before they were filled.
From frame 4012 of film CPE/UK/1912

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In 1999 while a group of cavers were looking at the Forty Acre Lane Swallet site a lady dog walker commented “There’s another smaller one of these in the next field”, indicating the field on the north side of the swallet. The feature she mentioned has not been identified although the Forty Acre Lane Swallet is fed by two streams, the main one and a piped inlet from a small depression on the opposite side of the footpath (ST 6380 8741).

Alveston Allotment Field (ST 63324 87291 ST 63362 87263)

In 2000, as part of the geophysical investigations for the Time Team programme at Fishmonger's Swallet, two anomalies were found in the paddock north of the cave. This field is now partly divided up into Allotments. The features found during resistivity and magnetometry surveying have been described as "...large pits, possibly former swallet holes, and this interpretation was confirmed by excavation of the northernmost example" (GSB Propection, 2000).

Unfortunately, this assessment did not involve anyone with caving or geological experience and the report only became available to the author in 2020. It is unlikely that these were excavated back to natural rock given the nature of the investigations at the time. The term "swallet holes" is therefore probably inappropriately used in this context given the absence of any stream disappearing underground. It is possible that these pits were formed by surface water but if they are geological features, it is more likely they are dolines, caused by a minor collapse, which have been subsequently infilled as is the case elsewhere in the immediate vicinity.

The geophysical investigations carried out where the underlying rock is limestone shows faint linear features running approximately north-west to south-east, the same alignment as the parallel faults identified adjacent to the entrance to Fishmonger's Swallet (see Tringham, 2022) and are likely to be similar features.

New Lane - Landfill (ST 64305 88185)

Local accounts refer to a large depression on the east side of New Lane in Alveston. An elongated depression is marked on the OS maps on the south side of a small track which may be this feature. It is said to have been progressively filled with rubbish over several years and was sufficiently large that one of the items disposed of was a Model T Ford. Geological maps show this as being also on carboniferous Limestone but not on the transition line from mudstone as the other "whirly holes" and no evidence has been found to suggest that it ever took a stream. It is possible that this is a collapse feature although it could also simply be a small local quarry for which no records have been found.

KNOWN PASSAGES AND UNDERGROUND VOIDS

Alveston Bone Fissure (ST 6144 8503)

This feature was 100 m north-west of the A38 in a former quarry located almost directly opposite the entrance to the Woodhouse Park Activity Centre, (Scout campsite), Fernhill. The whole of the quarry was filled in April 1963 (Taylor, 1973).

Before the site was lost several investigations were carried out by UBSS and a large quantity of Pleistocene faunal material was obtained. The final excavation was cut short by the unexpected filling of the site. The material was reported on by Taylor (1973) and is conserved in the Society's museum under the catalogue code G2.

There has been a degree of confusion as to the naming of this site. Davy (1933) described the site as "near Almondsbury" but did not name it. Taylor (1973) although undeniably talking about the same site, used the name given here, but their NGR, also that used here, places it much closer to Almondsbury than Alveston. The site was earlier correctly identified by Gilbert (1961) as being in the parish of Olveston. The similarity of village names may be the cause of Taylor's misnaming. Confusion regarding the name is compounded further by the producers of the *Time Team* episode made at Fishmonger's Swallet, which is located in Alveston, calling that episode "The Bone Cave". Other sources record the site as the "bone

fissure at Almondsbury” (Houston, 1961) and the “Almondsbury Bone Fissure” (Savage, 1969, Donovan 1954/1964 cited in Hawkins and Tratman 1977),

Taylor (1973) briefly described the nature of the site. He concluded that the site was a remnant of an ancient cave system, identifying a filled phreatic pipe heading west-north-west, towards the River Severn, with both stalagmite deposits and deep basal silt. He concluded that the cave became open to the surface due to rock falls which allowed bones to enter from the surface before being infilled with interglacial and post glacial deposits. It was subsequently reopened by lead miners and the deposit was described as badly disturbed by mining (Houston, 1961).

Fishmonger’s Swallet (ST 63315 87200)

Almost certainly at the site of one of the whirly holes described by the Alveston Naturalist (Knapp, 1828) and identified as such by Alveston WI (1957) and by Clarke and Levitan (1987), it is at this location a dig by Clive Grace (the Fishmonger) cleared a water fluted shaft to enter a small chamber in the late 1970s/early 1980s. The cave has since been extended to its current length of 96 m and depth of 24 m mainly by members of the Hades Caving Club who broke through into the first of the three additional chambers in 1997 (Hardwick, 1997; Hardwick, 2022). In the first chamber, Bone Idle Chamber, a significant number of bones have been found, including human remains. These have been dated to the late Iron Age (Bricking, Horton, Mullan and Peto, 2022; Horton, 2022; Cox and Loe, 2022; Bricking, Hayes, and Madgwick, 2022; Peto, Mulville and Best, 2022).

The swallet hole is at the point of a cross junction of several vertical faults. The cave is initially in Clifton Down Limestone, but it is thought that the current end extends below a band of Cromhall Sandstone (Tringham, 2022). The chambers trend north-eastwards, towards the Forty Acre Lane Swallet and it had been assumed that the stream encountered at the end of the Mudlands is the stream coming from there. The unexpected discovery that this water rises from below suggests this is an overspill in wet weather from a source lower down. The nature of this source has yet to be determined.

Forty Acre Lane Swallet (ST 6375 8753)

The original report on this site (Clarke and Levitan, 1987) refers to it as ‘the Swallet’. The term Forty Acre Lane Swallet was adopted by caves digging Fishmongers Swallet to differentiate the two locations as the Lane itself is about the same distance from both. The “Gazetteer of Caves, Fissures and Rock Shelters in Britain Containing Human Remains” (Chamberlain, n.d.) uses the name Forty Acre Lane Swallow Hole.

The site was dug from 1977 to 1982 by Alan Clarke and his team of diggers. No survey has been published although the description indicates a shaft was sunk to a depth of 6 m, taken from the base of the initial rock face they were digging against which is approximately 2 m high. At the base of this shaft, which they divided by a wall to aid access and provide space for dug spoil, they followed a narrow rift sloping downwards for a further 6 m southwards, this being an eroded joint heading back under the stream bed. Reference is made to a bedding plane above this and to a vertical slot on the west side of the shaft. At one point they holed through to a separate rift.

The location of the dig is described as “at the eroded intersection of two vertical joints meeting at about 60°”. The material dug was a mixture of clay and broken stone including a firm compact yellow clay considered to be an older deposit. Their final session exposed what was described as “honeycombed, rotten rock”. Other than commenting that the mud included fragments of Cromhall sandstone no analysis of the rock types is given.

It appears from the description that the dig filled with water in the winter months was partly owing to the clay they had excavated blocking narrow gaps through which the water percolated.

One hundred and sixty-five bones and bone fragments were discovered along with parts of a glass bottle described as “typical of the period 1670-1710”. The bones were “heavily stained and often eroded” apart from those of a rabbit which were considered to be modern intrusions. The bones were described in detail by Levitan (Clarke and Levitan, 1987).

Briarlands Borehole (Approx. ST6310 8695)

When the agricultural buildings that now form the Briarlands Office Park were being developed in the 1990s, the landowner at the time, Patrick Pinker, sunk a borehole to provide a private water supply. As this was being drilled the rods suddenly dropped “about 6 ft” having evidently hit a void. This apparently happened on more than one occasion (Pinker, *pers. comm.*). At the time this information was noted, the exact location of the bore hole was not stated but the site is adjacent to the Black & White Garage Sink (*vide supra*).

Tytherington Tunnel and other quarry caves

Local stories exist about a cave “several miles long”, being broken into when the railway tunnel at Tytherington was excavated. The tunnel is part of the Thornbury branch line, which opened as far as Tytherington in 1869 but was not fully opened to Thornbury until 2nd September 1872, because of the need to construct two tunnels the longer of which is the Tytherington Tunnel (Maggs, 2002).

Lloyd Morgan (1889) gives a more feasible report of a passage being discovered that was two or three hundred feet in length. The entrance to this was slightly beyond the tunnel when heading towards Thornbury, and it was on the south side of the cutting where the entrance has been walled up. A section of walling with typical large railway style masonry is the most likely place (ST664 888). The section provided by Lloyd Morgan (Figure 7) is drawn along the line of the railway, looking south, and indicates that this is at the point where the cutting meets what he calls the Lower Limestones (also labelled Black Rock). The cave is described as “a great cavern, or underground watercourse, that dipped down southwards.” When inspected during a guided quarry tour a pocket of dog tooth spar was identified near to the stone walling suggesting there may have been some hydrothermal activity involved in its formation.

The same article also mentions a “small hollow, about 7 feet deep by 3½ wide” that had been broken into on the opposite side of the line and a larger cavity, 20 or 25 ft long, at “Mr Hardwicke’s” quarry. At this date Castle Quarry southwest of the tunnel was being worked although Lloyd Morgan described it as being “in the oolitic limestone”.

Small quarry caves have been discovered periodically in Tytherington Quarry and Cromhall (Slickstones) Quarry by the quarrymen during their excavations. Before he died, former quarryman and local historian, Ambrose Johnson, gave several interviews regarding his experiences at the quarry and confirmed that voids in the limestone were often encountered. At a time when liquid nitroglycerine was being used in the quarry as the explosive it was Ambrose’s job to inspect any voids, “otherwise the men would keep on pouring it in until we had enough to send a rock the size of a Land Rover to land onto Thornbury High Street” (Johnson A., *pers comm.*). Many of the caves found were in the form of rifts filled with

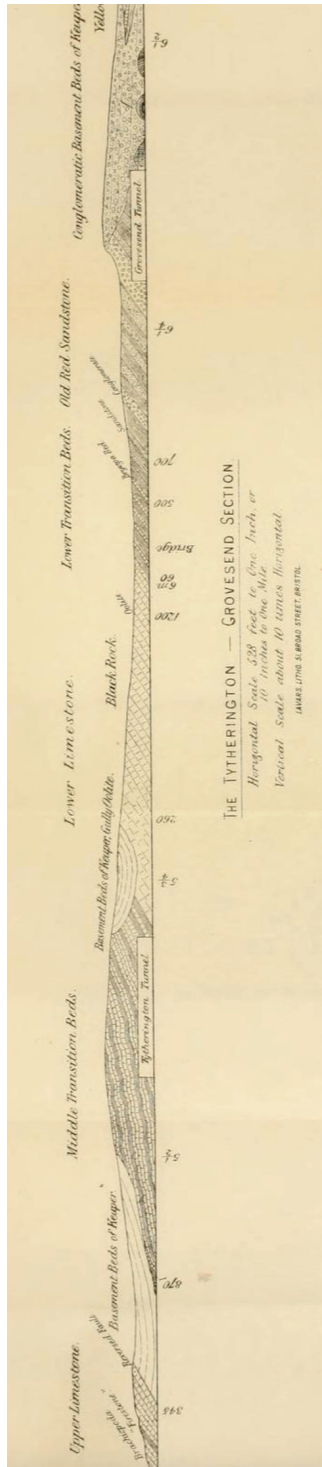


Figure 7. Section through Tyttherington Tunnel Section. From Lloyd Morgan, 1889.

Triassic period marl referred to by older quarry men as “muck joints” (Johnson H., *pers comm.*). These are discussed in various articles e.g. Cromhall (Fraser and Walkden, 1983, 1993) and Tytherington (Marshall and Whiteside, 1980).

One of the reasons for the numerous references to these locations is the discovery of dinosaur bones in these deposits in the quarries at both Tytherington and Cromhall. The most well-known is the “Bristol Dinosaur” (*Thecodontosaurus antiquus*) after the bones of a similar dinosaur were discovered in 1834 on Durdham Downs in Bristol. Those bones were however destroyed during the second world war when Bristol Museum was bombed making the discovery of similar fossils in Tytherington in the 1970’s particularly significant. At the time most of the quarry’s output was going towards the construction of the M5 motorway and there was pressure to produce as much aggregate as possible. It was Ambrose who had initially identified the significance of the bones and a large pile “big enough to fill a skip” was put aside but unfortunately the message that these were not to go through the crusher was not passed to the next shift and only a small amount was saved (Johnson A., *pers comm.*). A similar fate met a fossilised tree found in Quartzite Quarry Cromhall (Mitchelmore, *pers comm.*). In the Cromhall Quarry at Slickstones, fossilised bones were first identified in 1938. The most abundant remains are from sphenodontids, particularly *Clevosaurus* but finds also include *Kuehneosaurus*, a gliding reptile; a Theropod dinosaur; a crocodile, and the oldest pterosaur remains in Britain. A carnivorous dinosaur, *Agnosphitys cromhallensis*, was named after the village.

The main fissure at Cromhall Quarry has been suggested as being formed by hydrothermal activity (Simms, 1990a, 1990b).

Passage off Leyhill Quarry

Another alleged discovery of a cave which “went for miles” is at Cromhall on the north side of the road from Cromhall to Leyhill. Before the limestone quarry at this location was backfilled, a rift passage heading north had been broken into. Unlike the filled rifts in the near-by Slickstones Quarry this one was apparently open. According to a former quarry manager of the Wickwar and Quartzite quarries the passage headed “towards Woodend Farm” (Marklove, *pers comm.*). No other detail of it, nor any recollections of anyone known to have explored it have come to light.

Wickwar and Chipping Sodbury Quarries

The active quarries on the eastern side of the outcrop also periodically show examples of mineralization as cave infill, rich in crystals of various types. This is also likely to be associated with hydrothermal activity. These are discussed in detail by Starkey (2018) who comments: “The size of some of the cavities is truly impressive and on occasions, spectacular...” (p. 172). Regular field meetings by the Russell Society reported particularly good exposures between 1884 and 1887, but as is the nature of quarrying, these were worked through. The three types of mineralization identified by Stanley *et al* (1996), included consideration of cave floor chemical sediments, formations in solutional cavities and deposits that were vertical vein and joint filling. An example of the small caves being found in these quarries was reported in *Descent* magazine (Harding and Richards, 2003).



Figure 8. *Void in Hamsptead Quarry Chipping Sodbury with Barium Rich Celestine August 2003*
Photo © Chris Finch.

DISCUSSION

The area under consideration does not appear as a classic karst landscape even though most of the features associated with one have been identified. The reason for this is at least partly that the land has historically been extensively used for agriculture with fields and hedges rather than open moorland as is often the case on limestone regions at higher altitude. Collapses that occur have largely been filled and swallets adapted to take field drainage with some having also been filled in.

The area is heavily faulted with most of the features being primarily aligned with the rifts and fractures in the rock. It is clear that different periods of both development and infilling have occurred. Lead-ore was deposited in veins which have been mined throughout the study area, but these workings appears to be generally of a small scale and short lived (Hardwick, 2004). Hydrothermal activity also appears to be a factor, probably both in the formation of voids and in the crystallisation of the various minerals. Infilling including during the Triassic period resulted in formerly open rifts being filled with deposits some containing dinosaur bones and other fossils. Later infilling such as at the Alveston Bone Fissure during the Eemian interglacial period has resulted in bones from that period also being found.

There are major structural faults running southwest to northeast but also other fractures running perpendicular to these. In the Alveston area, where water coming from the later mudstones has followed these lines, this has resulted in either cutting into the limestone or possibly washing out infill to create a descending channel. Both the active swallets that have been dug, sink at the point where there is a cross rift. The Forty Acre Lane Swallet remained as narrow slots rather than opening out as might be expected with the usual crowning out of a collapse feature to create a doline. The description of the whirly holes as being 'frightful chasms' in the past could be indicative of these once being deeper slot features which have since become wider but shallower, as the sides have fallen in and the base filled up.

The lack of a large resurgence implies there is no active streamway running below the landscape and this is supported by the only underground stream found so far being an overflow for water rising from a lower level. There are also numerous voids which have been discovered both from surface collapses that have occurred and when drilling bore holes. This implies a solutional process is taking place with the evidence at Fishmonger's Swallet of water rising and flooding the lower parts in winter and then draining away possibly being matched at Forty Acre Lane Swallet where winter pooling of water prevented excavation, except during the summer months.

Historic surface springs have been identified although the majority of these are no longer active. The reason for this, for much of the area, may be the lowering of the water table by the extraction of large amounts of limestone from the local quarries. This implies that these are not the primary outlets for the water but merely overspills, with most of the catchment going elsewhere. The difficulty, however, is ascertaining where it goes.

The existence of fresh water springs in the River Severn at Oldbury on Severn and further southwest in the Bristol Channel near Steep Holm and Flat Holm, could give one possible solution. The strata of the area includes various layers of sandstone so it is possible for there to be an enclosed aquifer under a capping layer. The discovery of a water filled rift with water rising under pressure during the construction of the Severn Tunnel may be evidence that this is occurring and although the catchment for that spring has been shown to be, at least in part, from the Welsh side of the river (Drew, *et al*, 1970) it is not unreasonable to consider whether the other fresh water springs in the river might be fed from the east.

There is evidence of hydrothermal activity in the formation of some of the quarry caves of Tytherington and Cromhall and the deposition of minerals particularly in Hampstead Farm Quarry in Chipping Sodbury. It is becoming clear (see, for example, Smart and McArdle, 2019) that many more caves might share a hydrothermal origin. Such caves tend only to be discovered when surface lowering, by erosion or by quarrying, breaks into them.

This paper has set out to identify the speleological features in the area considered and in doing so has identified a landscape which merits further investigation. The lack of clarity over the hydrology of the area is one particular aspect of this.

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investigate sites, in particular Jack Randell, Andy Brander and the late Richard Gledhill. Local quarry managers have allowed several visits to look at ever-changing discoveries in both Tytherington and Cromhall quarries, significantly enhancing the understanding of the local geology. Particular acknowledgement of the role of the Fishmonger, Clive Grace, in supporting and feeding the author’s enthusiasm for this subject is warranted as without this little would have been achieved. The author is also especially grateful to Dr. Tony Boycott for his assistance in tracking down numerous references, particularly some of the more obscure ones which were, to say the least, “a challenge”.

GAZETTEER

A gazetteer has been compiled which gives details of all the identified sites of interest in the area. These main ones are shown in the map in Figure 9, below, and the document may be found online at https://ubss.org.uk/resources/procsupplement/29_2_193-217.xlsx. See also <https://tinyurl.com/ya88vyez>

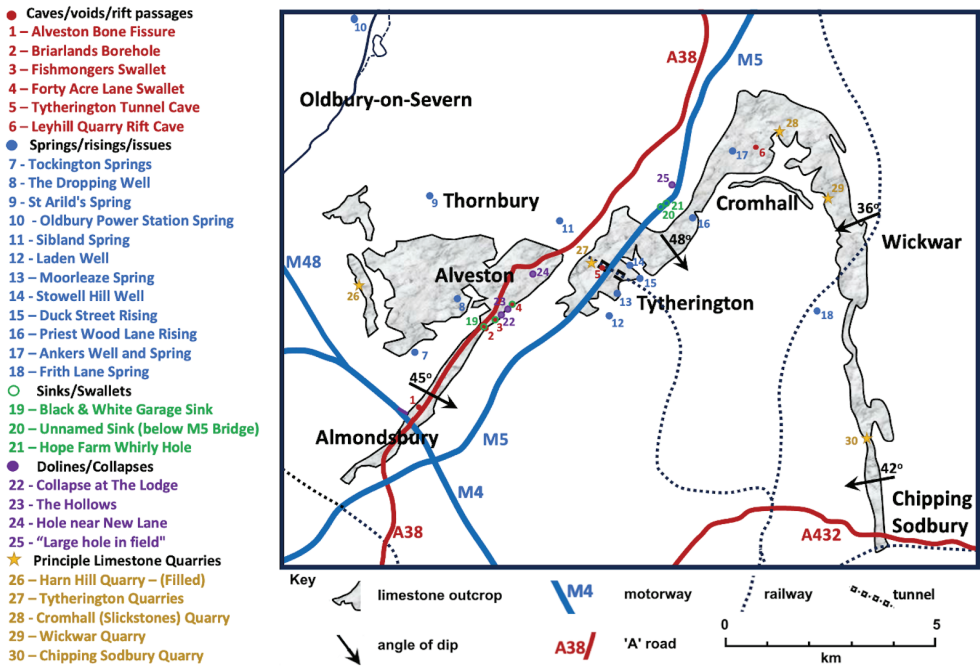


Figure 9. Location plan showing the main sites of the North Bristol Outcrop.

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