# A SUB-TIDAL WATER CISTERN AT CHEPSTOW CASTLE

**by Rick Turner**

Cadw: Welsh Historic Monuments, Cathays Park, Cardiff CF10 3NQ, UK.

*This paper describes a limited excavation and recording of a stone water cistern at the base of the limestone cliff below the Great Tower of Chepstow Castle, Monmouthshire. The surviving stone structure is set into the estuarine silts below high water mark and was built to capture a vigorous fresh water spring, which emerges at the foot of the cliff. Originally the cistern must have risen well above the high water mark to allow uncontaminated fresh water to be raised to the castle above. This beautifully made stone structure probably dates to the early 13th century.*

## INTRODUCTION

Chepstow Castle stands proudly on the limestone cliff that forms the west bank of the estuary of the River Wye, controlling the lowest bridging point into south Wales (Figure 1). First established by William fitz Osbern, earl of Hereford, immediately after the Norman Conquest, the castle has had a long and complicated history (Turner 2002).

Over the past four years Cadw has undertaken an intensive study of the castle: recording and analysing the fabric of the buildings (Avent 2002), analysing and sourcing the building stone (John Allen in progress), doing dendrochronological analysis of the surviving doors (Miles and Worthington 1998), and collating the very extensive documentary record (Stephen Priestley in progress). All this has led to a radical re-interpretation of the history of the castle's construction and the functions of its different parts (Turner 2002).

This paper will describe one aspect of this research, the supply of fresh water. The castle stands on a cliff of Carboniferous limestone, rising

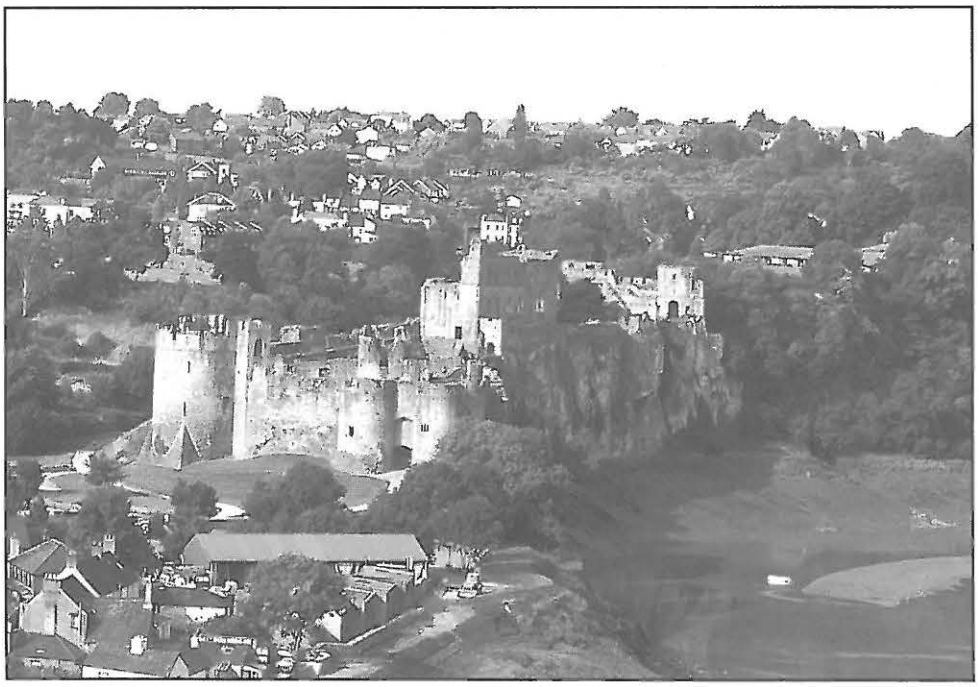

*Figure 1: Distant view of Chepstow Castle.*

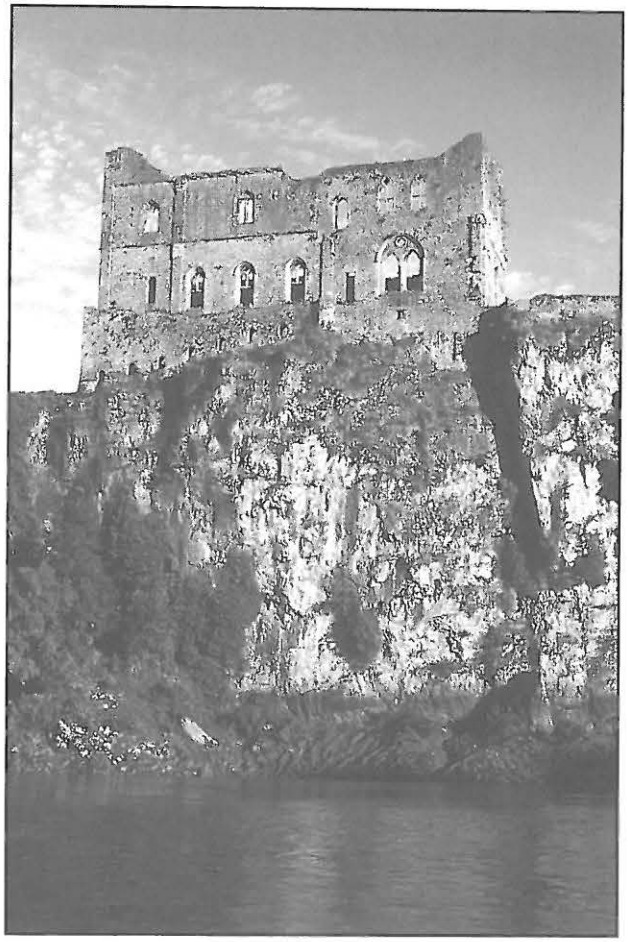

*Figure 2: The Great Tower on the cliff.*

up to 30 m above the river, which contains a number of natural fissures and small caves (Figure 2). The site is therefore very free draining and the only well is in the Lower Bailey just outside the entrance to Marten's Tower. Here the water level is 23 m below the surface. The Lower Bailey was added to the castle by William Marshal at the end of the 12th century (Avent 2002), so the problem remains of how the earlier castle was supplied with water? Lack of water was the greatest threat to the defenders of a castle facing a siege.

The Norman Castle was dominated by the Great Tower, which stands on the highest part of the promontory, which forms the cliff (Figure 3). The lower courses of the curtain wall of the Upper Bailey contain similar stonework to the Great Tower, implying that it too was part of the Norman Castle and some eastern defences, perhaps in wood, may have been needed to protect the approach to the tower. There is no evidence for a well or cistern to trap rainwater in this part of the castle.

## THE DISCOVERY OF THE CISTERN

The survival of a well-like structure at the base of the cliff below the north-west corner of the Great Tower has been known for around a century. It can be seen from high vantage points in the castle and from across the river as a nearly complete circle of well-dressed stones poking out of the top of the inter-tidal mud. The site has been investigated on two previous occasions.

The first excavation of the cistern formed part of a bigger and quite bizarre campaign of work within the river below Chepstow Castle. This was led by Dr Orville Owen of Detroit, Michigan, in partnership with Dr Prescott of Boston. Dr Owen had undertaken a long study of Shakespeare's plays and works by other Elizabethan dramatists and poets such as Christopher Marlowe and Sir Philip Sidney. He believed that all these works were written by Sir Francis Bacon, whom he argued was an illegitimate child of Queen Elizabeth I and Robert Dudley, earl of Leicester. Claiming some spiritual guidance from Sir Francis Bacon himself, Dr Owen believed that the plays and other poetic works contained a cipher. He developed a machine on which all the texts were cut up and pasted onto a 1000 ft (300 m) length of calico, which could be rotated to throw up juxtapositions of letters and words giving Bacon's true message. The publication of the decodings of this cipher was eventually to fill five volumes (see for example Owen 1893 and 1894).

To cut a long story short, one reading of the cipher led Drs Owen and Prescott to come to Chepstow in September 1909. Somewhere in the river below the castle, they believed that they would find the original manuscripts of Shakespeare's plays hidden in a cave in 66 lead-lined, iron-bound boxes sealed within a masonry and concrete chamber. The Duke of Beaufort (owner of the castle and the riparian rights) employed a local engineer, Fred Hammond, to oversee the proceedings, ensure that no damage came to the castle and make plans of the excavations. After working in a cave below the castle Dr Owen's workforce seem to have

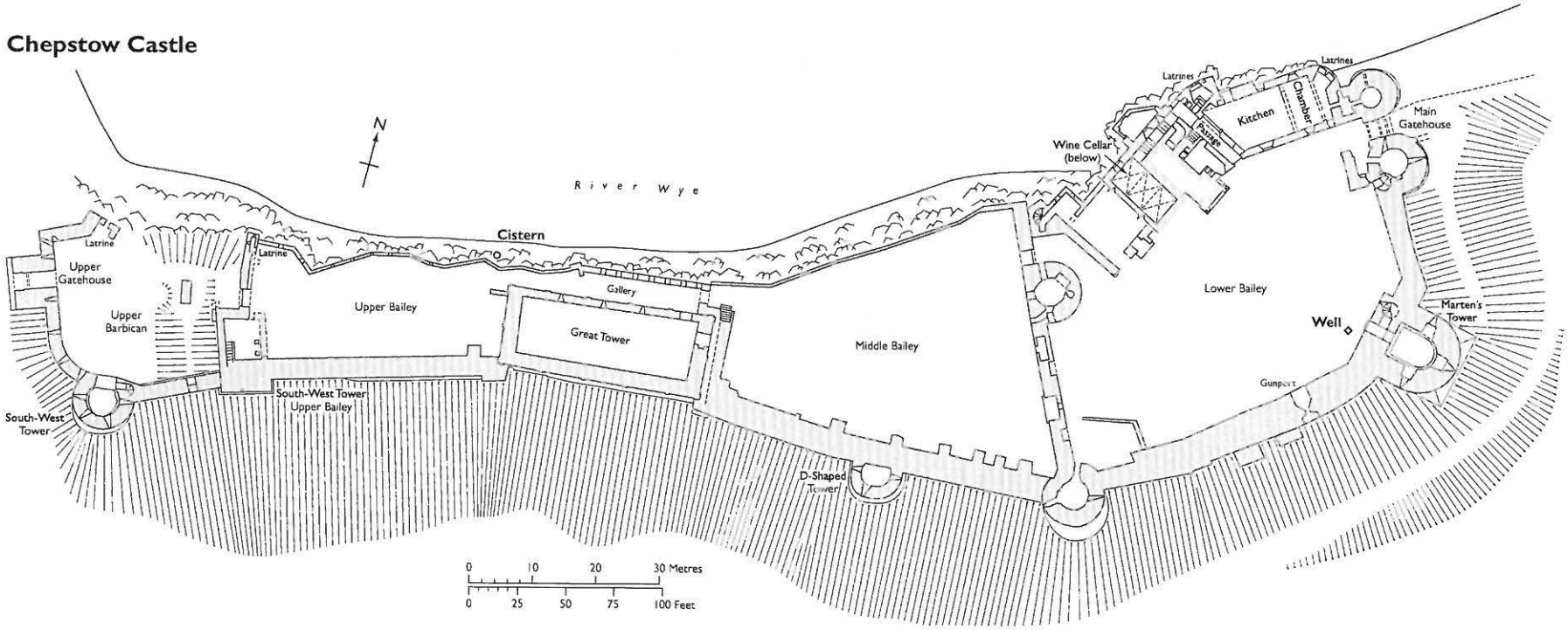


*Figure 3: The plan of Chepstow Castle (P Lawrence).*

excavated out the cistern. Two of Hammond's photographs survive at Chepstow Museum (Acc. Nos CH/1968-40(39-40)). The first shows the top of the excavated cistern shaft with a complete ring of inner ashlar stones at the level of the top of the inter-tidal mud. The second shows that the outside of the ring of ashlar stones was excavated out of the mud for at least six courses. There is an indication that the top course was chamfered to form a plinth for a less massive superstructure, perhaps a narrower cylinder rising above the tidal limit. This masonry has now fallen away. Hammond's notebooks are reported to be in Newport Museum or Library but they could not be traced. These may contain a description of what was found during the emptying out of the cistern.

The second excavation was undertaken by a group of local men led by Bill Whatton, over three days in August 1998. They were able to empty out much of the interior and excavate around the outside of the masonry structure, to reveal a platform of wooden beams upon which it was constructed. The timbers were massive, tightly packed and supported on piles driven into the mud. This raft foundation extended well out from the cliff and the masonry was built directly upon it. One large outer baulk of timber had slots cut into it, which one of the excavators (Jan Cernik pers comm) felt may have held braces to give additional support to the structure. No proper record of this work was undertaken though some colour prints of the top of the stonework survive, and a single block from the cistern lining was recovered and is now in Chepstow Museum.

## THE RECORDING OF THE CISTERN

With the help of the local inshore lifeboat crew, my team of four were marooned at the base of the cliff for one favourable tide on 22 July 2001. It was a spring tide and the top of the stonework was not revealed until one and a half hours after high tide. There is a refuge above an ash tree growing out of the foot of the cliff, but access to the cistern involved quite a treacherous walk through the thick estuarine mud.

The upper course of the ashlar stonework was revealed at about 1.6 m below the high-tide mark on the cliff. The structure was filled with estuarine mud to a depth of 0.8 m and contained a short aluminium ladder and other debris from the 1998 excavation. The area around the cistern had been partly buried by angular lumps of rock that had fallen from the cliff during stabilisation works undertaken in 2000.

Only three and a half hours of excavation were undertaken. The site was arranged to leave a section running perpendicular to the cliff and the western half of the structure unexcavated (Figure 4). This allowed the estuarine mud that had accumulated since 1998 and the debris of that excavation to be removed. In the end a total of six courses of fine ashlar masonry standing 1.5 m high was revealed with a seventh course visible in the water below. Digging below that level proved impossible because of the constant flow of fresh water from the spring in the cliff which filled the cistern and ran away around its eastern side.

The structure was built within an irregular 'chimney', about 1.5 m wide and up to 0.4 m deep, cut into the face of the limestone cliff (Figure 5). This 'chimney' can be traced for at least 5.2 m above the top of the surviving ashlar stonework and could easily have continued even higher into what becomes a natural cleft in the rock. A Distomat reading suggests that the cliff face is 27 m high at this point. Within the rock-cut chimney, mortar can be seen adhering to the rockface for a height of at least 2.2 m above the top of the surviving stonework – ie above the high-tide mark – and is quite likely to have risen at least as high as the rock cutting.

The cistern has an internal diameter of 1.50 m, but the pressure of the water has caused the north-eastern quadrant to bow out, and the weight of the estuarine mud has caused the north-western quadrant to collapse inwards. The inner ring of stone is made of the finest ashlar and most blocks are made of a fine-grained, buff-brown sandstone. Each block was carefully cut to form sectors of a tightly jointed circle, with the horizontal courses varying between 0.18 and 0.39 m in height. The longest stone measured 0.68 m. The inner faces have a very fine diagonal tooling (Figure 6) and the joints are very narrow – no more than 5 mm originally – and some are packed with very thin pieces of green slate to further improve the waterproofing. The back faces of these ashlar blocks were left only roughly dressed to bond in with the outer rubble masonry.

*Figure 4: General view of the excavated site.*

Two of the blocks found during the excavation were re-used. One was fully revealed (Figure 7). It was a limestone voussoir from a large window or doorway with the outer moulding surviving on each edge but with the central mouldings chiselled away (Figure 5). The second block was of a similar type, but had had all of its mouldings cut away before re-use. Finally, the block recovered in 1998 and now in the museum also shows evidence of re-use. It is made of Old Red Sandstone and formed part of a chamfered plinth or window opening. The stonework had collapsed between the two re-used blocks allowing the fresh water to flow out, but water pressure had also blown out two blocks from the lowest course, allowing most of the water to flow out around the eastern side.

The ashlar stonework was held within a mass of limestone rubble and mortar. This was only one stone thick against the cliff face, but the mortar patches visible on the eastern part of the cliff (Figure 5) suggest that it may have been over 1 m thick as it curved around the river side of the cistern. Sockets formed by the rubblework adhering to the cliff show that the ashlar lining rose for at least three more courses originally.

Probing with a ranging pole showed that there was a soft fill to the depth of 1.2 m below the ambient water level outside the eastern part of the structure and between 1.4 and 1.6 m on the inside. Jan Cernik, one of the 1998 excavators, visited during the course of our excavation and confirmed that this was the likely depth of the wooden platform described above. He also explained that the water gushes out of a small cave whose mouth is about 0.5 m square and spills into the base of the cistern.

This elaborate and beautifully made structure was designed to capture the pure spring water gushing from the cave at the base of the cliff. The masonry would have to have risen high enough not to allow pollution by the tidal waters. This would have required a column of stonework

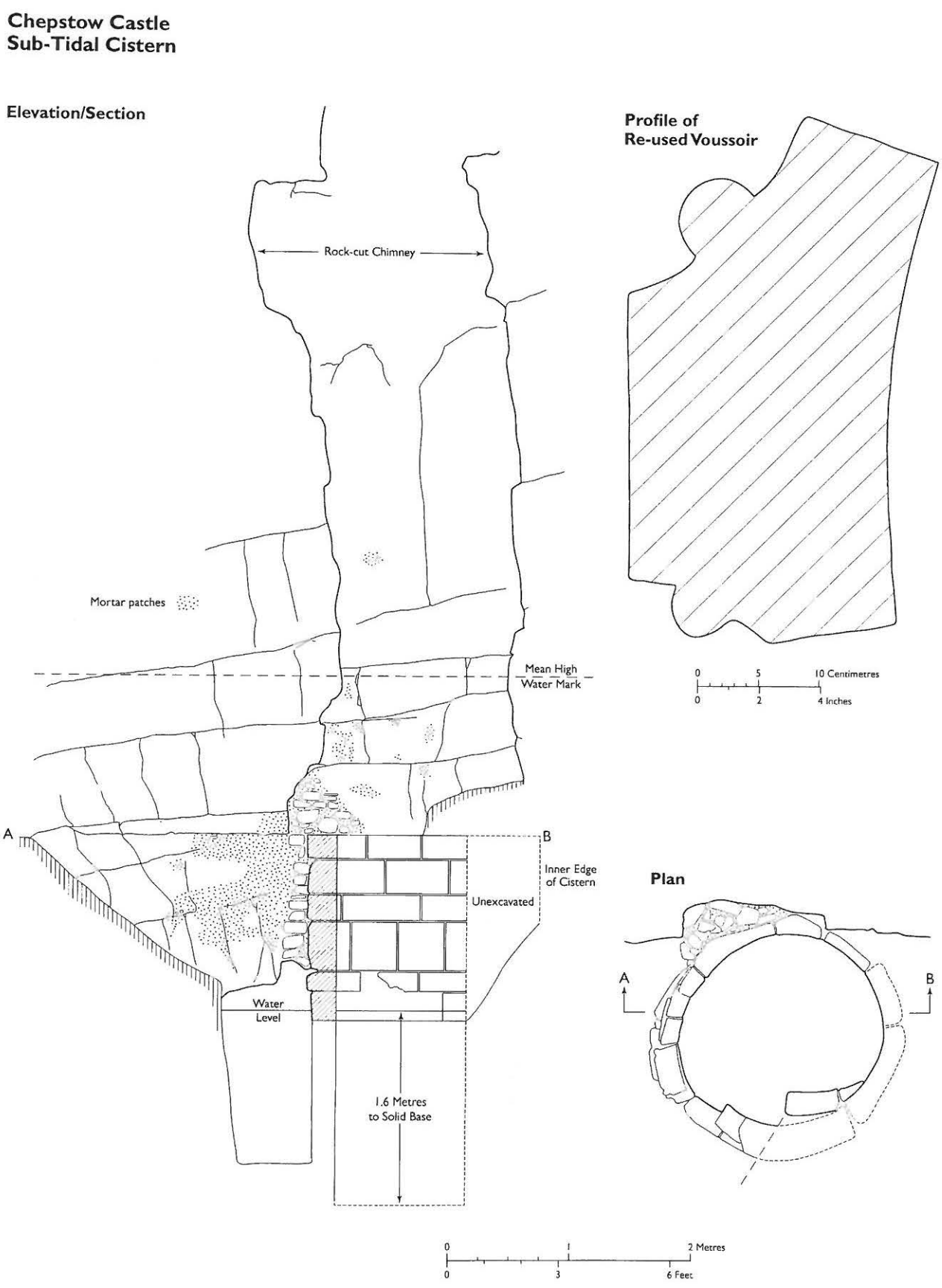


*Figure 5: Plan and elevation of the excavation (J Godbert).*

*Figure 6: Detail of the ashlar masonry.*

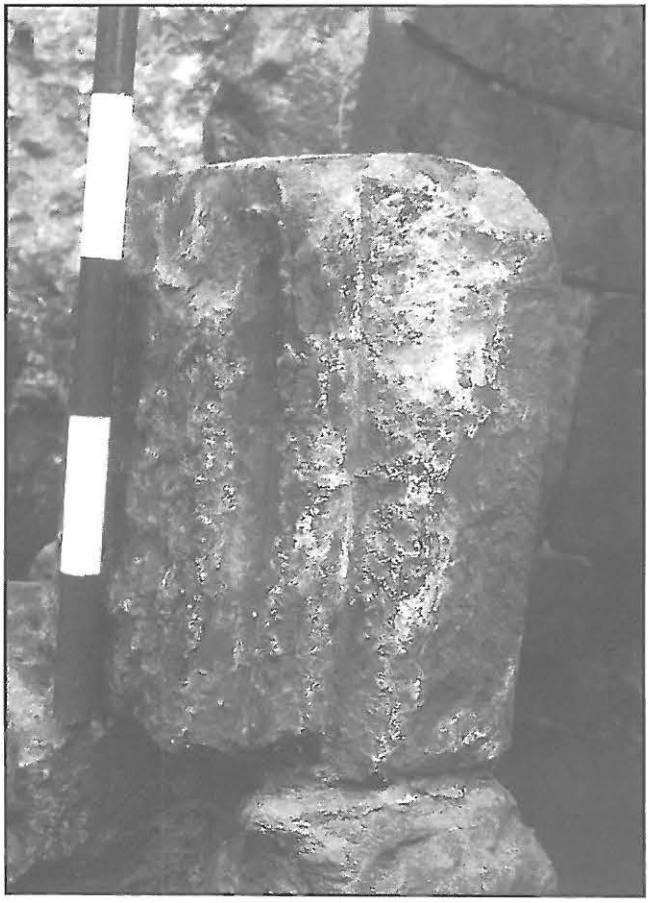

*Figure 7: Voussoir in position.*

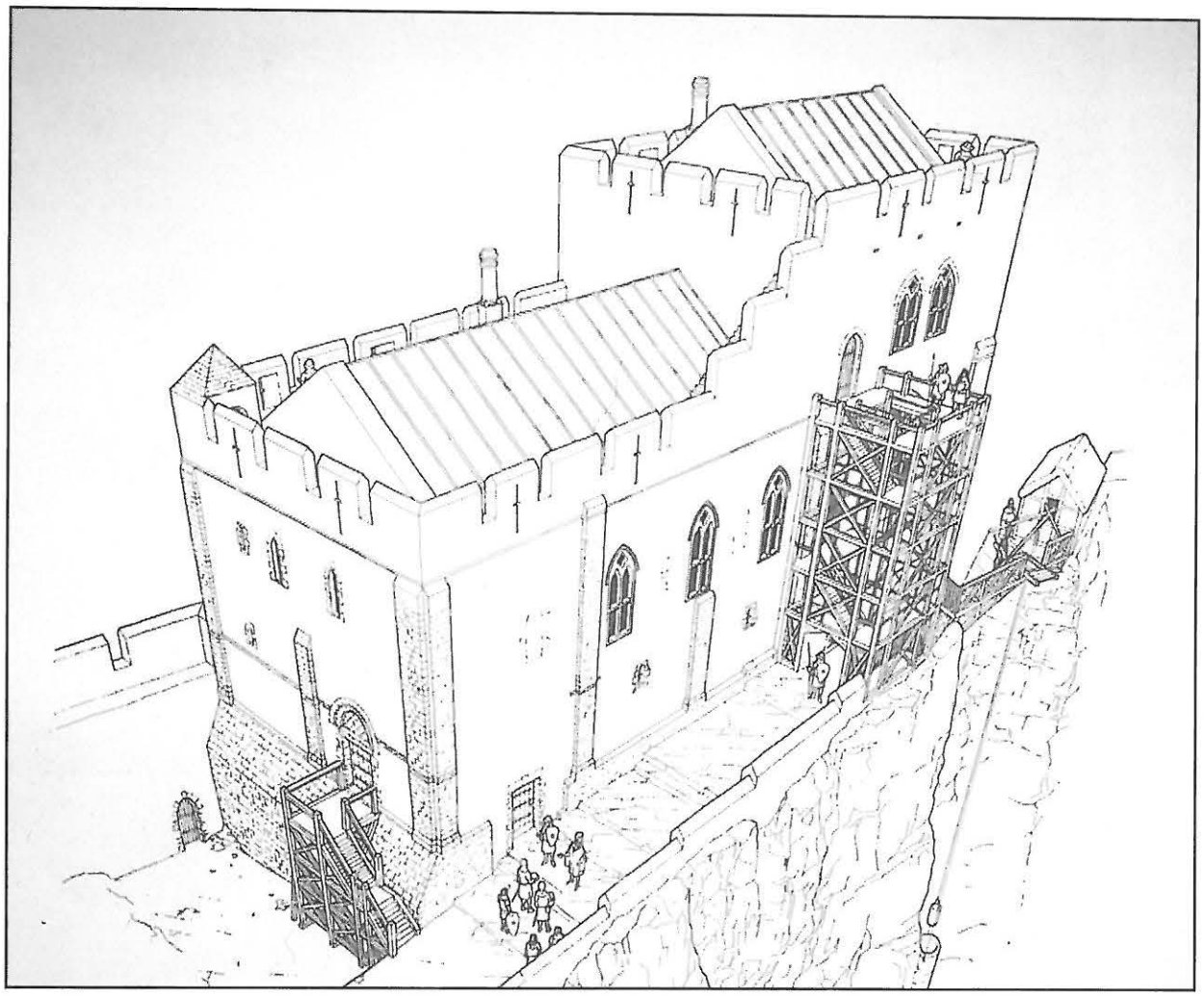

*Figure 8: Reconstruction of the second phase of the Great Tower (C Jones-Jenkins).*

at least 5 m high. If the water pressure were sufficient to fill this column then it would have contained a volume of 23.5 $m^3$, about 23.5 metric tonnes in weight. Twice a day this structure would have to withstand the tide rising and falling and travelling at speeds of up to 13 knots (25 km/h). This explains why it needed to be so robust, finely made and secured on massive wooden foundations.

## THE OPERATION AND DATE OF THE CISTERN

The natural spring, which emerges from the cliff at about 2 m below the present high tide mark, is very vigorous and was well capable of supplying the needs of the castle's garrison. The practical difficulties of constructing the massive timber raft and the very fine stonework within the inter-tidal zone must have been very considerable. However, they were possibly far less demanding than the effort required to excavate a well, for at least 30 m deep, into the limestone bedrock.

Whilst the masonry cylinder can be realistically reconstructed to 5 m in height, it may have risen to the top of the rock-cut chimney at about 8 m high. Some sort of overflow may have been needed to relieve the water pressure inside. Whether the stone cylinder carried a lighter stone or wooden superstructure up to the cliff top or whether buckets were lowered into the cistern with the help of a rope or chain guide is not clear. A winding house with a pulley arm operating the buckets could have stood directly above the cistern a few metres from the north-west corner of the Great Tower, where railings enclose a modern viewing point (Figure 8). Whether the bucket was

raised by a simple hand winch or a more sophisticated machine (such as the donkey wheel which survives at Carisbrooke Castle, Isle of Wight ) is unknown. There is no mention of a well, wellhouse or the water supply in the very extensive documentation now being assembled for the castle.

The only date that can be offered comes from the stonework. The re-used limestone voussoir provides a *terminus ante quem* but its moulding profile is incomplete and only the outer orders remain (Figure 7). Richard Morris (pers comm) cannot yet assign a date other than broader 13th or early 14th century. The chamfered plinth in Old Red Sandstone now in the museum cannot be directly compared with a surviving structure in the castle, though this type of stone most commonly occurs in the work of William Marshal's sons. The form of construction, which uses a very accurately dressed ashlar cylinder clasped within rubble masonry, does occur elsewhere in the castle. It can be found in the main gatehouse where two circular shafts run vertically down in front of the forward portcullis and may have housed the counterweights to operate this device (Avent 2002, 32). The ashlar limestone ring set within the Carboniferous limestone rubble is best seen on top of the gatehouse, though the diameter (0.3 m) is far smaller than that of the cistern.

Taking this rather inconclusive evidence together suggests the cistern dates to the very end of the 12th century at the earliest but a more likely date falls within the 13th century. It could belong to the remodelling of the nearby Norman Great Tower, probably undertaken by Gilbert Marshal in the 1230s (Turner 2002, and Figure 8). If so then it does not solve the question originally posed at the start of this paper – how was the Norman castle supplied with water? It therefore seems likely that the present stone cistern is not the original, and that the timber raft and piles may belong to an earlier structure used to raise the water above high-tide level. Only full excavation and tree-ring dating could provide the answers to the origins of this unique structure. For the moment this lies beyond the resources of the present research programme.

## ACKNOWLEDGEMENTS

I would like to thank John Godbert, Nigel Nayling and Bevis Sale for assisting with the excavation and to SARA (Severn Area Rescue Association) for taking us so memorably to and from the site. I would also like to thank Richard Morris (architectural mouldings), John Allen (building stone) and Anne Rainsbury of Chepstow Museum for their help in writing this article. The work was funded by Cadw: Welsh Historic Monuments.

## BIBLIOGRAPHY

Avent, R. (2002) The Late Twelfth Century Gatehouse at Chepstow Castle, Monmouthshire, Wales. *Château Gaillard*, 20, 27-40.

Miles, D. H. and Worthington, M. J. (1998) List 24: Welsh Dendrochronology – phase 2. *Vernacular Architecture* 29, 126-9.

Owen, O. W. (1893) *Sir Francis Bacon's Cipher Story*. Vol 1, Howard Publishing Company.

Owen, O. W. (1894) *Sir Francis Bacon's Cipher Story*. Vol 2, Howard Publishing Company.

Turner, R. C. (2002) *Chepstow Castle*. Cadw guidebook, Cardiff.

*The Committee is extremely grateful to Cadw: Welsh Historic Monuments for a grant towards the cost of this publication*