Meeting not open to the public

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Agenda for Asset Management Forum Thursday, 10 December 2015; 9.30am

To: Members of Asset Management Forum; Service Leads

Venue: Council Chamber, Knowle, Sidmouth

Contact: Chris Lane, 01395 571544 (or group number 01395 517546): Issued 2 December 2015

1 To confirm the report of the meeting of the Asset Management Forum held on 5 November 2015 (pages 2 - 3)

2 Apologies for absence

3 Data Management – Update on Strata project

4 Tenanted Non Residential Property Review – Sports & Activity Clubs – Verbal update

5 Tenanted Non Residential Property Review – Beach Huts and Chalets – Verbal update

6 Acquisition proposal - attached

Date of next meeting – Thursday, 7 January 2016, 9.30am, in the Council Chamber

Decision making and equalities

Mark Williams, Chief Executive

EAST DEVON DISTRICT COUNCIL

Report of a Meeting of the Asset Management Forum held at Knowle, Sidmouth on Thursday, 5 November 2015

Present:	Councillors: Geoff Pook Ian Thomas Paul Diviani
	Officers: Donna Best Simon Davey Adrian Marsden Chris Lane
Also present:	Mike Allen John Dyson Rob Longhurst
Apologies:	Philip Skinner Andrew Moulding Richard Cohen Sue Percival Matthew Booth

The meeting started at 9.30am and finished at 10.55am.

1 Notes

Members noted the report of the meeting held on 8 October 2015.

2 Data Management - Demonstration

The Forum received a demonstration on the data management system from Adrian Marsden, Senior Systems Analyst, Strata which provided a brief summary of where the asset systems were for property management.

Members noted that all the non-housing data was now stored in the Uniform system. Each asset had a record that may be part of a “family”. The land asset was stored as a parent, with building and infrastructure assets held as children. It was noted that nearly all of the assets in Uniform had been mapped.

Adrian Marsden reported that he had drawn on all data available but was uncertain on how clean the data was. The Chairman suggested that Ward Members could get involved in this cleansing by having a paper A1 sized map of their area with a list of recorded assets and check whether these assets were correctly recorded and named.

Simon Davey, Strategic Lead – Finance reported that he was uncertain whether all costs were correctly recorded against each asset that relied on the use of ‘job codes’ by staff. Also, there are a number of teams undertaking work across a number of services, the costs of which are attributed to a service area and not individual assets. It was suggested that a one off exercise be undertaken to apportion service costs to asset levels to be used in conversation with town and

parish councils, which was an estimated two months work, to ensure sensible apportionment and gathering of data

During discussions the following points were noted:

- Understanding the Council's asset base could help make informed strategic decisions on reducing costs;
- The asset base was available on the EMap system, which was available to Council staff;
- Need to reduce the £2.76M expenditure on assets;
- Importance of understanding housing assets and Members should be allowed access to separate the housing land maps system;
- Possibility of involving Devon County Council at a later stage of the project.

Adrian Marsden and his colleagues at Strata were thanked for their work on the project so far.

RESOLVED 1. that Members for the following Wards be requested to become involved with data cleansing for the East Devon Asset Management Forum by checking the recorded district council assets on a map as a pilot project before it was rolled out to all Members: Beer, Exmouth Brixington, Honiton, Trinity, and Lympstone;

2. that a one off exercise be undertaken to apportion service costs to asset levels to be used in conversation with town and parish councils, which was an estimated two months' work, to ensure sensible apportionment and gathering of data.

3 Date of next meeting

The next meeting of the Asset Management Forum would be held on **Thursday 10 December 2015** at 9.30am in the Council Chamber, Knowle, Sidmouth.

Report to AMF December 2015
Steve Edmonds, Countryside Team Leader (Sites)

Proposal: to accept land transfer of Top Pool (or Lamb's Pool), Holyford Woods, and to incorporate it into the management parcel of Holyford Woods Local Nature Reserve.

Holyford Woods Local Nature Reserve (LNR) was the 1000th LNR to be designated in England, following the partnership work between the EDDC Countryside section and a local group of people who fundraised to help protect their local woods. This group is known as the Holyford Woodland Trust and the partnership between the two groups is still strong. The woodland has at its heart a pool, whose current owner, Andrew Lamb, wishes be donated to EDDC to form part of the LNR. (See Appendix 1 – letter from Andrew Lamb). This is subsequent to the sale of the property to Mr. Lamb from Anthea Simmons, who had previously also shown a willingness to transfer the property to EDDC to be incorporated into the nature reserve. (See Appendix 2 – letter from Anthea Simmons).

The current landholding of the Local Nature Reserve is in the ownership of EDDC and is leased to the Holyford Woodland Trust, who are responsible for the management of the woods. In reality, much of the management of the woods is carried out by EDDC Countryside staff and volunteers, but it is a situation with which we are very happy, and which is seeing the woodlands flourish. Many members of the Holyford Woodland Trust are no longer able to offer the physical assistance with managing the woods as they were when the lease agreement was drawn up, but the situation as it stands in reality today is one that works well, as the Trust are used more as a funding body for contract work that needs to be carried out on the LNR.

History
The 'Top Pool' used to technically be a reservoir, used by South West Water until it looked to sell up some of its assets in the late 90's. This included the woodland which now makes up Holyford Woods LNR. The reservoir itself was attached to the 'Pump House', where Andrew Lamb now lives, but as it no longer serves a purpose as a reservoir, it is far more suited as a component of a Local Nature Reserve. The term 'reservoir' in this case is also somewhat of a misnomer, in that the body of water has nowhere near the volume to mean that it has to comply with the Reservoirs Act. In essence, it is a small silty pond that is in need of some careful management to improve its biodiversity value at the heart of the woods.

Engineers Report
Appendix 3 is an engineer's report, carried out on the structures that are attached to the pool, namely the dam wall and associated downstream revetments that were originally essential for the functionality of the reservoir. The report identifies some small minor concerns in terms of individual structures, but nothing of major concern given the low volume of water held back by the dam wall and the fact that there is a further holding pool downstream that reduces risk to properties further down the valley.

Nature Reserve value for wildlife and people
Holyford Woods is a highly-valued LNR by many local residents and visitors from further afield. The various woodland components of conifer plantation, broadleaf woodland and coppice, interspersed with glades, tracks and footpaths offer great sanctuary in a peaceful valley, full of birdsong, insect life and many mammalian residents such as deer, fox, badger and dormouse. Top Pool is right at the heart of the reserve and is regularly used by spawning toads, resident ducks and many dragonflies, as well as providing a watering hole for all of the woodland's residents. Such is the feel of the Top Pool within the woodland setting that many visitors assume that the pool is part of the nature reserve already.

Ongoing management costs and requirements
The management required for the pool is fairly minimal, with bankside coppicing, some tree removal on the dam wall, and a certain degree of dredging required. A quote for this work has come in at £2k - £3k + VAT, and this also includes footpath levelling and surfacing to the pool. This work already has funding identified from the Holyford Woodland Trust or out of the EDDC LNR budget.

In terms of ongoing maintenance, the work will be integrated into the action plan of work required for the LNR, which will largely be carried out by the EDDC Nature Reserves Ranger and volunteers, or with the use of contractors (again funded by the HWT or the EDDC LNR budget).

However, one of the other advantages with the transfer of the pool is that it will facilitate us creating a ford around the western part of the pool, which will open up a greater area of the woods to vehicles. This will enable more efficient working on a day to day basis, saving time on practical work days, as well as allowing us to maximise the productivity of the woodfuel initiative we are developing at Holyford Woods and other sites (firewood, charcoal etc). We would aim to derive £400-500 per annum through woodfuel in the first few years, rising to £1000 per year in subsequent years from this site, thanks to the improved access.

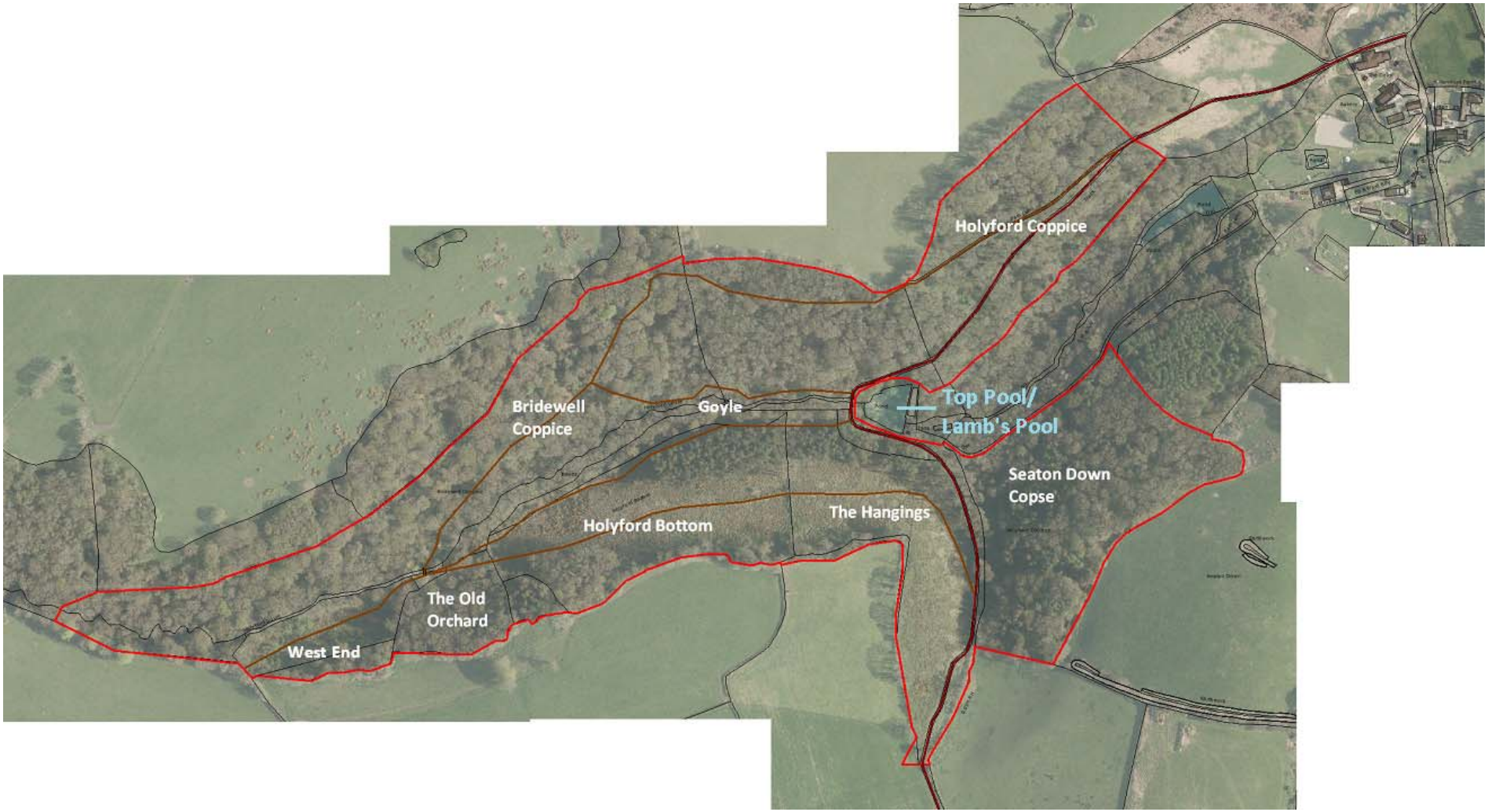
Summary
It is recommended that we accept the offer of the transfer of this land, which will greatly enhance what is an already stunning nature reserve. This would help to maintain our very healthy relationship with the Holyford Woodland Trust, who are a very loyal group to the woods, and who, as previously mentioned, assist with funding required for certain management tasks. All costs associated with work required have been identified, and the benefits of taking on the pool in the long-term are very significant in terms of the ease of managing the woods and increasing the income potential of the site.

Steve Edmonds
Countryside Team Leader, EDDC, November 2015

3

Location Map

Site map showing Top Pool/Lamb's Pool in relation to the rest of the Local Nature Reserve (LNR boundary – red line)



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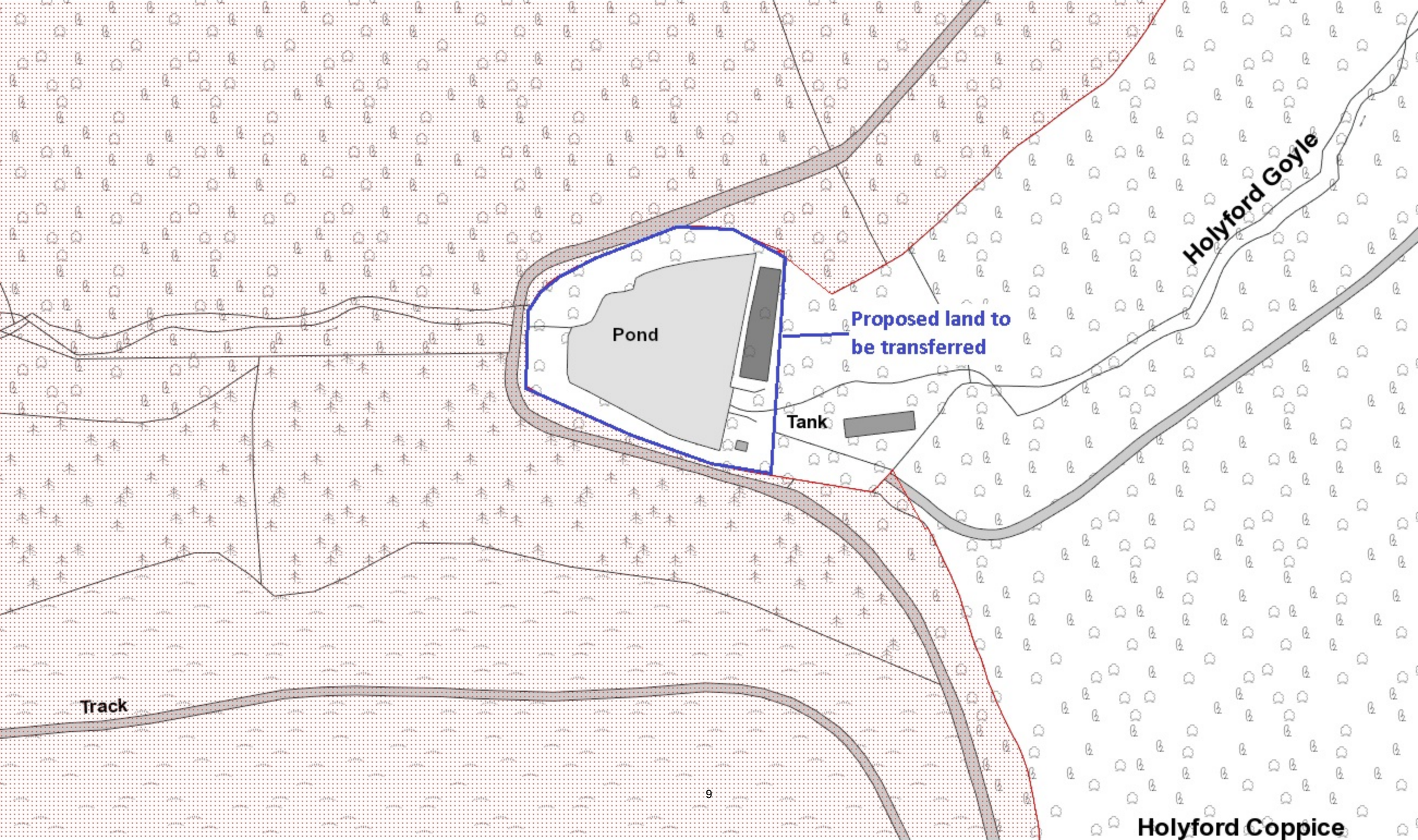

Pond
Proposed land to be transferred
Tank
Holyford Goyle
Track
Holyford Coppice

The Old Pump House

Holyford Lane

Colyford Devon EX24 6HW

01297 551142

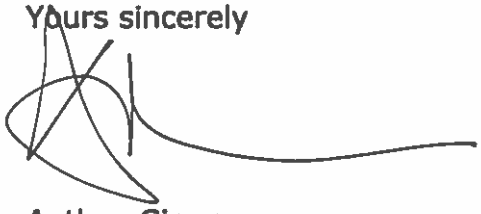
Dear Mr Edmonds,

RE: Reservoir Holyford Woods

This is just to confirm my intention to gift the top reservoir and land to the agreed boundary to East Devon District Council on the basis that all legal costs etc will be borne by EDDC.

I am in the process of selling The Old Pump House. The reservoir was excluded from the particulars but remains part of the sale. The prospective buyers* are aware of the situation and will continue with the transfer of ownership as planned. I have explained that there will be no financial benefit or cost to them as a result of this transaction.

Yours sincerely



Anthea Simmons

Please note correct spelling of my name!

*Mr and Mrs M Johnson

CONSULTING CIVIL AND STRUCTURAL ENGINEERS

RESERVOIR DAM INSPECTION

Holyford Woods, Seaton

for: East Devon District Council

Document ref: XEDD2296/PD02

March 2012

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01	05/04/12	First Draft	IWJ	MW
02	17/07/12	Final (no changes)	IWJ	MW

1 Introduction & Brief

1.1 East Devon District Council (EDDC) currently own and manage an area of Holyford Woods, Seaton Down as one of their Local Nature Reserves. Within the Woods there is a former South West Water reservoir and dam that is currently in private ownership, but has been offered to the Authority to be incorporated within the Nature Reserve. BSW Consulting were appointed by East Devon District Council to inspect the dam and advise on its current condition, and the level of risk that the Authority might attract in respect of future repairs and maintenance by taking ownership.

1.2 The reservoir was originally part of the Seaton UDC water supply system and fed water to the now defunct water tower at the top of Seaton Down Hill via a downstream collecting tank, filter house and pumping station. Of these structures, only the reservoir and its dam are being considered for transfer of ownership to EDDC and require inspection.

1.3 The references in the report to 'left hand' and 'right hand' wing walls are when standing downstream of the weir wall looking towards the reservoir.

1.4 The inspection carried out was purely visual and no opening up, coring or testing was carried out. This report has been prepared for East Devon District Council and their advisors. BSW accept no responsibility to any other parties for the whole or part of this report.

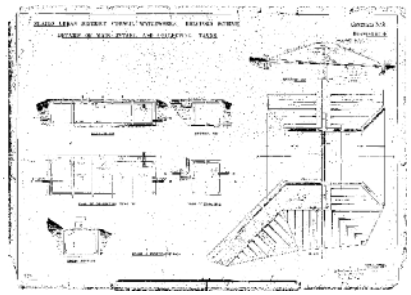
2 Records

2.1 We have obtained copies of extracts of historic maps of the area for 1889, 1906, 1936, and 1958 and these are attached in Appendix 1. The 1889 map indicates that there was an 'Old Clay Pit' to the north of the present reservoir site, and the 1906 map shows an 'Old Quarry' to the south. The reservoir appears on the 1936 map and the construction date must lie somewhere between 1906 and 1936.

2.2 We have spoken with South West Water, who confirmed that they previously owned the reservoir and dam, but that they were unlikely to have any records available as these should have been transferred to the new owner along with the deeds. The spokesperson believed that the reservoir, dam and downstream structures along the valley were all sold to the present private owner around 6 years ago.

2.3 We understand that East Devon District Council have asked the present owner for sight of any records, but these have not been forthcoming. We subsequently made further enquiries with South West Water's Mapping Section, and they were able to provide copies of some original drawings. These are included in Appendix 2 and show the following:

Drawing No.4 by Rofe & Rafferty Consulting Engineers of Victoria Street, London – Seaton UDC Waterworks Holyford Scheme: Details of Main Intake & Collecting Tank:



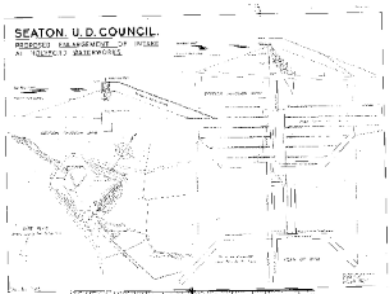
There is no date given on the drawing, which appears to show the original outline construction details through the dam embankment and spillway. The upstream slope of the embankment is originally noted as 1 in 3 and the downstream slope as 1 in 2.5. Handwritten notes have altered these to 1 in 2.75 and 1 in 2.65 respectively, although the later drawings (see below) indicate that the original gradients are the ones actually used. From the type of rc construction shown on the drawing, together with the historic maps, we would estimate the construction date to have been around 1930.

The drawing doesn't show a section through the embankment itself – only the spillway weir. However, the implication is that the embankment is an earth fill structure (see subsequent drawing below). There is no indication of any surfacing or rip-rap protection to the upstream embankment face.

The spillway weir structure is located at the left hand end of the dam, with essentially all of the earth embankment to the right. The length of the crest of the embankment in its increased condition is about 96' (29m). Whilst there is earth fill to the left of the spillway, this is contained within the left hand wing walls of the spillway. Two thirds the way along the upstream left hand wing wall, there is a 3'x3' (0.9x0.9m) square chamber, although it's purpose is not indicated on the drawing (but see below).

The concrete spillway weir wall is 6' (1.8m) high and has a vertical upstream face and a stepped downstream face. The wall is 1'3" (380mm) thick at the top and 4'6" (1370mm) at the bottom. The weir has a central V-notch. The spillway has upstream and downstream aprons and wing walls extending 22'4" (6.8m) upstream and 24'1" (7.34m) downstream of the weir wall, and a central cut-off wall extending 6' (1.8m) below the bottom of the aprons. The leading and trailing edges of the concrete aprons have concrete downstand thickenings.

Drawing No. 985 by Seaton UDC – Proposed Enlargement of Intake at Holyford Waterworks – dated October 1941:

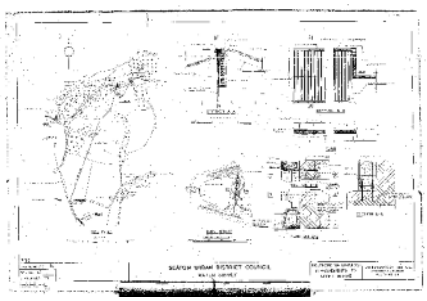


Plan & Sections showing the proposed raising of the water level by increasing the height of the embankment and spillway by 3' (915mm). The Section through the embankment shows that the existing construction was of a central clay puddle core, with earth fill on the upstream and downstream faces. The embankment was to be raised by constructing a 1'6" (457mm) thick by 5' (1525mm) high concrete wall above and partially into the central clay core, and providing an overlay of earth fill on the downstream face only.

Corresponding additional concrete was also to be placed above the existing weir and downstream wing walls. The V-notch was not reconstructed at this stage, and the weir has a level top which classifies it as a 'broad-crested weir'. The raised wing walls and embankment crest maintained a height difference above the weir of 1'9" (533mm).

The drawing indicates that the chamber on the left hand wing wall is a draw-off point for a pipe supplying water to the Collecting Tank downstream of the dam.

Drawing No. NP/O/1/1 by JD & DM Watson, Chartered Civil Engineers, Westminster – Seaton UDC Water Supply – Holyford Waterworks, Improvements to Upper Intake – dated September 1956:



The drawing shows installation of steel sheet piling into the upstream face of the embankment along the front of the clay core and previous concrete wall, together with provision of a reinforced concrete capping beam bolted back to the existing central concrete wall. It appears that the work was to strengthen the upstream embankment face, and no further increase was made to the embankment height (but see 3.8 below).

2.4 From the information shown on the drawings, the 1941 reservoir with its increased capacity has a maximum holding volume of around 1,500-2,000m^3 (330,000-440,000gallons). It therefore falls outside The Reservoirs Act 1975, which requires statutory records, inspections and maintenance to be carried out by owners of reservoirs larger than 25,000m^3.

3 Inspection

3.1 A preliminary visit was made on 1 April 2010 by Ian Jolley CEng FIStructE MICE RMaPS in the company of Fraser Rush of East Devon District Council. The area around the dam was heavily overgrown and although a general walkover was carried out and some photographs taken (Photo 1) it was agreed that some clearance work would be carried out by EDDC in order to be able to better inspect the embankment. In the event, the clearance work was delayed for over a year and we made our initial inspection visit on 20 April 2011. A further inspection was carried out 11 months later on 30 March 2012 in order to check for any significant changes. The weather during all the inspection visits was dry and sunny.

Photo 1

3.2 As noted above, the inspections were purely visual and involved the following procedure:

- Walk the crest from abutment to abutment
- Walk the embankment slope in an up & down zig-zag pattern from abutment to abutment
- Walk the length of both abutment/embankment contacts/wings
- Walk the length of the downstream embankment toe
- Observe all accessible features of the outlet conduit
- Walk the length of the spillway

3.3 At the time of the initial main inspection in April 2011, the scrub vegetation had been cut back but there was still a general groundcovering of grasses, ferns and nettles, etc and a number of trees of varying sizes on and around the embankment (Photo 2).

Photo 2

3.4 At the time of all 3 visits, the reservoir was full and there was a small amount of water running over the top of the weir (Photos 3 & 4).

Photo 3

Photo 4

Because the reservoir was full and the water was very cloudy and had a lot of surface algae and pond growth, it was only possible to see a small amount of the upstream face of the embankment and weir structure above water level (Photo 5). However, it was possible to see the top ends of steel piles under a concrete capping beam running along the front edge of the embankment. The spillway wing walls on the reservoir side of the weir were not raised during the 1941 work and consequently, are below water level. The tops of the walls were just visible under the water surface.

Photo 5

3.5 There was no visible evidence of soil movement/slippage on the downstream face of the embankment at the crest and toe, and no signs of significant animal burrows in the face. Although there was no evidence of running water seepage through the embankment, the ground in one localised area at the foot of the embankment was quite damp and spongy near to three fairly large trees.

3.6 At the time of our April 2010 inspection there was a large tree near the end of the right hand weir wing wall which was leaning towards the weir (Photo 6). By the time of our March 2012 inspection, the tree had collapsed onto the wall, with its branches lying in the reservoir (Photo 7).

Photo 6

Photo 7

3.7 There are a number of smaller trees growing on the face of the embankment, the largest of which is near the embankment crest beyond the right hand wing wall and is leaning out over the water (Photo 8).

Photo 8

3.8 Each of the inner faces of the weir wing walls had horizontal and sloping cracks parallel to the tops of the walls, which corresponded with the construction joints which would have been formed in 1941 between the original and increased wall heights (Photos 9 & 10)

Photo 9

Photo 10

It also appears that when the piling and concrete capping was constructed in front of the embankment in 1956, some additional concrete was also added to the top of the left hand wing wall (see Photo 9), and the wall on this side is higher than the right hand wall by this amount (about 450mm). The ground behind the left hand wing wall was level with the top of the wall, suggesting that the ground here was also raised in 1956.

3.9 The faces of the downstream wing walls were reasonably plumb and in good alignment, but were spalling in places. However, it appeared that the loose surface was a cement render, albeit extremely thin. The worst damage was on the right hand wall at the 45° change of direction where the render thickness varied from about 12mm at the top, feathering to zero at the bottom (Photo 11).

Photo 11

3.10 There was a vertical crack in the left hand wing wall at the junction where the wall splayed outwards at 45° on plan, and there was a large orange-brown accretion projecting from the lower part of the wall (Photos 12 & 13).

Photo 12

Photo 13

The material was very soft and appeared to be a clayey residue being washed through the crack from behind the wall. At the time of our most recent visit in March 2012, the accretion had increased slightly in bulk and there was a constant dripping of water from the crack (Photo 14). The crack itself was about 6mm wide at the top of the residue, and 10mm wide at the top of the wall (Photo 15). There was no discernible increase in the crack widths between our visits in April 2011 and March 2012.

Photo 14

Photo 15

3.11 The reservoir's 9" (225mm) wash-out pipe noted on the drawings could be seen at the bottom left corner of the weir wall (Photo 16). However, there was no sign of a valve/penstock wheel or spindle on the upstream side of the weir – and none is indicated on the drawings. There was a small amount of the orange-brown soft material in the bottom of the pipe.

Photo 16

3.12 Although not shown on the record drawings, at the extremity of the downstream wing walls there is a 1.5m cascade down to the level of the stream bed (Photo 17).

Photo 17

4 Discussion & Conclusions

4.1 The size of the Holyford Reservoir is below the capacity covered by The Reservoir Act, 1975 and thus does not need to comply with the stringent statutory inspection and maintenance regime required by the Act. Nevertheless, the owner of any reservoir and dam has other legal obligations, principally under Health & Safety legislation.

4.2 The reservoir is classed as a 'small raised reservoir', i.e. 'raised' in that the water is raised by impounding above the original natural ground level. Failure of even small raised reservoirs can pose a threat to life and property as they can discharge a significant volume of water. In consideration of this risk, the Environment Agency is currently pressing for a change in the legislation to bring the capacity of registered reservoirs down from 25,000m^3 to 10,000m^3. As the Holyford Reservoir has a maximum capacity in the region of 2,000m^3 it will still fall below this revised figure.

4.3 The consequences of failure of a dam depend upon many factors, including the volume of water, the height of the dam, and the slope and nature of the land downstream of the dam. Investigation of the consequences of failure of the Holyford Dam was not part of our brief, and is mentioned here as a matter for further consideration. The land immediately below the dam is a reasonably wide valley through the Holyford Woods which should be able to accommodate a significant volume of water. However, about 500m downstream of the dam is another impounding dam, located not far from a number of farmhouses and buildings (Fig 1).

Fig 1

The consequences of a sudden large volume of additional water reaching this second reservoir may cause the downstream one to either also fail, or at least overtop, with potentially serious implications for the residents and buildings downstream.

4.4 As far as we can ascertain from published aerial photographs, there is no corresponding reservoir upstream of Holyford Dam that in the event of its failure could create similar difficulties for Holyford Dam. Also, the impression gained from the condition of the existing reservoir is that the effects of heavy rainfall upstream are unlikely to have a significant effect on the amount of water entering the reservoir. At all three visits, the water in the reservoir was almost stagnant with minimal through-flow over the weir, and there was heavy plant and algal growth on the surface. This would suggest that there has been no rapid increase in water intake sufficient to cause flushing out of the reservoir for many years, if ever.

4.5 Based on the width of the weir of 19'10" and a maximum head of 1'9" above the weir before overtopping of the embankment, the potential maximum flow over the weir using a weir coefficient of 2.63, would be in the order of 120ft^3/sec (3.4m^3/sec). We would expect this discharge capacity to be adequate to cope with the likely maximum inflow that could be anticipated without overtopping the embankment, although a detailed upstream survey and flood risk assessment would be required to confirm this.

4.6 In the event of a total failure of the dam, up to 2,000m^3 of impounded water could be released in a relatively short time. However, a very rough estimate of the land capacity available between Holyford Dam and the downstream dam is in the order of 125,000m^3. This should be sufficient to cope with the levels of short-term flood inundation that could occur following failure of the dam but, as above, a detailed downstream topographic survey would be needed to confirm this.

4.7 Our inspection indicated that the construction information shown on the record drawings was essentially correct where visible.

4.8 It was not possible to see the upstream face of the embankment and spillway structures which were all below water level. Whilst it is therefore not known whether there is some protection to the upstream embankment face, the risk of damage from water movement/wave action is considered to be minimal given the practically stagnant nature of the reservoir.

4.9 The reason for installation of the steel sheet piling and capping beam to the front face of the embankment in 1956 is not indicated on the drawing. As the purpose does not appear to be to further raise the embankment height, the assumption has to be that these significant protection works were installed in order to strengthen the dam, which was possibly showing signs of seepage. There is a strong possibility that seepage would have been a problem as there is no indication on the drawings of surface protection providing waterproofing to the front slope of the embankment. The piles are shown as being driven about 9' (2.7m) into the original ground, about 5' (1.5m) lower than the existing puddle clay embankment core. The piles thus provide substantial further cut-off protection under the embankment.

4.10 The steel piles have now been in for about 56 years and some corrosion should be expected. However, the steel sections are noted as 'Larssen or similar' which have a relatively heavyweight section with wall thicknesses ranging from 8mm up to 20mm. It is not possible to check the extent of corrosion without direct visual examination – either by engineering diver, or by drawing down the water in the reservoir.

4.11 Concerning draw-down, it was not possible during the inspection to identify the presence of a penstock spindle for a handwheel or crank handle to open the wash-out through the weir wall. It is possible that one remains out of sight below water level following the raising of the dam in 1941. However, even if there is a spindle, the penstock will almost certainly be impossible to open after 80 years of immersion. Should it become necessary to draw down the reservoir, this will need to be done by over-pumping using a temporary mobile pump set.

4.12 Although the embankment has had some clearance work done, a number of sizeable trees still remain on the back slope or close to the toe. In particular, one tree has now fallen over and is resting on the weir wall. It is essential that all these trees, along with their main roots, are removed from the embankment in order to avoid disruption of the earth fill.

4.13 At the time of the inspections, there was no visible evidence of significant soil movement or slippage of the embankment slopes. There was an area near to the toe of the embankment that was wetter than the surrounding ground which could be indicative of seepage. However, it is also possible that this is simply a collecting point for general surface run-off.

4.14 The cracks in the spillway wing walls which follow the construction joint lines for the 1941 raising works, although unsightly, do not give cause for undue concern. The drawing doesn't indicate whether there was any drilling of tie bars into the tops of the original walls prior to placing the new concrete – and in fact doesn't indicate whether the new concrete was reinforced at all. Nor is there any detail of how the joint between the two sections was to be formed. The resulting cracks along the joint lines are therefore not unexpected. The walls behind the weir – i.e. the ones raised in 1941 – are not required to resist water pressure from the reservoir, and only carry load from the additional 530mm height of ground retention.

4.15 Without details of the reinforcement in the original walls, we are unable to advise whether the additional retention height would create problems for the original walls. In general, there is no evidence that the walls are overloaded, nor that the reinforcement is suffering from significant corrosion. However, it appears that the walls had a render coat applied at some time, and it is possible that this was done to provide protection to concrete surface damage from whatever cause.

4.16 A possible exception to the observation above regarding lack of wall damage from increased retention is the vertical crack and wash-out accretion on the left hand wing wall at the 45° junction. The retention height behind the left wall is greater than on the right, and on this side is in the order of 1m higher than the original walls were required to support. The tapering crack is indicative of rotational vertical movement of the wing wall, causing separation at the splayed corner. However, the plan form of the wall with its splayed end and its connection to

the weir wall makes for a reasonable robust structure, and we do not consider that the wall is in danger of imminent failure. Whilst it is possible to grout or otherwise seal the crack, this would not achieve a solution to any continuing movement and would essentially be cosmetic. The crack is likely to recur.

4.17 It is not clear whether the water dripping from the crack in the wing wall is coming from the reservoir or from the surrounding ground. However, the 1956 piling protection works do not appear to have been carried out to the left of the weir wall. Thus, the resistance to seepage under this part of the dam structure is provided only by the original clay puddle core under the earth fill within the arms of the left hand wing walls. It is therefore probable that the water coming from the crack is seepage from the reservoir.

4.18 Whilst it is tempting to consider removal of some of the ground from behind the left hand wing wall in order to relieve the pressure on the wall, we would advise that this should be avoided. Removal of mass from the rear of the dam in this location, may risk comprising the local resistance of the dam to water pressure from the reservoir and might cause a local blow-out. Any removal of dam material should only be done in conjunction with draw down of the water level, and as part of other remedial work to prevent seepage. The risk of failure of the 'embankment' in this area under the current conditions, is not considered to be great, as the ground is effectively contained within the upstream and downstream wing walls.

4.19 It should be noted that draw down of the reservoir may result in settlement of the crest of the embankment due to the changes in pore water pressure. Whilst this is unlikely to affect the stability of the dam – particularly as there is now the added protection from the steel piles – some re-profiling of the embankment may be required following draw down. Although draw down could also affect the stability of the front face of the embankment by changing the pore water regime, this is unlikely to create a general instability issue for the embankment as the steel piles protecting the core and rear face are driven into the underlying original ground, and do not appear to rely on the embankment material.

5 Recommendations

5.1 If it is deemed necessary to further consider the risk of upstream flash flooding adversely affecting the Holyford Dam, a topographic survey of the land upstream of the dam will need to be carried out in conjunction with a desk study of OS maps in order for an appropriate flood risk assessment to be made.

5.2 Similarly, in order to further evaluate the consequences of failure of the Holyford Dam and its effects on other structures downstream, it will be necessary to carry out a topographic survey and desk study of the land downstream of the dam so that an appropriate risk assessment can be made of the downstream flood capacity.

5.3 Assessment of the condition of the steel piling should be made, and this will require inspection by an experienced diver or draw-down of the reservoir. We do not consider this to be an urgent requirement, provided regular inspections of the condition of the dam are made, but should be included in the budget for future medium term maintenance. During maintenance work involving draw-down, consideration could be given to replacing the existing penstock to allow future wash-out and allow draw downs without the need for pumping.

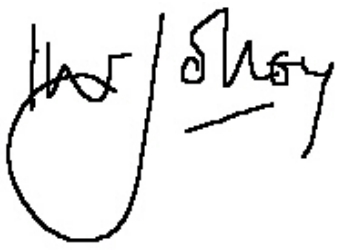
5.4 All trees and significant vegetation on or near to the embankment and spillway structure should be removed as a matter of urgency. Removal of tree roots will need to be done carefully in order to avoid creating excessive cavities, and suitable compacted infilling will be needed following root removal. The only vegetation permitted on the crest and downstream slope should be short grass.

5.5 The wet area near the embankment toe should be visually monitored on a regular basis to check for any worsening. In the event of concern, professional advice should be sought but geotechnical investigation is likely to be required.

5.6 Whilst not an urgent requirement, we recommend that as part of a future maintenance programme, the damaged render on the downstream wing walls is removed in order that the concrete substrate can be examined, and a view taken as to whether more effective repairs are necessary.

5.7 Future major maintenance should be allowed for in respect of remedial works at the left hand end of the dam in respect of prevention of seepage and restoration of the integrity of the wing wall. The works will need to be done in conjunction with reservoir draw down, and a suitable remedial scheme – probably involving installation of sheet piling or a grout curtain – will need to be drawn up.

5.8 An essential guidance document for owners of earth dams is the Environment Agency's *Creating a Better Place - The owner's guide to reservoir safety*. The guide recommends that visual monitoring of earth dams should be carried out at no longer than monthly intervals.



I W Jolley CEng FIStructE MICE RMaPS 05 April 2012

Appendix A

Historic Maps:

Appendix B

Record Drawings