

# **Copperhouse and Wilson's Pool Tidal Inundation and Flood Risk**

## **1.0 Introduction**

Concerns were raised by members of the Hayle Harbour Advisory Committee with regard to the impoundment of Copperhouse Pool during the Summer months. It was apparent that members representing the variety of interested parties and statutory bodies had differing opinions and objectives with regard to impoundments.

In order to firmly establish the parameters for impoundments it was necessary to carry out a controlled test by raising the tidal gate on a spring tide and monitor levels achieved.

## **2.0 Controlled Test**

The controlled test was carried out on the evening tide of the 6<sup>th</sup> of May 2008 with a predicted high tide level of 6.82 St. Ives. There were three main objectives to the test:

1. To ascertain the level at which Wilson's Pool has a sufficient level of inundation to sustain the saltmarsh designation.
2. To prove the theoretical tidal flood level limits and thus a level at which the Copperhouse pool could be impounded with a risk based approach.
3. The actual depth of the water across Copperhouse pool during an impoundment for recreational use.

## **3.0 Objective N01 Wilson's Pool**

Observations at the listed bridge between Copperhouse and Wilson's pools noted that reverse flow started to take place at 17:10 hours with the predicted high tide of 18:30. Copperhouse pool level at 17:10 was 2.1 AOD (Above Ordinance Datum).

However, due to the levels of the leat banks, the tide did not overtop onto the main area of Wilson's pool until 18:07 at a pool level of 3.14.

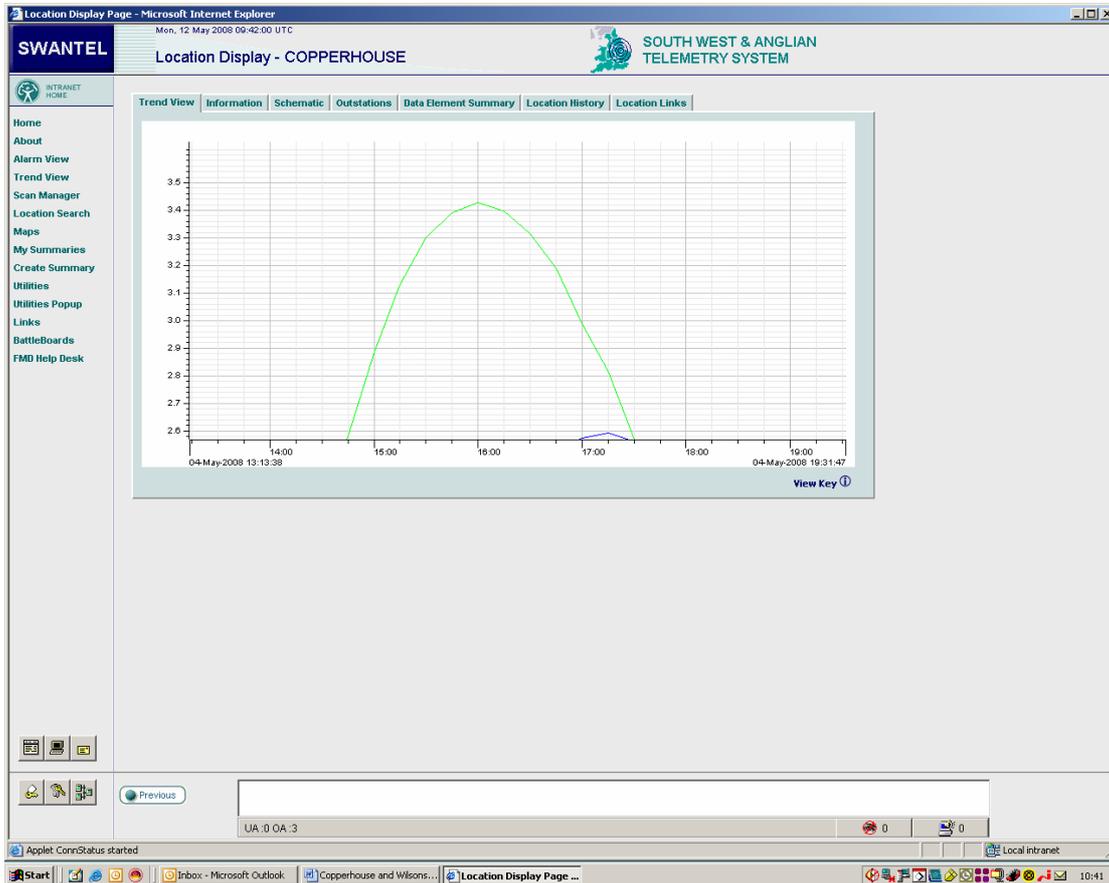
Further observations were made by both EA and Natural England Staff to establish if sufficient sea water levels were present across the entire pool, this was observed with a pool level of 3.3 metres AOD.

Using a conversion figure of chart datum (tide table figure) to ordinance datum OD of -3.4, a published predicted level of 6.7 metres high tide for St. Ives is a high enough tide level to flood Wilson's pool.

Using a 6.7 metre predicted high tide for St. Ives does give opportunity to flood Wilson's most months throughout the year, rather than choosing a higher tide which, if not controlled would give greater flood risk.

Increasing Copperhouse pool to a level greater than the designed flood alleviation scheme level of 2.5 metres AOD will increase flood risk and would have to be carefully planned and managed. The final decision on whether or not to increase the tidal level in the pool would have to be taken by the EA Operational Duty Officer (ODO) on the day of the planned flooding of Wilson's pool.

The flood risk would be the period above which the pool remains at a level greater than 2.5 metres AOD. From the graph below it can be seen that this “flood risk” time would be limited 2 hours 45 minutes which is manageable during fine weather.



Natural England are to assess the Environmental benefits of the possible monthly flooding of Wilson’s pool and advise .



Significant tidal level lag was observed at Wilson's pool (above) with peak level being observed some 45 minutes after the peak level at the tidal gate. This is probably due to the restriction imposed by the redundant sluice wing walls (below) that abut the listed bridge structure.



#### 4.0 Objective N02 Maximum Impounded Tide Level

The photo below shows Copperhouse Pool flooded to a level of 3.4 metres AOD (6.8 metres CD).

It can be seen from the photo that this level is extremely high, in excess of the EA high level warning alarm set at 3.35 m AOD. Observations made at this level confirm that overtopping of the banks behind Atlantic motors would occur if the level was further increased by 200mm. Observations in the drainage systems in front of the Cornish Arms and adjacent to the Passmore Edwards Institute indicate that these drainage systems may become tide locked at this level.

Impounding at this level would represent an unacceptable flood risk considering inflows from the Angarrack river, Loggins Mill Leat and surface water drainage.



The flood alleviation scheme is designed for there to be a maximum level of 2.5 metres AOD in order to allow for the discharge of a 1 in 50 year flood event. Any impounded level or tidal level greater than this represents a greater flood risk.

EA have produced flood risk management procedures that enable management of the level of Copperhouse pool during impoundments. The text below is an extract from these procedures:

##### Impoundments

*Hayle Town Council and the other community groups increasingly request impoundments at spring high tides during the summer. Planned impoundments take place from April to October where the tidal gate is closed at the peak of the tide or to a **maximum of 3.0Mtrs AOD** to retain waters for recreational programmed events. Impoundments for aesthetic value for the Hayle in bloom competition should be limited to **2.8 AOD**.*

*The number and duration of impoundments is subject to advice issued by Natural England who are the statutory body for the SSSI and who are best placed to advise of ecological and biodiversity issues related to impoundments beyond normal tide cycles.*

*There is an increased flood risk during impoundments as the impounded levels are greater than the 2.5 Mtrs AOD. This is the design level required to contain the maximum discharge from the Angarrack of 15.5 cumecs in a 1 in 50 year event.*

*ODO's need to be aware of the flood risk during impoundments and monitor the pool level on SWANTEL. The high level alarm on the pool is set at 3.35 metres local but to covert the local datum to AOD 100mm must be added to the pool gauge board and add 70mm to the seaward side gauge board.*

*If heavy rainfall is forecast over the planned weekend of impoundment, the ODO must ensure the impounded level must be limited the maximum scheme pool level of 2.5MAOD.*

*Once impounded, if a heavy rainfall warning is issued, the ODO MUST monitor pool levels and decrease the pool level to 2.5 MAOD at the next incoming high tide.*

*The ODO should consider opening the gate bypass sluice if he considers the level is required to be reduced at low tide. This must be considered if the pool level reaches **above 3.4 metres AOD** which is **3.5 on the gauge board and SWANTEL**. Opening the bypass sluice may be difficult due to the head difference at low tide and manual hand operation may be necessary if the motor is unable to open the sluice. Although not designed to do so, it may be possible to crack open the main tidal gate in extreme circumstances. However, the ODO is to ensure water released does not pose a hazard to harbour users, property or structures downstream.*

It must be appreciated that pool levels increase during impoundments due to inflows and rainfall, reducing the level at times other than on falling high tides can be extremely hazardous and could cause danger to people and structures down stream of the tidal gate.

## **5.0 Objective N03 Depth Trials**

Depth trials taken across the pool at an Impounded 3.0 metres AOD show the average depth to be in the order of 1.5 metres with some additional depth of up to 2.4 metres being available above the river channel locations that could be utilized for particular events.

It is therefore reasonable to set the maximum level for impoundments to 3.0 metres above ordinance datum. This equates to a Chart Datum tide height for St. Ives of 6.4 high tide dependent upon residual effects due to barometric pressure variance.

All events impoundment events planned for (so far) for this summer are, with the exception of the Penwith Schools Regatta at tides above 6.4 m CD St.Ives.

David Turner  
Flood Risk Management Environment Agency.

