EXECUTIVE SUMMARY

The LIFE III restoration works undertaken on the Black Water and Highland Water tributaries of the River Lymington in the New Forest aimed to reconnect the river with its surrounding wetland in order to re-wet the wetland and re-establish natural river processes. The main river restoration work undertaken involved reconnecting disconnected meanders and raising the bed levels of overly deep stretches of river. Through increasing the in-stream channel roughness by actions such as lengthening stream courses, increasing sinuosity and adding debris dams, water can be retained in the upper catchments for longer, and potential for over-bank flooding increased, thus wetting the adjacent catchment. Restoration work was undertaken between summer 2003 and summer 2006.

The aim of this paper is to expand on the EA Hydrological Interim report (EA, 2003) and assess whether any changes to river regimes post-restoration are due to the restoration work. Analysis was undertaken of the stage (water level) data and spot flow data obtained from the hydrometric monitoring network set up in each catchment. Seven sites have been installed in the catchment, 3 of which were installed to obtain a "before" picture, and four were installed later to assess the extent of the impact of the restoration. Comparison between pre- & post- restoration peak events and Low Flows was used to assess the difference the restoration work has had on the catchments.

However, the physical characteristics of the river channels at both the primary monitoring sites of the streams – Highland Water 1 and Black Water 2, were altered during various phases of the restoration and because of this a lot of the collected data is not comparable. This is because to assess whether changes at a site are caused by a particular factor – in this case the restoration, the effect of other external factors need to be ruled out. All the variables at a station need to be kept the same so that after the restoration work has been undertaken the only factor that could explain any changes is the restoration. Therefore, the data assessed at Black Water 2 is for the pre-restoration 2001-2003 and post restoration period 2003-2005. After 2005 the station was re-located 60m downstream and the channel bed at the new site was raised. There was no option for the Highland Water than to use all its data.

Other limitations to the data also include:

a) the short length of post-restoration record,
b) the Hampshire drought that began in Oct 2004 and continued to the end of the restoration works in 2006,
c) the availability of only stage, not flow data,
d) the small scale of the catchment and of the works - any overall catchment change might be so small as to be undetectable and so restoration success may not be obvious, particularly when monitoring at this level.

The main observations from the data were:

- Highland Water 1 data does not show any change in magnitudes of peak events, instead it shows an increase in baseflow. This could possibly be due to restoration works since the works raised the site's riverbed and this may have re-connected the stream with the water table in its surrounding wetland. However, this there is currently not enough data to support this suggestion.

- Black Water 2 data shows that, post-restoration, there is a decrease in the magnitude of peak event, a decrease in summer low flows and a shift in flow so that at the same stage post-restoration there is less flow. This all suggests that the capacity of the channel is less and that over-banking may be occurring, which is a desired effect of the restoration. However, the changes in low flow and in gauged flow are reflected in the data of the Black Water 1 control site. This suggests that it might be other external factors, such as climate that are affecting the changes not the restoration. Nevertheless, the change in magnitude of peak events only appears to happen in the Black Water 2 site so this may indicate an effect of the works.
- There was no change in either catchment in time to peak of peak events. This would suggest that the restoration work has had limited success since the slowing down of time to peak is a desired effect of the works.

The small scale of the catchments and the restoration work means that any changes to the regime are site specific, and any overall catchment change so small as to be virtually undetectable. The overall restoration success may therefore not be obvious, particularly when monitoring at catchment scale rather than reach scale.

There are many lessons to be learnt from the hydrometric monitoring of this project including:

a) better consideration of monitoring station locations,
b) ensuring a more active role of the hydrometric monitoring team in the restoration process so that monitoring sites are not altered,
c) immediate installation of monitoring sites once a project is underway to gather the most pre-restoration data,
d) more consideration of flooding monitoring (e.g. it would have been useful to monitor water levels in the wetland itself to prove any increased over-banking).

Due to the limitations in data collected so far, it is therefore recommended that the LIFE III hydrometric monitoring continue to allow for collection of more data and to increase the opportunity for encompassing a wider range of hydrological conditions.