Issue 1 – Dealing with interaction with the Kennet & Avon Canal

Contents

1. Discussion of the problem

The Kennet & Avon Canal was re-opened in 1990 after a lengthy period of restoration. It joins the River Avon in Bath with the River Thames in Reading, interacting with the River Kennet between Kintbury and Reading (Figure 1.1).

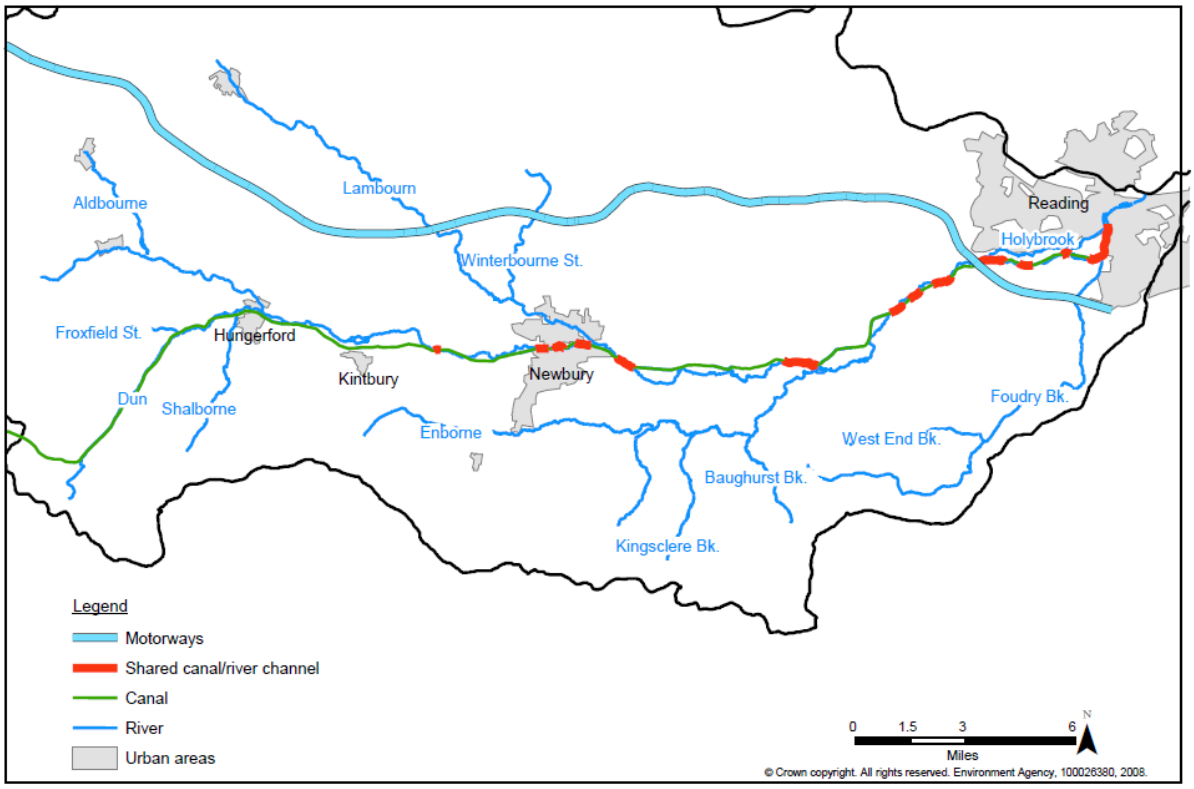

Figure 1. 1 - Major interaction points of the Kennet with the K&A canal

On the eastern arm of the canal, from the summit near Burbage to Reading, the main water source is Wilton Water which provides a groundwater-fed supply of water to the upper reaches of the canal to maintain navigation.

The canal flows alongside the River Dun to Hungerford. At a number of points along this route, water from the canal may be discharged via overflow weirs to the River Dun. The River Dun flows into the River Kennet in Hungerford. From Hungerford, the canal runs east to Reading in close association with Kennet. There is an exchange of waters from canal to river and vice versa.

Approximately half way between Hungerford and Newbury, the River Kennet and Kennet & Avon canal join and follow the same channel for a short distance. They separate again and the river flows through the Craven Fishery for approximately one mile. At this point the Kennet flows back into the canal before flowing over a set of hatches and on through the Benham Estate.

The two watercourses rejoin 3 km downstream and flow together through Newbury until joined by the River Lambourn. From this point to Reading the river and canal separate and rejoin at several locations, as shown on Figure 1.1.

The water quality in the river and canal differ greatly. The river is a groundwater-fed chalk stream whose chief characteristics are clear and fast-flowing water. Although the source water to the canal is much the same, the fact that it is a slow-flowing or static watercourse, which acts effectively as a series of temporary sinks of catchment derived sediment. In

addition, because of the long retention time of the canal water and catchment inputs of nutrients and algae (from Wilton), the canal acts as a linear bioreactor for algae. This has two effects: the algae consume the available nutrients, resulting in a significant seasonal reduction in phosphate load but at the same time a significant growth (blooms) of algae (chlorophyll-a). . This manifests itself in discharges of turbid water from the canal to the river especially at times when there is increased navigation (releasing algae in suspension and re-suspending sediments that have settled on the bed of the canal at locks).

The main factors influencing water quality in the canal are:

- Elevated concentrations of nutrients, particularly phosphorus
- High sediment loading
- Boat traffic disturbing bed-sediments and associated nutrients
- Slow flowing water
- Impoundments (Locks)
- Shallow water leading to higher temperatures
- The decay of organic matter

Sources of nutrient inputs to the canal:

Sewage treatment works (STWs) – these are the main point source of nutrients to the canal. The slow flowing nature and higher water temperatures in the canal provide ideal conditions for algae to feed and multiply on the rich nutrient source. Several STWs discharge directly and indirectly into the canal, including Great Bedwyn and Kintbury.

Wilton Water – this reservoir provides the main water supply for the canal on its eastern arm between the summit and its confluence with the Kennet. Wilton Water is a shallow, groundwater-fed artificial reservoir which is surrounded by intensive agricultural land. It also receives the discharges from two sewage treatment works. Water is pumped from the lake and discharged into the canal close to the summit to maintain navigation.

Agricultural runoff – the canal passes through large areas of intensive agriculture where the application of natural and artificial nutrients is commonplace. Much of the land is sloping and at risk from overland runoff following high rainfall events. Nutrients may also reach the canal via flow in numerous stream, ditches and tracks.

Stored nutrients – the sediment deposited in the canal acts as a storage compartment for nutrients from point and diffuse sources and as a result of the decay of organic matter.

Sources of sediment inputs to the canal (many similar to nutrient inputs)

There is a wide array of sources of sediments entering the canal, many of which are similar to the nutrient input sources:

- Direct runoff from agricultural land
- Direct runoff from urban areas via surface drainage
- Feeder streams which discharge directly to the canal. Many of these streams have large catchments and run intermittently
- Winter interaction points such as the Kintbury Feeder Stream where sediment laden water discharges into the canal to relieve flood pressure on adjoining land
- Sewage treatment works discharge treated effluent under legal discharge consents where suspended sediment levels are controlled. Storm discharges are permitted under the consents and can add sediment, mainly in the form of organic matter.

- Organic material from the decay of leaf litter
- Canal bank erosion which can be caused by passing boat traffic and by the burrowing activities of American Signal Crayfish, which are common in the canal

Effects on water quality of the River Kennet resulting from the interaction of the river and canal

The mixing of canal and river water increases levels of sediment and nutrients in the river. This may occur as a result of overspills from the canal and in the case of the Kennet at points where the two watercourses join, such as Copse Lock. The resultant levels of turbidity in the river can have an adverse impact on fish spawning, invertebrates and aquatic plant life.

A sampling run carried out on behalf of the Environment Agency in July 2007 showed how the increased levels of algae in the canal are transferred to the river and increase the measured levels downstream (Fig 1.2)

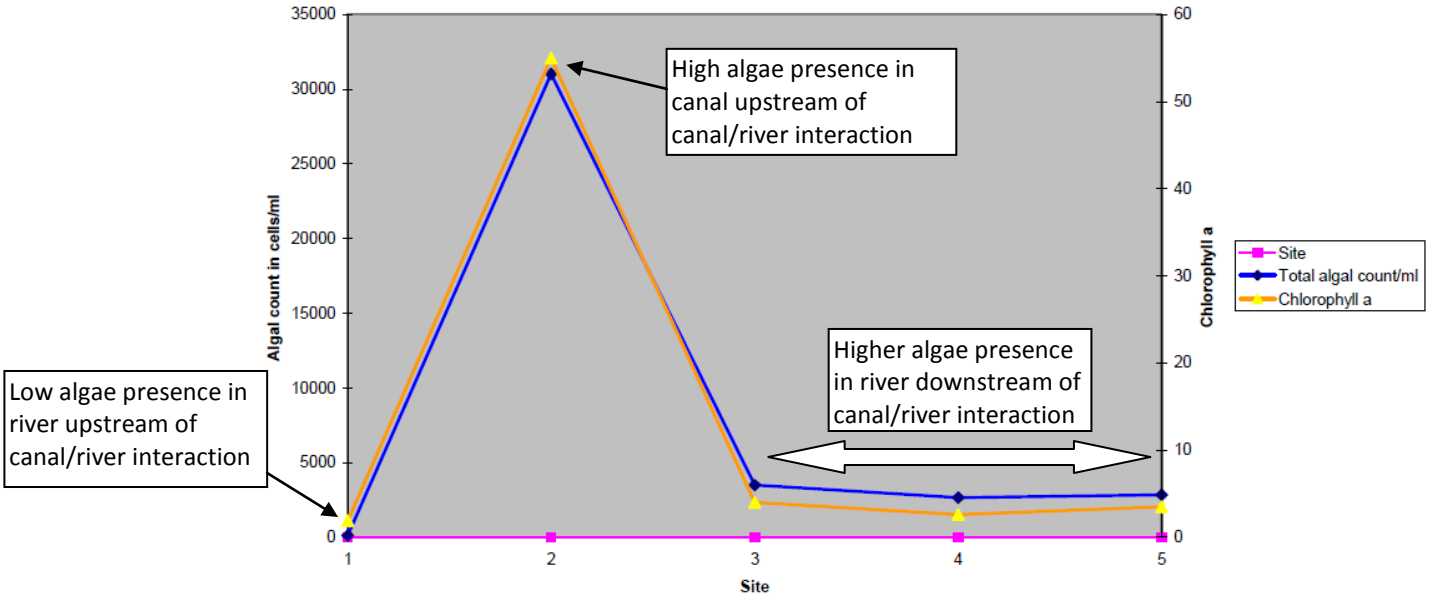

Figure 1. 2 - Algae in K&A canal 10th July 2007

Figure 1.2 shows the low levels of algae and chlorophyll upstream of the confluence of the Kennet and Kennet & Avon Canal at Copse Lock (Site 1). Site 2 is a measure of the algal/chlorophyll levels in the canal upstream of Copse Lock. Sites 3, 4 & 5 show the relative increase in algal/chlorophyll levels in the river downstream of the confluence.

The Kennet from Marlborough to Reading has been designated in the River Basin Management as heavily modified on the grounds of the river's use for navigation. The ecological potential is moderate, with Good Ecological Potential not set to be achieved until 2027. Macrophytes and phytobenthos have not been monitored for WFD classification, but have been assessed by consultants Environmental Planning Associates[1], working on behalf of local riparian owners. They concluded that phosphates and algal growth in the middle Kennet between Hungerford and Newbury have been responsible for heavy sedimentation, poor *Ranunculus* growth and poor conditions for trout spawning.

The River Lambourn joins the Kennet in Newbury and adds a flow of high quality water to the system. Between Newbury and Reading the river is further affected by interchanges with

[1] Assessment of Potential Causes of Sediment Deposition Problems in the River Kennet. Environmental Planning Associates. December 2007.

canal including stretches where the two watercourses share the same channel. This leads to high turbidity levels made up of a mixture of suspended sediment and algae. This is known to coat aquatic weeds including *Ranunculus*, thus affecting growth potential.

Fish are classified as moderate for the Middle Kennet from Marlborough to Newbury and good for the Lower Kennet and Holy Brook. The quality of the fishery in the Middle Kennet is markedly worse below Hungerford, after the interaction with the canal, as shown in Table 1.1

Reach	Site Name	Year	Fish EQR	Class	Mean Fish EQR for reach	Class for reach
Marlborough to Hungerford	Elcot	2005	0.366	Moderate	0.313	**Moderate**
	Werg Mill, Mildenhall	2005	0.293	Moderate		
	Sheepdrove Bend	2005	0.31	Moderate		
	White Bridge - Axford	2002	0.282	Moderate		
	Harbrook, Ramsbury	2005	0.313	Moderate		
	Howe Mill	2005	0.358	Moderate		
Hungerford to Newbury	Willow Stream – Barton Court	2005	0.139	Bad	0.250	**Poor**
	Pipe Stream – Wilderness	2005	0.438	Good		
	Pipestream River Kennet	2002	0.268	Poor		
	Bathing Pool to Barnets Hatch	2004	0.282	Moderate		
	Marsh Benham	2005	0.241	Poor		
	Northcroft Recreation Centre -West Mills	2005	0.134	Bad		

Table 1. 1 – fisheries classification for the Middle Kennet water body

In recognition of the fundamental differences in the River Kennet on either side of the interaction with the canal, the Environment Agency has proposed to split the Middle Kennet water body into two, above and Copse Lock. The new water body from Copse Lock down to Newbury would have a poor fisheries classification on the basis of the data shown in Table 1.1.

Between Newbury and Reading, the river is further affected by interchanges with the canal and shares channels at the locations shown in Figure 1.1. The river experiences high turbidity and poor ranunculus growth throughout, as noted during fish surveys but not formally monitored. Fish are classified as moderate from Newbury to Woolhampton and good from Woolhampton to Reading, although local angling groups dispute this. Macrophytes and phytoplankton have not been classified, but are suspected to be at moderate status or worse.

2. Past and current activities to reduce the impact of the interaction

In 2006/7, two reports highlighted the problems being caused by interaction of the canal with the river:

- A scoping study carried out by Halcrow for the Environment Agency in 2006, which examined the evidence of the impact and put forward a sequenced programme of activities to understand the problem better and deal with it.
- The Environmental Planning Associates study on behalf of the Sutton estate in 2007, which highlighted the water quality deterioration which had damaged the fishery.

The Halcrow scoping study recognised the difficulty and cost of full separation of the canal and river, and recommended that this should not be pursued until various pilot projects and investigations had been undertaken. These have largely been done, or are currently being done, and the outcomes can be summarised as;

1. Some dredging has been carried out by British Waterways to maintain sufficient depth for navigation.
2. A flow gauging investigation of the Kintbury Feeder and associated watercourses has provided data to ascertain the feasibility of changing flow characteristics in the area to reduce sediment input to the canal.
3. There have been various activities promoted through the Defra's Catchment Sensitive Farming programme to reduce sediments and agricultural pollutants entering the canal at Peartree Bottom and the Shalbourne. The effectiveness has not been measured
4. There have been design studies for works to prevent sediment-rich flow from Peartree Bottom entering the canal.
5. Floating reed islands have been installed at Wilton Water to encourage the development of zooplankton capable of removing harmful planktonic algae. The effectiveness has not been measured.
6. There have been designs produced for seven new by-pass weirs on the canal where it runs adjacent to the River Dun, which would prevent overspills of canal water into the river. Funding for the construction of the weirs is now being sought through Defra's catchment restoration fund.
7. An investigation into the sources and scale of urban diffuse pollution to the Kennet from industrial estates in Newbury.
8. A feasibility study for separation of the canal and river at Copse Lock, carried out by Atkins Ltd for Environment Agency in 2011, has shown that separation would be feasible, but expensive and with significant secondary impacts that might negate the benefits.
9. The phosphorous consent at Kintbury sewage works was tightened in 2007 and monitoring undertaken by the Environment Agency shows a significant reduction in phosphate discharged into the canal. Phosphate stripping is planned for Great Bedwyn within the current asset management plan period.
10. An investigation was undertaken by the Environment Agency in 2010 into urban diffuse pollution in Newbury, which identified a number of actions to reduce pollutants entering the canal and river, particularly sewer mis-connections.

Since the studies in 2007, steady progress has been made into understanding and dealing with the problem. However, the ecological impacts and their causes are still only partially understood and the feasibility of achieving good ecological potential has yet to be established. Activity now needs to be intensified to enable Water Framework Directive targets to be met.

3. Measures to be taken

3.1 Measures in the River Basin Management Plan

Annex C of the Thames River Basin Management Plan contains a number of measures to deal with the canal/river interaction as shown in Table 1.2

RBMP Measure Code	What Needs to be done	Location	Lead organisation	Dates		External partners	EA owner	Expected costs (£s)	Funded (Y/N)	Actual Costs (£s)
				Implementation	Completion: Actual (expected)					
TH0008	Operational management protocol for the Dun overspills agreed with BW to minimise pollution risk	Kennet and Avon Canal and Dun above Hungerford	BW	2010	2010		Graham Scholey			
TH0033 & 0165	Copse Lock river/canal separation detailed feasibility study	Kennet & Avon canal and river, Copse Lock to Reading	EA	2011	2011	KCRP members	Kat Cornfield			
TH0033	Barton Holt habitat restoration	Middle Kennet (Marlborough to Newbury)	EA	2011	2011		Graham Scholey			
TH0046	Agreement with BW on strategy to reduce growth in boat movements by constraining new moorings and hire boat licences	All water bodies connected to canal	NE and EA	2010	2010		Graham Scholey			
TH0044	Dredging programme on K&A Canal to reduce levels of silt and remove nutrients	Whole canal from summit pound to Reading	BW	2010	On-going		Graham Scholey			
TH0282	AMP5 investigation into water quality impacts of sewage treatment works on the Kennet and Avon Canal	Kennet and Avon Canal and Dun above Hungerford	Thames Water		2011	BW	Kat Cornfield			
TH0038 & TH0039	Biological monitoring of River Kennet SSSI between Hungerford and Newbury	Middle Kennet (Marlborough to Newbury)	EA		2010		Kat Cornfield			
TH0234	In the absence of specific RBMP LDF policy and for windfall sites, we will work with West Berkshire DC and developers to influence high quality development which has the potential to protect and enhance the natural river corridor.	Kennet and Avon Canal and Dun above Hungerford			On-going	Sarah Green				

Table 1. 2 - RBMP measures for tackling the canal/river interaction

Three years in to the first 6-year river basin management cycle, these measures are all complete or substantially in hand. However, there is still no conclusive picture of the measures needed to achieve good ecological potential in relation to the potential impacts of the canal/river interaction A lot has been done and it has yielded some good data which has helped to define some of the issues but has failed to define the extent of the problem and the relative importance of different causative factors and impact pathways.

Determining what is needed to achieve “good” status

There now needs to be an expanded programme of activities that builds on the investigations that have been undertaken and the improvements put in place (although these

have so far been quite limited). Fundamental to this will be further work to define the nature of the problem downstream of the interaction between the canal and the River Kennet which will then define the nature and extent of the different measures required to:

- Manage catchment inputs of nutrients and resulting water quality in the canal and manage algal blooms; and,
- Manage catchment sediment inputs to the canal and from it to the river.

It is likely that a combination of catchment measures will be necessary. . There also needs to be better understanding of the effectiveness of measures already undertaken to manage sediment and nutrient inputs to the canal, including broader catchment management measures.

An outline programme of activities aimed at reaching a full understanding of what is needed to deliver "good" potential by 2021 is shown in Figure 1.3. This programme has been developed with the support of Atkins, drawing on their significant practical experience of responding to issues within the Kennet catchment (including their work on the Copse Lock separation study, ongoing water quality investigations and various water resources assessments).

Broadly, the programme is intended to enable all activities necessary to achieve good condition to be identified, assessed as feasible and costed by the end of the first river basin management cycle in 2015. The measures identified can then be incorporated in the second cycle RBMP for completion and achievement of good status by 2021.

3.2 The need for technical leadership

Four major organisations are involved in addressing the canal interaction issue – the Environment Agency, British Waterways, Thames Water and Natural England. Each has played its part in leading the various activities that have taken place since the Halcrow scoping study in 2006. However, progress has been slow, partly no doubt because of funding constraints, but also, probably, because of the shared responsibility and lack of "ownership" of the problem. If progress is to accelerate, more technical leadership is needed to coordinate the investigations required to understand the problem and to develop an integrated programme of feasible projects to deliver the improvements.

Therefore, a Managing Consultant should be appointed, reporting to the Kennet catchment steering group and with a brief to:

- Design and arrange procurement of the investigations needed to understand the issue and identify solutions
- Interpret the results of investigations and provide technical coordination to all the parties undertaking them
- Ensure that the condition of the canal and river is appropriately monitored, so that their base-line condition is firmly established and the effectiveness of improvement projects can be measured
- Identify potential solutions and establish their feasibility
- Prepare a masterplan, which would, by 2015, establish and appraise a fully identified, feasible programme of activities to achieve "good" status, ideally, by 2021.

An immediate priority for the Kennet catchment steering group is to agree the need for this role, develop the terms of reference and arrange funding for an estimated cost of £100,000 over three years. The September 2012 window for the Defra catchment restoration fund would be the first target for funding. However, other avenues also need to be explored,

including contributions from the four main partners and from the riparian owners affected. The aim should be to appoint the Managing Consultant by the end of 2012.

3.3 Further investigations needed

Figure 1.3 gives some details of the investigations needed. These fall into four categories:

1. Identification of causal factors of impact on ecological condition – this will involve review of all existing information, including information currently being collected by Thames Water, but will also require more field investigations, including algal monitoring and sampling of the condition at river gravels, with associated laboratory testing.
2. Assessment of sediment input to and from the canal - this will build on investigations currently being undertaken by the Environment Agency, make use of British Waterways dredging data and will include further data collection and laboratory analysis. The outcome will be the identification of the key sources of sediment, the relationship with nutrient loading, and the potential impact on ecological condition.
3. Assessment of nutrient inputs to and from the canal – this will build on the work currently being undertaken by WS Atkins for Thames Water and will include further water quality modelling. The outcome will be the identification of feasible and cost effective measures to deliver long term sustainable improvements to ecological condition.
4. Identification and assessment of an integrated programme of measures – the measure are likely to include improvements to management of Wilton Water, a structured programme of remedial and maintenance dredging, sewage treatment and effluent disposal improvements, diversion or partial diversion of stream inflows to the canal at Peartree Bottom, improved or new lock by-pass channels and, possibly, some canal/river separation. Their assessment will involve water quality modelling of their combined effectiveness, engineering feasibility studies of sufficient detail to derive firm estimates of cost and impacts on land holdings, and environmental impact assessments of each component project.

Figure 1.3 - Programme to investigate and implement actions needed to achieve Good Ecological Potential

Addressing the impacts of interaction between the River Kennet and the K&A Canal

Key

- Indicative delivery - best case
- Indicative delivery - precautionary view
- BW ongoing programme
- Programme reporting

	Studies	Lead / Partners	2012	2013	2014	2015	2016	2017	2018	2019	2020	Funding	Estimated cost (£)	Risk / Dependencies	Comment
A	**Aim: Programme co-ordination and management**														
	Outcome: Integrated programme management, development & review														
1	Appointment of Managing Consultant to provide the programme management framework, technical development, overview and supervision of delivery of outputs agreed to deliver GES/GEP	TBA											£100k (Initial 3 yr period)	Requires co-ordination and agreement of funding to programme	Independent managing consultant role to provide technical co-ordination and interpretation, and overall programme management. Funding based on 3 year programme, to be reviewed / rolled forward
2	Development of masterplan - planning framework for delivery of fully evidenced framework and programme for delivering GES/GEP in the Kennet as of 2015 (end WFD 1st cycle)	TBA													★ Denotes annual report of programme and analysis to programme board. Key dates: Delivery of Evidence Framework and Outline Programme (January 2015); Funding and Implementation of Programme (2015-20)
3	Secure funding and implementation of measures (WFD 2nd cycle)	TBA													
B	**Aim: Characterising impact on ecological condition**														
	Outcome: Identification of the key causal factors of impact on ecological condition														
4	**Review baseline monitoring** information to identify specific drivers of impact / deterioration on ecological condition at points of interaction between canal and river (Dreweat's, Copse):- hydro-ecological analyses (LIFE, HEV etc), hydro-morphology (RHS etc), sediments (Psi), pesticides (SPEARS), fishery status etc	EA											£45k		Some analysis recently undertaken but will require further development following a further one or two years data collection. Diatom methodology specifically for Chalk streams currently being developed but not available. Will need to be applied to River Kennet and tributaries.
5	Undertake specific **investigations** of condition of river bed gravels and comparative analysis of sites on the Kennet against those downstream of Dreweat's and Copse (freeze core sampling, egg box sampling, etc. Integrated monitoring strategy incl. physical properties, hydrochemistry and ecology to inform linkages.	EA											£65k		Assumes 5 sites for 1yr, excluding equipment cost (to be covered by EA). Could include other sites on the canal (Peartree, Kintbury etc as indicated in #7-9) which could increase costs .
6	**Integration -** Assessment of the relative impacts of nutrients, algae and sediment inputs on ecological condition	EA											£10k		Based on inorganic / organic fraction analyses, flourescence, chemical analyses etc to be defined in #5.

Figure 1.3 (cont.) - Programme to investigate and implement actions needed to achieve Good Ecological Potential

	Studies	Lead / Partners	2012	2013	2014	2015	2016	2017	2018	2019	2020	Funding	Estimated cost (£)	Risk / Dependencies	Comment
C	**Aim: Assessment of impact of sediment input to / from the canal**														
	Outcome: Identification of the key sources of sediment, relationship with nutrient loading, and potential impact on ecological condition														
7	Sediment **source mapping**: collation and review of wet walk-over surveys (NE, ARK etc) and sediment analysis (BW, NE)	EA / NE / BW											£5k	Availability of data from EA and NE surveys. Quality of observations from independent	Review of data from ongoing assessments. Additional survey costs ?? Analysis of impact of signal crayfish on bank erosion?
8	Undertake further investigation of sediment **load and physico-chemical character** (inorganic, OM, bound phosphorous): suspended and bed sediment (feeder streams, canal and river).	EA / NE / BW											£30k	Linked to monitoring in #2. Not proposing to follow detailed chemical analyses currently being undertaken by EA but will require longer term data set	Assessment relative proportion of catchment - algal load. Assessment of feeder stream loads, winter interactions (Kintbury, Peartree etc).
9	Assessment of sediment **dynamics** of the canal: sources, storage, temporal variation in loads; compared to river baseline	EA / NE / BW											£15k	Requires longer term data set; analysis limited to limitations of available data and planned surveys (1yr)	Identify / quantify sources, sinks, release dynamics. Review BW dredging data to provide initial quantification of load at key points.
D	**Aim: Assessment of the nutrient inputs to / from the canal**														
	Outcome: Identification / quantification of catchment sources, identification of impacts and measures to improve quality														
10	AMP5 Investigations of nutrient inputs from sewage treatment works	TW											N/A		Planned completion December 2012
11	Phosphorous reduction at Gt Bedwyn sewage works	TW											Not available		Planned for implementation in current AMP period
12	Quantification of catchment sources and assessment of impact pathways. Understanding of nutrient / sediment interactions.	EA / NE / BW / TW											£40k	Potentially requires development of new models	Review of outputs from #1 to #8 with further modelling (SAGIS, Canal model, INCA / SIMCAT?)
E	**Aim: Identification and assessment of measures**														
	Outcome: Identification of feasible and cost effective measures to deliver long term, sustainable improvements to ecological condition														
13	Management options to reduce nutrient inputs to Wilton Water	TW / BW											£30k	Need will link to findings of investigation #7	Options identification and initial feasibility: treatment at STW works, greensand aquifer. May require additional modelling scenarios
14	Implementation of agreed and cost-effective management measures to reduce nutrient inputs to Wilton Water	TW / BW											Not available	Dependency on regulatory processes for TW. BW?	
15	Alternatives to canal - river separation. Feasibility of other measures at Dreweat's / Copse to manage sediment and treat algae / nutrients prior to canal discharging to the river.	BW/EA											£50k	Will link to findings of investigation #7	
16	Ongoing remedial / targetted dredging	BW											Not available	Findings of #1 to #11 may identify a more cost effective approach to sediment management	
17	Peartree Bottom culvert: review need, feasibility, impact, cost-effectiveness	BW/EA											£400k	Need will link to findings of investigation #7	Will require feasibility / options appraisal
18	Kintbury STW effluent by-pass: review need, feasibility, impact, cost-effectiveness	TW / BW / EA											£M's	Need will link to findings of investigation #7	Will require feasibility / options appraisal. Implementation (if funded by TW) will require direction (and funding approval) from EA / Ofwat (NEP Programme)

Figure 1.3 (cont.) - Programme to investigate and implement actions needed to achieve Good Ecological Potential

	Studies	Lead / Partners	2012	2013	2014	2015	2016	2017	2018	2019	2020	Funding	Estimated cost (£)	Risk / Dependencies	Comment
C	**Aim: Assessment of impact of sediment input to / from the canal**														
	Outcome: Identification of the key sources of sediment, relationship with nutrient loading, and potential impact on ecological condition														
7	Sediment **source mapping**: collation and review of wet walk-over surveys (NE, ARK etc) and sediment analysis (BW, NE)	EA / NE / BW											£5k	Availability of data from EA and NE surveys. Quality of observations from independent	Review of data from ongoing assessments. Additional survey costs ?? Analysis of impact of signal crayfish on bank erosion?
8	Undertake further investigation of sediment **load and physico-chemical character** (inorganic, OM, bound phosphorous): suspended and bed sediment (feeder streams, canal and river).	EA / NE / BW											£30k	Linked to monitoring in #2. Not proposing to follow detailed chemical analyses currently being undertaken by EA but will require longer term data set	Assessment relative proportion of catchment - algal load. Assessment of feeder stream loads, winter interactions (Kintbury, Peartree etc).
9	Assessment of sediment **dynamics** of the canal: sources, storage, temporal variation in loads; compared to river baseline	EA / NE / BW											£15k	Requires longer term data set; analysis limited to limitations of available data and planned surveys (1yr)	Identify / quantify sources, sinks, release dynamics. Review BW dredging data to provide initial quantification of load at key points.

3.4 The Masterplan for delivering GEP and favourable SSSI condition

The aim should be to appoint the Managing Consultant by the end of 2012

The outcomes of all the work to be coordinated by the Managing Consultant will be incorporated in the masterplan, which should be completed in draft by the end of 2014, with refinements continuing in 2015 as some of the longer term investigations are completed and negotiations with potential funders, land owners and deliverers of projects evolve. The masterplan will include:

- A summary of the outcome of all diagnostic investigations, defining the condition of the canal and river, and ecological impacts of the inter-action that need to be overcome
- A summary of the feasibility work on potential improvement projects, including details of estimated costs of construction and long-term maintenance, environmental assessments and implications for affected land holdings
- Consideration of alternative improvement strategies, with combinations of remedial projects and operational improvements.
- Recommendations for the preferred improvement strategy
- Sufficient supporting evidence to justify the recommendations to be taken forward in the second cycle river basin management plan

The Managing Consultant will produce a report on the investigation findings in mid-2014 and the draft masterplan by the end of 2014. There will also be 6-monthly progress reports and presentations to the Kennet catchment steering group.