

CATCHMENT POLLUTION REDUCTION PROGRAMME UNDER DIRECTIVE 78/659/EEC ON THE QUALITY OF FRESH WATERS NEEDING PROTECTION OR IMPROVEMENT IN ORDER TO SUPPORT FISH LIFE

Improvement programme to achieve Guideline values under Article 5 of the Directive

RIVER TWEED CATCHMENT
Monitoring Years: 2005-2007

1. CATCHMENT DETAILS

The Tweed catchment covers an area of over 4400km² and the majority of waters are designated under the Directive. Table 1 shows details of the sampling points covered by this programme.

Table 1 Details of sampling points

SOEnvD Ref No	Sampling point NGR	SEPA Location Code	Site Name	Waterbody Name	SEPA Waterbody ID	SEPA Catchment No	Fish Class
501	NT941635	9422	Eye Water	River Eye	5010	67	Salmonid
502	NT890468	9514	Norham	Tweed	5200	69	Salmonid
503	NT209400	9847	Lyne Water Foot	Lyne Water	5311	69	Salmonid
504	NT439276	9821	Yarrow Water Foot	Yarrow Water	5290	69	Salmonid
505	NT488322	9542	u/s Ettrick Water Foot	Tweed	5203	69	Salmonid
506	NT489321	9798	Ettrick Water Foot	Ettrick Water	5287	69	Salmonid
507	NT511350	9678	Gala Water Foot	Gala Water	5280	69	Salmonid
508	NT577346	9650	Leader Water Foot	Leader Water	5266	69	Salmonid
509	NT511153	9735	Weensland	Teviot Water	5220	69	Salmonid
510	NT629234	9750	Ale Water Foot	Ale Water	5236	69	Salmonid
511	NT709275	9743	Kale Water Foot	Kale Water	5222	69	Salmonid
512	NT719335	9710	Teviot Water Foot	Teviot Water	5219	69	Salmonid
513	NT786567	9472	Cumledge	Whiteadder Water	5101	68	Salmonid
514	NT863544	9490	Blackadder Water Foot	Blackadder Water	5105	68	Salmonid
515	NT937535	9457	Chesterfield	Whiteadder Water	6844	68	Salmonid

2. CATCHMENT DESCRIPTION

The River Tweed drains the eastern slopes of the Scottish southern uplands and the northern slopes of the Cheviots, flowing over 160 km before reaching the Tweed estuary at Berwick. The main rivers of the Tweed catchment include the Teviot to the south with its tributaries Ale, Jed and Kale Waters, the Whiteadder, Blackadder and Eye Waters to the north and the tributaries of the Tweed itself such as the Ettrick, Gala and Leader Waters. The sheer size of the catchment leads to a diverse range of physical characteristics. Elevations range from over 800m in the upper catchment to sea level at the estuary. Average rainfall over the whole catchment is 969 mm yr⁻¹ but ranges from 1891 mm yr⁻¹ in the south west to 652mm yr⁻¹ in the east.

The Tweed has a strong nutrient gradient throughout its system, with oligotrophic conditions in the headwaters and nutrient-rich lowlands. Land use in the upper catchment is predominantly heather and grass moorland along with significant areas of managed coniferous forestry. The rest of the catchment is dominated by arable agricultural land. The south-eastern lower parts of the catchment are designated under the Nitrates Directive as Nitrate Vulnerable Zone (NVZ) for surface and groundwater, reflecting the intensive use of land for agriculture. The Leet Water catchment, a tributary of the Tweed just upstream from sampling point 502, is also designated as a Surface Water NVZ.

There are many protected areas within the Tweed catchment, the most notable being the River Tweed itself which is a Special Area of Conservation (SAC). This is due to its high ecological diversity, its significant population of Atlantic Salmon, three species of Lamprey, Ranunculus species and otters. Due to a high proportion of the River Tweed being accessible to salmon and the variety of habitat conditions in the river, the full range of salmon life-history types can be found. As a consequence, the Tweed is a renowned salmon fishery that is of significant economic value to the local area. Salmon catches have been increasing over the last few years, indicating the general good, and improving health of these waters. Other designated areas include the Moorfoot Hills SAC for its large extent of European dry heath and blanket bogs, and Dogden Moss SAC, a raised bog in an upland area.

Although much of southern Scotland is underlain by weakly permeable rocks, there are also areas of younger rocks in the Tweed catchment that have moderate to high permeability. Most of the catchment is dominated by sandstone, the upper half in particular. The mouth of the Tweed has interbedded sandstone and limestone, the southern area is sandstone and siltstone, and the Cheviot Lavas extend into the most south-eastern corner of the catchment. Till deposits are mainly found in the lower parts of the catchment, and glacial sands and gravels and alluvium are present in all the major river corridors. These river gravels can supply large volumes of naturally filtered river water, but are dependent on the stage of the river.

River quality, as illustrated in Figure 1, is generally excellent or good throughout the catchment, despite a number of discharges particularly from Sewage Treatment Works (STWs). Diffuse agricultural pollution has a part to play in reducing water quality in the lower parts of the catchment.

4 2 0 4 km
[Scale bar]

River Tweed



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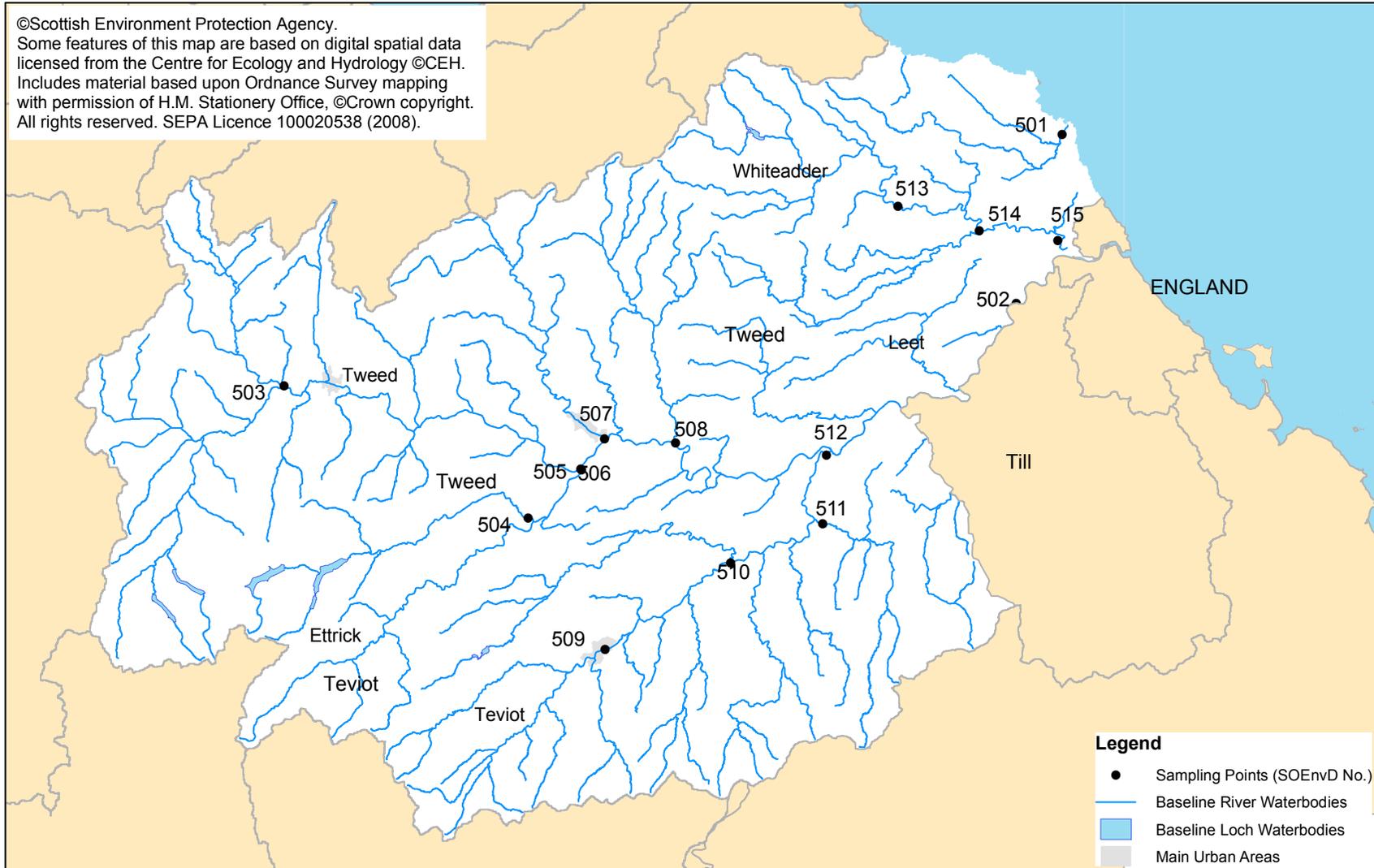


Figure 1 River Tweed Catchment

3. COMPLIANCE

Waters throughout the catchment are identified as salmonid waters as described in the Directive. Many discharge improvements have been carried out in the catchment and during 2005-2007 all monitoring sites bar one at Norham met all imperative standards as specified in the Directive. Norham on the Tweed has a separate improvement plan. Table 2 shows those sites in the catchment that fail to comply fully with guideline values.

Table 2 Sites not respecting guideline values 2005-2007

SOEnD Ref.	Watercourse	Site Name	Parameter(s)	Year Failed
501	River Eye	Eye Water	Nitrites Total ammonium	2005, 2007 2005, 2006
502	Tweed	Norham	Dissolved Oxygen Nitrites Non ionised ammonia pH (failed I value) Total ammonia	2004 2005-2007 2005-2006 2005-2006 2005-2006
503	Lyne Water	Lyne Water Foot	Nitrites Total ammonium	2005-2007 2005-2007
504	Yarrow Water	Yarrow Water Foot	Nitrites	2005
505	Tweed	U/S Ettrick Water Foot	Nitrites	2005-2007
506	Ettrick Water	Ettrick Water Foot	Nitrites Total ammonium	2005 2005-2006
507	Gala Water	Gala Water Foot	Nitrites Total ammonium	2005-2007 2005-2007
508	Leader Water	Leader Water Foot	Nitrites Total ammonium	2005-2007 2005-2007
509	Teviot Water	Weensland	BOD5 Total Ammonium Suspended solids	2005 2006 2005
510	Ale Water	Ale Water Foot	Nitrites Non-ionised ammonia Total ammonium	2005-2007 2006 2007
511	Kale Water	Kale Water Foot	BOD5 Nitrites	2007 2005-2007
512	Teviot Water	Teviot Water Foot	Nitrites Total ammonia	2005-2007 2005-2007
513	Whiteadder Water	Cumledge	Nitrites Total ammonium	2005-2007 2007
514	Blackadder Water	Blackadder Water Foot	BOD5 Nitrites Total ammonium	2007 2005-2007 2005-2007
515	Whiteadder Water	Chesterfield	BOD5 Nitrites Non-ionised ammonia Total ammonium	2007 2005-2007 2005 2005-2006

4. CAUSATIVE FACTORS

Land use in the Tweed catchment is predominantly agricultural, ranging from heather moorland on the hill slopes to arable land in the eastern lowlands. Diffuse pollution is therefore a significant threat to meeting the Directive's guideline standards, particularly from agricultural run-off. Animals have unhindered access to water courses in many locations which can lead to faecal contamination as well as erosion, bank instability and sediment movement issues.

There are a number of STWs serving small rural towns and villages in addition to private septic tanks that discharge to the water courses in the catchment. Occasionally there may be operational problems that can add stress to the water environment, particularly during dry periods of weather. In the vast majority of cases however, exceedances of nitrites and total ammonia are due to diffuse pollution rather than specific incidents or incapacity of sewerage systems.

The Tweed has a number of significant drinking water supplies in the form of large reservoirs and abstractions, and the operation of these can sometimes lead to stress in downstream watercourses due to low flows. Low flows, due to both natural and artificial conditions, can cause reduced aeration and enhance the susceptibility of the water to temperature rises when in direct sunlight. These conditions are known to cause excessive algal growth in some areas which leads to sharp increases in pH and an increase in toxicity of non-ionised ammonia. This can happen naturally as well as being exacerbated by diffuse pollution. Additionally, despite SEPA's best efforts, land is continually cropped to the edge of burns which reduces protection from direct sunlight and decreases the distance for buffering against fertiliser-enriched run-off. Watercourses can also be canalised to increase the area of land utilised and, with very little shading in places, the full impact of direct sunlight assists in providing ideal conditions for algal growth. These factors, along with the surrounding arable land use, are likely to be significant contributors to the high pH values at Norham in July and August 2005.

5. RECENT IMPROVEMENT ACTIONS

The Quality and Standards (Q&S) investments and schemes within the Tweed catchment will result in overall improvements to chemical and ecological water quality throughout the area. Ancrum STW was improved in 2003, just upstream of site 510 on the Ale Water, and included the installation of a reed bed. The discharge from Ayton STW was removed from the Eye Water in January 2006, and sewage is now pumped to Eyemouth for treatment.

An Action Plan completed in 2005 reviewed private sewage treatment installations with respect to environmental risk and legal compliance. As a result, a number of previously unconsented discharges were consented or soakaways confirmed. Another Action Plan investigated sources of pollution at Charlesfield Industrial Estate that were causing downgrading of the St Boswells Burn, which is a tributary of the Tweed upstream of site 512. Runoff from a wash bay was redirected to foul sewer, and the burn is now excellent water quality. An Action Plan was also carried out at Duns Industrial Estate where surface water discharges were impacting the Kelloe Burn, just upstream of site 514 on the Whiteadder. Cross connections were identified that have now been rectified, and liaison with Scottish Water continues about other possible sources of surface water contamination.

The Leet Water, which flows into the lower Tweed at Coldstream, suffers greatly from diffuse agricultural pollution and a number of studies have been undertaken within the catchment over the last few years. A two year Action Plan on the Lamden Burn, part of the Leet catchment, identified significant nutrient inputs to the watercourse from intensive agricultural livestock and poultry units. Farmers were made aware of the issues and with the help of grants from the Farming and Wildlife Advisory Group (FWAG) four wetland or reedbed treatment systems were constructed to deal with the contaminated steading runoff. Three of these are upstream of site 502 so should improve water quality at this site and help ensure the imperative FWF standard continues to be met in future. The other treatment system is located on the Manse Burn, which eventually flows into the [Blackadder](#)

water. Therefore, it may help improve water quality at site 514. The effectiveness of these treatment ponds is being assessed in the Constructed Wetland Monitoring Action Plan that is taking place over the 2008-2010 period.

Another investigation on the Leet looked at quantifying rural sewage discharges and their phosphorus levels. Although it was found that around 60% of phosphorus in the catchment comes from diffuse agricultural pollution, a significant proportion of point sources could be reduced using reed beds and rumbling drains. These findings are now considered when determining new discharge consents in the catchment.

Two other Action Plans within the Tweed catchment investigated the effects of freshet releases on water quality, with the aim of being able in the future to target release dates to coincide with periods of poor water quality. This should help reduce the potential for water quality problems at particularly stressful times of year such as during long periods of dry weather.

A SEPA Action Plan in 2004 looked at pollution in the North Burn that was impacting the designated Bathing Water at Eyemouth. A number of cross connections were identified as well as a cracked foul sewer, both of which were rectified by Scottish Water. The main problem was with two septic tanks discharging into the burn. After many discussions, the discharges were successfully connected to the foul sewer by a local developer in early 2006.

All waters within the catchment were reviewed under SEPA's 'South-East Area Umbrella Directives' Action Plan, which included not only the FWF Directive but also Shellfish and Bathing Waters Directives. Long term data analysis was used to assist in the identification of trends or specific problems which were then targeted for action.

6. PLANNED IMPROVEMENT ACTIONS

SEPA will continue to monitor the Tweed catchment and undertake long-term data analysis to ensure downward trends in pollutants continue and to flag up any specific problems.

The next phase of Quality and Standards within the Tweed for the period 2006-2014 will deliver a number of projects that will improve the overall water quality throughout the catchments. There are also a number of projects which will address population growth demands in areas currently constrained by sewerage infrastructure.

A long term SEPA Action Plan was initiated in 2004 investigating water quality changes associated with a move from extensive to intensive livestock production in the Manse Burn, an upper tributary of the Blackadder. Monitoring is continuing until 2010 to fully understand the impacts, but data to date has shown deterioration in water quality from good to fair although the physical condition of a number of sites appears now to be improving following extensive fencing off to prevent stock access to watercourses. This study will help influence agricultural policy in terms of good agricultural practice, and help SEPA's understanding of diffuse agricultural pollution from livestock with a view to regulation and enforcement under the Water Framework Directive regulations.

A SEPA Action Plan on the Stank at Yetholm is being investigated to assess the reasons for downgrading. Diffuse agricultural pollution, impacts from water use and Yetholm Loch are thought to be potential sources. The investigation will also engage local farming communities to raise awareness of issues where relevant. This should help improve water quality in the upper reaches of the Till which then flows into the Tweed upstream of site 502 at Norham.

The Eye Water was the subject of an Action Plan that began 2005 and is planned to continue into 2010. Investigations suggested cattle poaching and contaminated run-off are potentially significant

pressures on water quality, particularly in the summer. SEPA set up a meeting in November 2006 with local farmers to raise awareness of the issues and explore the options available for livestock watering in the catchment. A survey of the entire Eye Water catchment to identify areas where livestock have access was undertaken and microbiological samples taken to show impact. Over 100 areas of concern were identified in this exercise. SEPA will continue to monitor these areas and through stakeholder involvement seek to remediate these sources, through dialogue with the National Farmers Union Scotland (NFUS), Scottish Government Rural Payments and Inspections Directorate (SGRPID) and individual farmers. The continued monitoring will hopefully provide a robust scientific evidence base to present to stakeholders. Although driven primarily by the Bathing Waters Directive, this action plan should also improve water quality for FWF at site 501.

A SEPA Action Plan is due to commence on the Tufford Burn in April 2009, which is upstream of site 508. It is recognized that historically poultry litter was used within this catchment as fertiliser, which gave rise to high nitrate levels in surface and groundwater in this catchment. This action plan intends to investigate any specific sources of the P enrichment that exist on this burn and its tributaries and discuss actions with the farmers involved to remediate impact. This should raise awareness of the potential problem with high P levels and other nutrients with the farmers concerned, helping to maintain and restore the water environment in this catchment. This should also help these waterbodies meet FWF standards.

There is also a SEPA Action Plan to review, select and prioritise up to 26 candidate sites nationally for the improvement of fish passage. Candidate sites for maximum benefit have been proposed by Fisheries Trusts and Boards and the Fisheries Research Service and include a number of sites in the Tweed catchment area. Although this will not improve water quality, it may help improve fish passage in this catchment if the sites selected are prioritised.

To enable implementation of the EU Water Framework Directive (WFD), the Water Environment and Water Services (Scotland) Act 2003 (WEWS) was passed by the Scottish Executive. This Act gave Scottish ministers powers to introduce regulatory controls over activities to protect and improve the water environment. These regulatory controls, the Water Environment (Controlled Activities) (Scotland) Regulations 2005 (CAR) came into force in April 2006. They encompass discharges of polluting matter to wetlands, surface waters and groundwaters, disposal of waste sheep dip and waste pesticides, abstractions from all wetlands, surface waters and groundwaters, impoundments of rivers, lochs, wetlands and transitional waters, and engineering works in inland waters and wetlands.

These allow SEPA to regulate all abstractions over a set threshold to ensure river flows sustain aquatic ecosystems whilst allowing continued use for essential anthropogenic purposes. This is particularly important in the Tweed catchment, where low flows during the summer can exacerbate temperature and dissolved oxygen problems, subsequently affecting pH and non-ionised ammonia. Controls for new engineering works should also minimise any further degradation of habitat quality. However, whereas abstraction controls are retrospective, applying to abstractions already in place, engineering controls do not apply to pre-existing structures. Significant new in-stream works, channel and bed modifications have been regulated, helping to prevent further loss or damage to physical habitats and their associated species.

The most significant issue in this catchment is tackling land management and reducing agricultural diffuse pollution inputs. SEPA has worked with farming interests and the Scottish Executive to produce and promote 'Codes of Good Practice' to minimise diffuse pollution. The Prevention of Environmental Pollution From Agricultural Activities (PEPFAA) Code outlines the 'dos and don'ts' of farming practices. It focuses on planning tools, in field measures, river margins and the built environment. The 'Four Point Plan' outlines dirty water management around steadings, better nutrient use, a risk assessment for manure and slurry, and managing water margins. The 'Forests and Water' guidelines provide advice on catchment planning, site planning and the conduct of all forest

operations. The 'Farm Soils Plan' provides guidance on recognising and rectifying poor soil conditions, targeted nutrient application, preventing soil loss and protecting water quality and soils. To supplement and compliment this existing advice, guidance on Best Management Practices (BMPs) were produced by SEPA in partnership with Scottish Executive, CEH, The Macaulay Institute, Farming and Wildlife Advisory Group, National Farmers Union Scotland, Forestry Commission, Scottish Agricultural College, and Soil and Water Scotland. This guidance facilitates selection of sites and suitable BMPs to help mitigate diffuse pollution from agriculture in this catchment.

Common Agricultural Policy (CAP) reforms in 2005 decoupled subsidies to farmers from production. This means farmers receive direct support in the form of a Single Farm Payment (SFP) instead of having to produce crops or livestock to obtain subsidies. This further encourages and rewards Best Management Practices and thus should lead to future improvements in water quality.

Also, the CAR regulations were amended and expanded by the Water Environment (Diffuse Pollution) (Scotland) Regulations 2008, which came into force in April 2008. Seven new General Binding Rules (GBRs) for diffuse pollution were added based on standards of good practice such as the PEPFAA Code; providing a statutory baseline of good practice. The activities covered include management of fertilisers, livestock, pesticides, sheep dips, cultivation of land, construction and maintenance of roads and tracks and discharges of surface water run-off. These new regulations should assist in reducing agricultural diffuse pollution and improve water quality throughout this catchment.

The Scottish Rural Development Programme (SRDP) is a £1.6 billion programme of economic, environmental and social measures designed to develop rural Scotland over the 2007-13 period. To deliver environmental aspects of these measures, funding will be available through Rural Development Contracts (RDCs). RDC – Land Management Options (LMOs) provide funding for some measures that can reduce diffuse pollution risk. LMOs entail a 5-year commitment but are non competitive, with each participant limited to a maximum allowance. RDC – Rural Priorities is an integrated funding mechanism that will deliver targeted measures based on regional priorities. Regional priorities will be identified and agreed with local stakeholders through Regional Proposal Assessment Committees (RPACs), which will take account of local conditions and existing regional strategies. Rural Priorities is a competitive mechanism to ensure contracts are awarded to proposals best able to deliver them: as such there is no maximum allowance. Both these funding mechanisms should facilitate the ability of farmers to meet the new GBRs and implement BMPs. This should help mitigate agricultural diffuse pollution, improving water quality in this catchment and helping ensure compliance with FWF standards.

The WFD also requires the production of River Basin Management Plans by December 2009. These will bring together water and land management using an integrated catchment approach, working closely with stakeholders, the public and other organisations. Programmes of measures will be defined to reduce the impact of identified pressures and to ensure environmental objectives are met in the required timescales. The planned improvement actions outlined above will be incorporated into these programmes of measures. This should lead to further water quality improvements and increased compliance with FWF standards.

7. SUMMARY OF ACTIONS

Action	Deadline
CAP Reform regulations commence.	January 2005
SEPA Action Plan reviewing private sewage treatment installations.	Completed April 2005
SEPA Action Plan investigating pollution from Charlesfield Industrial Estate into St Boswells Burn.	Completed April 2005
SEPA Action Plan on the effects of agriculture in the Lamden Burn.	Completed April 2005
SEPA Action Plan quantifying phosphorus in the Leet Water.	Completed April 2005
SEPA Action Plan investigating sources of contamination in the North Burn.	Completed April 2005
SEPA 'South-East Area Umbrella Directives' Action Plan which includes data and trend analysis.	Completed April 2005
Q&S III investment programme begins.	March 2006
Regulation of abstractions, impoundments and engineering works under the WFD begins.	April 2006
SEPA Action Plan investigating freshet releases.	Completed April 2007
i) Develop SEPA internal Action Plan proposals where necessary to address problem areas that are highlighted from data analysis. ii) Undertake required Action Plans.	i) November 2007 ii) April 2008
SEPA Action Plan on Kelloe Burn downstream of Duns Industrial Estate.	April 2008
SEPA Action Plan on The Stank investigating causes of downgrading.	April 2008
SEPA Action Plan on Caddon Water impact assessment of a specific abstraction and regulated flow regime.	April 2008
Regulation of diffuse pollution under the WFD begins.	anticipated by 2008
SEPA Action Plan on Manse Burn investigating impacts of a move from extensive to intensive livestock production.	April 2009
Production of the first River Basin Management Plans.	December 2009
SEPA Action Plan investigating contamination in the Eye Water.	April 2010
SEPA Action Plan on Tufford Burn identifying sources of P enrichment and discussing remedial actions with farmers	April 2010

