natural scotland
SCOTTISH GOVERNMENT

# The river basin management plan for the Scotland river basin district 2009–2015

## Chapter 2:
## Environmental objectives

# Chapter guide*



*Appendices for this document are available on the SEPA website at: www.sepa.org.uk/water/river_basin_planning.aspx

# 1. Introduction

This Chapter sets out our[1] ambition for Scotland's water environment. The objectives it describes are the heart of this plan: our route map for ensuring the quality of Scotland's water environment is among the best in Europe and that we are well placed to cope with the effects of a changing climate.

You can find information on the objectives for individual water bodies using the interactive map on SEPA's website at: www.sepa.org.uk/water/river_basin_planning.aspx

Protecting and improving our water environment will bring multiple benefits. A better water environment will increase potential for new sustainable water uses and so support our economic growth: improving our waters will increase the abundance and diversity of fish and provide opportunities for the development and expansion of fishing-related enterprises. Improving surface waters will also enhance their amenity value to the benefit of our health, well-being and economic regeneration: enhancing and restoring degraded urban rivers will contribute to the regeneration of our inner cities by helping to remove the appearance of dereliction and improving opportunities for recreation.

Achieving our goals for the water environment will also ensure that our wildlife recovers and thrives again in areas where it is currently under pressure: removing barriers to fish migration will enable fish like Atlantic salmon and sea trout to re-colonise parts of the river basin district from which they have been absent for many decades. Systematically improving the ecological quality of rivers in towns, cities and farmland will create a network of high quality wildlife corridors in places where our wildlife habitats are otherwise scarce and relatively isolated from each other.

To safeguard our health and well-being and improve the resilience of our economy to climate change, we need to prepare for hotter, drier summers. Reducing over-abstraction of water will help us provide essential water supplies during drought conditions. It will also allow our rivers to continue to safely absorb waste waters.

We will also need to prepare for increased risks of flooding because of wetter winters and periods of intense rainfall. One of the multiple benefits of tackling water pollution will be the contribution to managing the risk of flooding: To achieve our objectives for reducing urban river pollution, we will need to deal with the problem of rainwater washing pollutants from our streets and pavements, overloading our sewers and polluting our surface waters. Developing more sustainable urban drainage systems will be a key means of doing this. These drainage systems can also act like 'sponges', storing rainwater that has fallen on urban surfaces, slowing down the rate at which it drains into rivers and re-establishing a more natural pattern of river flows. We can make use of this effect to help reduce the risk of urban flooding and hasten the drainage of flood waters where flooding occurs. As our climate changes, multi-benefit solutions for reducing flood risk will become increasingly cost-effective options for helping avoid the social and economic impacts that flooding causes.

Re-establishing vegetation cover and wetlands on banks that have been over-grazed or ploughed will help reduce diffuse pollution caused by agricultural activities by filtering out soil particles washing from fields and by absorbing nutrients. The wetlands can also act as natural flood storage areas and so reduce flood peaks in downstream towns and cities. Better vegetation cover will also stabilise soils and so reduce bank erosion during heavy rain.

Tackling diffuse pollution in agricultural areas will also bring other benefits: reducing losses of nutrients from fields will mean that less fertiliser has to be applied to land. The use of less fertiliser will save carbon emissions because of the large amounts of fossil fuel used in fertiliser production. Improved water quality will also help protect our drinking water sources and so avoid unnecessary water purification costs, including energy costs.

Protecting and improving heavily modified and artificial water bodies from deterioration is also a core aim of the river basin management plan. Despite their heavily modified or artificial characteristics, in good condition such water bodies provide valued sites for biodiversity and recreation and the condition of other water bodies often relies on their being at good ecological potential (eg safeguarding passage of fish).

[1]Where used in this Chapter, "our", "we" and "us" refers to the collective voice of the Scottish Government, SEPA, designated responsible authorities and all Scotland's other public bodies.

## Benefits and our goals for the water environment

Economic considerations have been an integral part of the development of our goals for the water environment from the outset of the river basin management planning process. To enable us take proper account of the costs and benefits of protecting and improving our water environment we carried out a series of economic analyses to inform key decisions.

The Scottish Government commissioned an assessment in 2001[2] to identify the benefits of introducing river basin management planning in Scotland. The results informed the decision by the Scottish Parliament to pass the Water Environment & Water Services (Scotland) Act 2003 (our legislative framework for river basin management planning) into law.

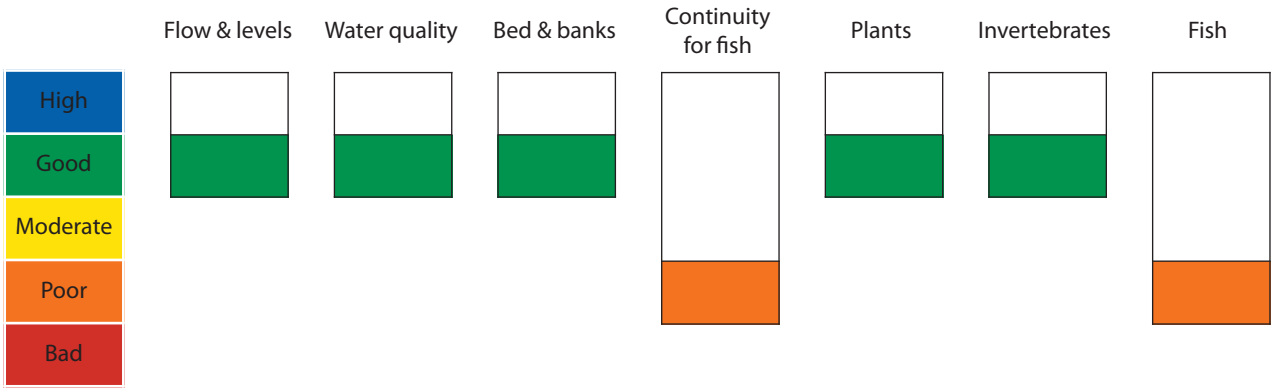
This was followed by further work to improve our understanding of the wide range of potential benefits, including those to individuals[3] and businesses[4]. During 2008, the Scottish Government commissioned an analysis of the benefits of the improvements being considered in the draft of this river basin management plan[5] as well as an assessment of trends relevant to the future management of the water environment[6].

These analyses allowed us to take account of the benefits to our economy, to public health and well-being and to our wildlife when determining the level of ambition for Scotland's water environment to include in this, our finalised river basin management plan. We will continue to take full account of benefits and costs as we put the plan into action.

For the large proportion of the water bodies in the Scotland river basin district that are currently at good status or better[7], our primary objective is to prevent deterioration of their status. For the 35% of water bodies that are currently at less than good status, our overall goal is to progressively enhance and restore the majority of them to good status over the next 18 years. This will mean that by 2027, 98% of all water bodies will be at good status or better.

## Protecting Scotland's water bodies from deterioration

Protecting the status of water bodies does not just mean preventing deterioration of their overall status. The overall status class of a water body depends on the condition of the different elements of the body (eg its plant community, fish populations, water quality etc) that contribute to its ecological quality. We will seek to prevent deterioration of each element. For example, the diagram below shows the overall status of an imaginary river water body and the condition of different ecological quality indicators used in determining its overall status. The overall status of the water body is poor as a result of the absence of migratory fish in the water body caused by an artificial barrier to fish migration. All the other indicators are in good condition. We will seek to maintain the condition of these other elements at good status by preventing their deterioration.




[2] *The Future for Scotland's Waters: Analysis of Costs and Benefits;* www.scotland.gov.uk/Publications/2002/07/15179
[3] *Valuing the Water Environment: A Review of International Literature*; www.scotland.gov.uk/Publications/2006/11/17092457/0
[4] Characterisation reports www.sepa.org.uk/water/water_publications/characterisation_reports.aspx
[5] *Impact Assessment of the River Basin Management Plan for Scotland River Basin District: Technical Report*; www.scotland.gov.uk/Publications/2009/01/08093641/22
[6] *Impact Assessments for the Scotland and Solway Tweed River Basin Management Plans: Report on Drivers, Policies and Trends;* www.scotland.gov.uk/Publications/2009/01/08093750/13
[7] Further details can be found in Chapter 1

Deterioration of the water environment does not always impact its ecological quality. The quality of our bathing waters, shellfish waters and drinking water sources can deteriorate if they become contaminated with bacteria or other pathogens that can affect human health. Preventing deterioration that would compromise the benefits Scotland derives from the protected areas[8] is also a key objective of this plan. Chapter 3 provides information on our objectives for protected areas.

Our objectives provide the basis for the integrated management of the river basins and the focus for co-ordinating efforts to protect and improve the waters they contain. Every public body will take account of the objectives when carrying out any of its functions that affect the river basin district. Integrated management will ensure that we maximise the contribution their achievement makes to other economic, environmental and social goals.

Our starting point in setting objectives for water bodies at less than good status was to assess whether we can restore them to good status by 2015. However, we have sought to strike the right balance between our ambition for the water environment and the benefits we derive from its sustainable use. Setting the right pace of improvement is particularly important and our objectives for enhancing and restoring the water environment take account of the time needed to meet the technical challenges of designing and implementing the necessary changes and the time needed by water users to make those changes without suffering disproportionate burdens. Where achieving good status by 2015 would be infeasible or disproportionately expensive, we have phased improvements over the periods 2015 to 2021 and 2021 to 2027 in order to progressively achieve our overall aim for 2027. Our reasons for extending the timescale for achieving good status beyond 2015 are set out and explained in Section 4 below.

Realising the benefits of an environmental improvement to a water body often depends on improvements having first been made elsewhere. For example, providing for fish passage at a dam will not deliver the full benefit if the waters made accessible to the fish are in a poor condition. We have phased our planned improvements for each river basin with such interdependencies in mind.

For a small number of water bodies, we believe good status cannot be achieved even by 2027. For the most part, this is because there is currently no feasible and effective means available for making the necessary improvements. For these water bodies, we have set a lower (less stringent) objective than good status. Section 5 provides further information about these water bodies.

Such lower objectives may nevertheless involve the achievement of a significant improvement in the condition of the water bodies. For example, suppose the best overall status we can achieve for a water body is moderate status. If it is feasible and proportionate to improve the condition of some aspects of the water body (eg its water quality) to good status rather than moderate, such improvements will be part of our objective for the water body.

Even though preventing deterioration of status is one of our primary objectives, there are circumstances under which allowing deterioration is appropriate. Such exceptions to the rule, or "exemptions", provide for developments whose benefits to human health, the maintenance of human safety or sustainable development outweigh the benefit to the environment and society of preventing deterioration of status or which are otherwise of overriding public interest. As of September 2009, we have allowed twenty nine such exemptions. The process we went through to decide an exemption was appropriate is summarised in Section 6 below.

[8]Further details on protected areas can be found in Chapter 5 of this document, available on the SEPA website: www.sepa.org.uk/water/river_basin_planning.aspx

# 2. Our overall objectives for improving Scotland's water environment

Our overall objectives for improving the status of water bodies in the Scotland river basin district are summarised in Table 1 below. Further details are provided in Tables 2 to 10. Maps 1 and 2 indicate where these improvements will be made. The objectives represent our best estimate of what we expect to achieve by 2015, 2021 and 2027. They will act as our route map for prioritising work to improve the water environment.

Table 1: Phased improvements to the status of water bodies in the Scotland RBD

| | Proportion of water bodies in a good or better condition (%) | | | |
|---|---|---|---|---|
| | 2008 | 2015 | 2021 | 2027 |
| All water bodies | 65 | 71 | 77 | 98 |
| Rivers | 56 | 63 | 71 | 97 |
| Lochs | 66 | 71 | 77 | 98 |
| Estuaries | 85 | 85 | 85 | 98 |
| Coastal waters | 94 | 97 | 98 | 99 |
| Groundwater | 76 | 85 | 88 | 94 |

You can find out about the objectives for individual water bodies using the interactive map available on SEPA's website at: www.sepa.org.uk/water/river_basin_planning.aspx

As part of each 6 yearly review of the river basin management plan and in line with guidance[9] issued by Scottish Ministers, SEPA will review and firm up the projected improvements on the basis of further, detailed information it has gathered through, for example, its monitoring programmes and reviews of the authorisations for activities that can adversely affect the water environment. As a result of this process, we may find that we can achieve an objective earlier than anticipated; or that things are worse than we thought and the improvement will take longer than planned or require additional measures that prove to be infeasible or disproportionately expensive.

You can find further information on the relationship between objective setting and the regulation of controlled activities by SEPA in the policy statement, *Principles for setting objectives for the river basin management plan*[10], published by Scottish Ministers in 2007.

On the interactive map you will also find information about the degree of confidence in the objective set for individual water bodies. The confidence assigned reflects how sure we are at this stage that the actions we have identified will achieve the objective in the planned timescale.

Setting appropriate objectives has involved us making judgements about what improvements are technically feasible and not disproportionately expensive to make and by when. To do this, we have identified the pressures causing the adverse impacts on the status of the water bodies and the measures we expect will be needed to reduce those pressures.

In many cases, where we have extended the Water Framework Directive's 2015 target date for achieving good status to 2021 or 2027, we are nevertheless taking measures in the interim. These measures may enable a water body to improve in status (eg from poor to moderate) by 2015 but only reach good status by 2021 or 2027. You can find out about interim improvements planned for particular water bodies using the interactive map available on SEPA's website at: www.sepa.org.uk/water/river_basin_planning.aspx

For water bodies adversely affected by multiple pressures (eg physical modifications to the bed and banks, over-abstraction etc), we have separately assessed when we can tackle each pressure. We have then combined the assessments to identify the earliest date by which all the pressures on the bodies can be addressed.

[9]Scottish Government guidance on objective setting www.scotland.gov.uk/Resource/Doc/1057/0082160.pdf
[10]Principles for objective setting for the river basin management plan www.scotland.gov.uk/Publications/2007/03/29111609/0

Table 2: Planned improvements to the status of rivers (other than artificial and heavily modified rivers)

| Overall status | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| | Number of water bodies | River length (km) | Number of water bodies | River length (km) | Number of water bodies | River length (km) | Number of water bodies | River length (km) |
| High | 190 | 1,492 | 190 | 1,492 | 190 | 1,492 | 190 | 1,492 |
| Good | 801 | 8,168 | 915 | 9,475 | 1053 | 11,067 | 1470 | 15,786 |
| Moderate | 357 | 4,227 | 324 | 3,940 | 271 | 3,241 | 32 | 416 |
| Poor | 242 | 2,512 | 187 | 1,894 | 126 | 1,283 | 14 | 113 |
| Bad | 126 | 1,508 | 100 | 1,105 | 76 | 823 | 10 | 100 |
| Totals | 1,716 | 17,907 | 1,716 | 17,907 | 1,716 | 17,907 | 1,716 | 17,907 |
| Proportion good or better (%) | 58 | 54 | 64 | 61 | 72 | 70 | 97 | 96 |

Table 3: Planned improvements to the status of heavily modified rivers and artificial river-like water bodies, such as canals

| Overall status | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| | Number of water bodies | River length (km) | Number of water bodies | River length (km) | Number of water bodies | River length (km) | Number of water bodies | River length (km) |
| Maximum | 1 | 28 | 2 | 29 | 2 | 29 | 2 | 29 |
| Good | 134 | 1,266 | 156 | 1,501 | 180 | 1,708 | 293 | 2,866 |
| Moderate | 50 | 423 | 58 | 519 | 52 | 471 | 2 | 15 |
| Poor | 58 | 586 | 42 | 414 | 32 | 325 | 0 | 0 |
| Bad | 54 | 607 | 39 | 447 | 31 | 377 | 0 | 0 |
| Totals | 297 | 2,910 | 297 | 2,910 | 297 | 2,910 | 297 | 2,910 |
| Proportion good or better (%) | 45 | 44 | 53 | 53 | 61 | 60 | 99 | 99 |

Table 4: Planned improvements to the status of lochs other than artificial and heavily modified lochs

| Overall status | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| | Number of water bodies | Loch area (ha) | Number of water bodies | Loch area (ha) | Number of water bodies | Loch area (ha) | Number of water bodies | Loch area (ha) |
| High | 60 | 144 | 60 | 144 | 60 | 145 | 60 | 145 |
| Good | 89 | 252 | 98 | 264 | 110 | 271 | 148 | 448 |
| Moderate | 36 | 101 | 37 | 96 | 33 | 178 | 4 | 12 |
| Poor | 20 | 98 | 15 | 98 | 7 | 8.1 | 0 | 0 |
| Bad | 7 | 9.7 | 2 | 2.3 | 2 | 2.3 | 0 | 0 |
| Totals | 212 | 604 | 212 | 604 | 212 | 604 | 212 | 604 |
| Proportion good or better (%) | 70 | 65 | 75 | 67 | 80 | 69 | 98 | 98 |

Table 5: Planned improvements to the status of heavily modified lochs and artificial loch-like water bodies, such as some reservoirs

| Overall status | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| | Number of water bodies | Loch area (km²) | Number of water bodies | Loch area (km²) | Number of water bodies | Loch area (km²) | Number of water bodies | Loch area (km²) |
| Maximum | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 |
| Good | 54 | 242 | 60 | 267 | 65 | 280 | 94 | 354 |
| Moderate | 12 | 22 | 14 | 25 | 13 | 23 | 0 | 0 |
| Poor | 19 | 27 | 17 | 54 | 13 | 43 | 1 | 0.6 |
| Bad | 11 | 64 | 4 | 8.6 | 4 | 8.6 | 0 | 0 |
| Totals | 97 | 356 | 97 | 356 | 97 | 356 | 97 | 356 |
| Proportion good or better (%) | 57 | 68 | 64 | 76 | 69 | 79 | 99 | 100 |

Table 6: Planned improvements to the status of estuaries (other than heavily modified estuaries)

| Overall status | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| | Number of water bodies | Estuary area (km²) | Number of water bodies | Estuary area (km²) | Number of water bodies | Estuary area (km²) | Number of water bodies | Estuary area (km²) |
| High | 14 | 160 | 14 | 160 | 14 | 160 | 14 | 160 |
| Good | 16 | 310 | 16 | 310 | 16 | 310 | 18 | 384 |
| Moderate | 3 | 82 | 3 | 82 | 3 | 82 | 1 | 8.5 |
| Poor | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bad | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Totals | 33 | 552 | 33 | 552 | 33 | 552 | 33 | 552 |
| Proportion good or better (%) | 91 | 85 | 91 | 85 | 91 | 85 | 97 | 98 |

Table 7: Planned improvements to the status of heavily modified estuaries

| Overall status | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| | Number of water bodies | Estuary area (km²) | Number of water bodies | Estuary area (km²) | Number of water bodies | Estuary area (km²) | Number of water bodies | Estuary area (km²) |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Good | 4 | 1.1 | 4 | 1.1 | 4 | 1.1 | 7 | 53 |
| Moderate | 2 | 43 | 2 | 43 | 2 | 43 | 0 | 0 |
| Poor | 1 | 9.7 | 1 | 9.7 | 1 | 9.7 | 0 | 0 |
| Bad | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Totals | 7 | 53 | 7 | 53 | 7 | 53 | 7 | 53 |
| Proportion good or better (%) | 57 | 2 | 57 | 2 | 57 | 2 | 100 | 100 |

Table 8: Planned improvements to the status of coastal waters (other than heavily modified coastal water bodies)

| Overall status | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| | Number of water bodies | Area coastal waters (km²) | Number of water bodies | Area coastal waters (km²) | Number of water bodies | Area coastal waters (km²) | Number of water bodies | Area coastal waters (km²) |
| High | 157 | 15,649 | 157 | 15,649 | 157 | 15,649 | 157 | 15,649 |
| Good | 252 | 26,138 | 266 | 26,732 | 270 | 27,422 | 277 | 29,520 |
| Moderate | 28 | 3,909 | 14 | 3,316 | 10 | 2,626 | 3 | 528 |
| Poor | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bad | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Totals | 437 | 45,697 | 437 | 45,697 | 437 | 45,697 | 437 | 45,697 |
| Proportion good or better (%) | 94 | 91 | 97 | 93 | 98 | 94 | 99 | 99 |

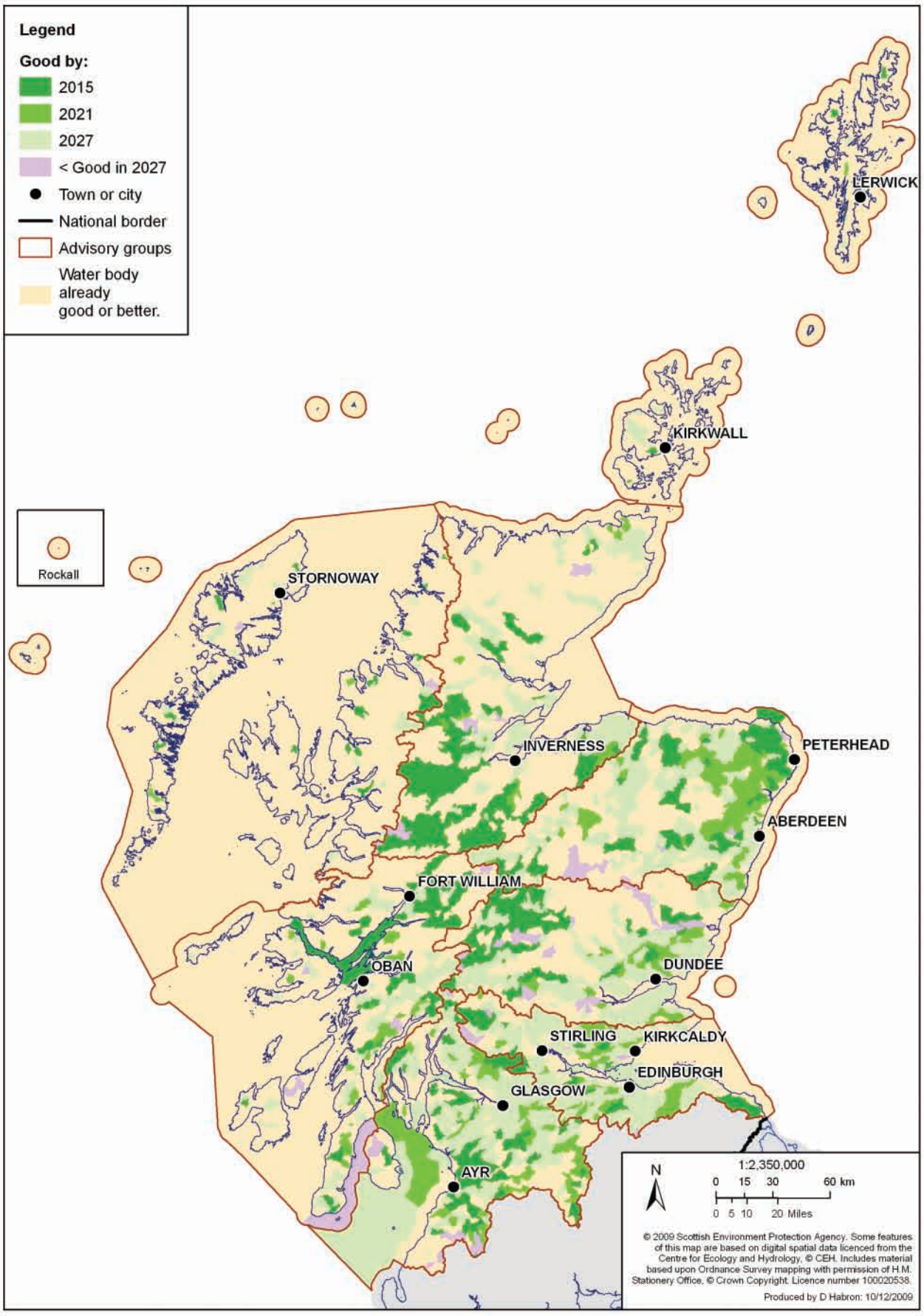
Table 9: Planned improvements to the status of heavily modified coastal waters

| Overall status | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| | Number of water bodies | Area coastal waters (km²) | Number of water bodies | Area coastal waters (km²) | Number of water bodies | Area coastal waters (km²) | Number of water bodies | Area coastal waters (km²) |
| Maximum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Good | 11 | 53 | 11 | 53 | 11 | 53 | 12 | 99 |
| Moderate | 1 | 46 | 1 | 46 | 1 | 46 | 0 | 0 |
| Poor | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bad | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Totals | 12 | 99 | 12 | 99 | 12 | 99 | 12 | 99 |
| Proportion good or better (%) | 92 | 54 | 92 | 54 | 92 | 54 | 100 | 100 |

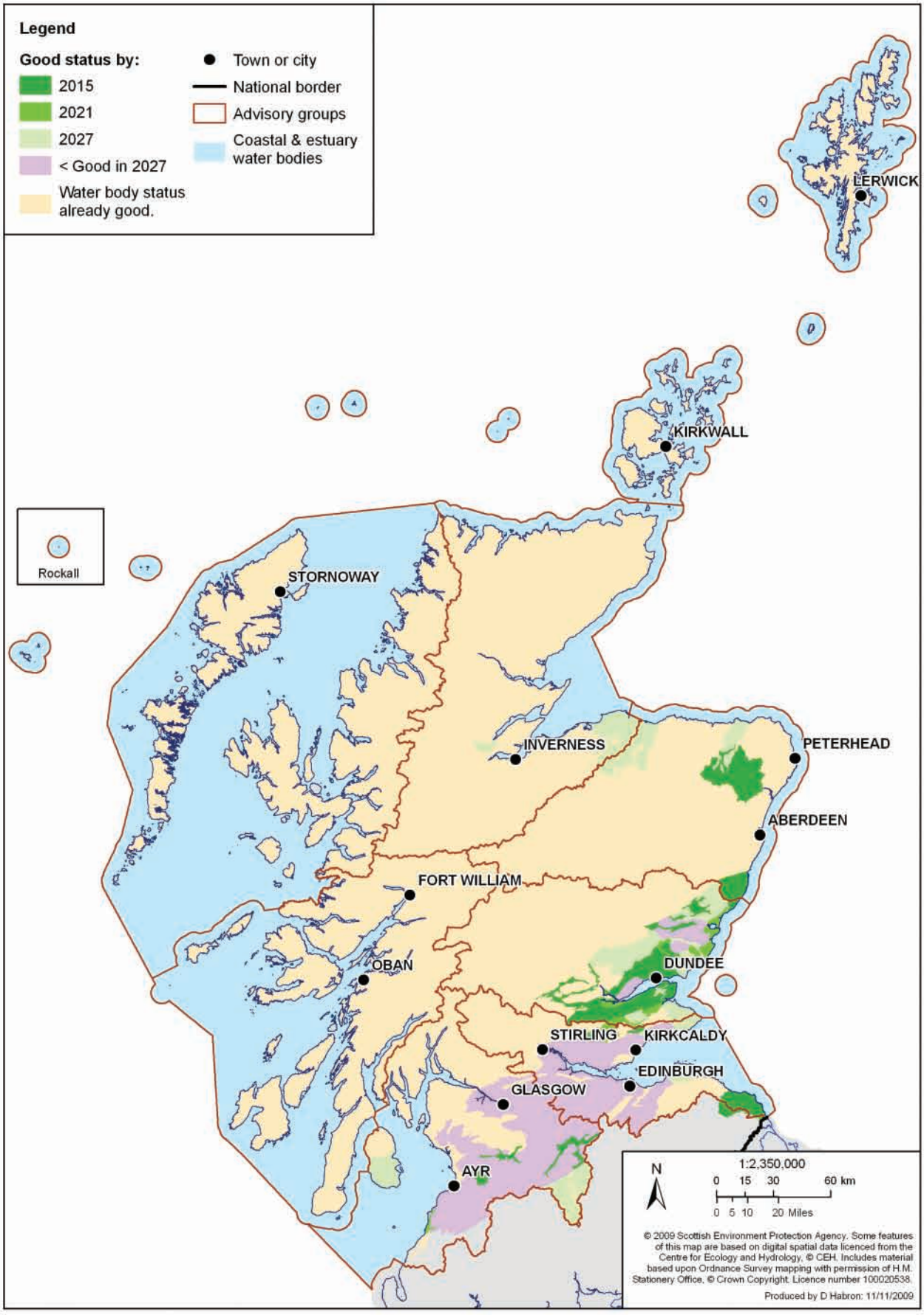
Table 10: Planned improvements to the status of groundwater

| Overall status | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| | Number of water bodies | Area ground-water (km²) | Number of water bodies | Area ground-waters (km²) | Number of water bodies | Area ground-waters (km²) | Number of water bodies | Area ground-waters (km²) |
| Good | 215 | 55,267 | 242 | 57,569 | 249 | 57,962 | 267 | 60,889 |
| Poor | 69 | 11,301 | 42 | 8,998 | 35 | 8,605 | 17 | 5,678 |
| Totals | 284 | 66,567 | 284 | 66,567 | 284 | 66,567 | 284 | 66,567 |
| Proportion good or better (%) | 76 | 83 | 85 | 86 | 88 | 87 | 94 | 91 |

Map 1: Our objectives for improving the status of surface waters in the Scotland RBD up to 2027



Map 2: Our objectives for improving the status of groundwater in the Scotland RBD up to 2027



# 3. Achieving our objectives: planned improvements

In the sections below, we have summarised our objectives for improving water quality; water flows and levels; and, in surface waters, the condition of the bed, banks and shores of water bodies. Further information can be found on the interactive map available on SEPA's website at: www.sepa.org.uk/water/river_basin_planning.aspx

## 3.1 Our objectives for water quality

This section describes our planned improvements to the water quality of rivers, lochs, estuaries, coastal waters and groundwater in the Scotland river basin district.

Tables 11 and 12 and Maps 3 and 4 below summarise our objectives for the water quality of bodies of surface water and bodies of groundwater, respectively.

Table 11: Summary of planned improvements to water quality in bodies of surface water

| Water quality | 2008<br>Number water bodies | 2015<br>Number water bodies | 2021<br>Number water bodies | 2027<br>Number water bodies |
|---|---|---|---|---|
| Good or better | 2,298 | 2,457 | 2,607 | 2,780 |
| Moderate | 434 | 307 | 186 | 30 |
| Poor | 68 | 45 | 17 | 1 |
| Bad | 11 | 2 | 1 | 0 |
| Totals | 2,811 | 2,811 | 2,811 | 2,811 |
| Proportion good or better (%) | 82 | 87 | 93 | 99 |

**Notes to Table 11**

(i) For surface waters, "water quality" takes account of the condition of general chemical and physicochemical quality criteria (eg oxygen levels, nutrient levels, etc); concentrations of priority substances and certain other pollutants (ie toxic pollutants for which quality standards have been set at European level) and concentrations of specific pollutants (ie other toxic pollutants identified as of concern in the UK).

(ii) For toxic pollutants (ie priority substances, certain other pollutants and specific pollutants) other than ammonia, water quality can be either "good or better" or "moderate".

Map 3: Projected improvements in the water quality of bodies of surface water in the period 2008 to 2027

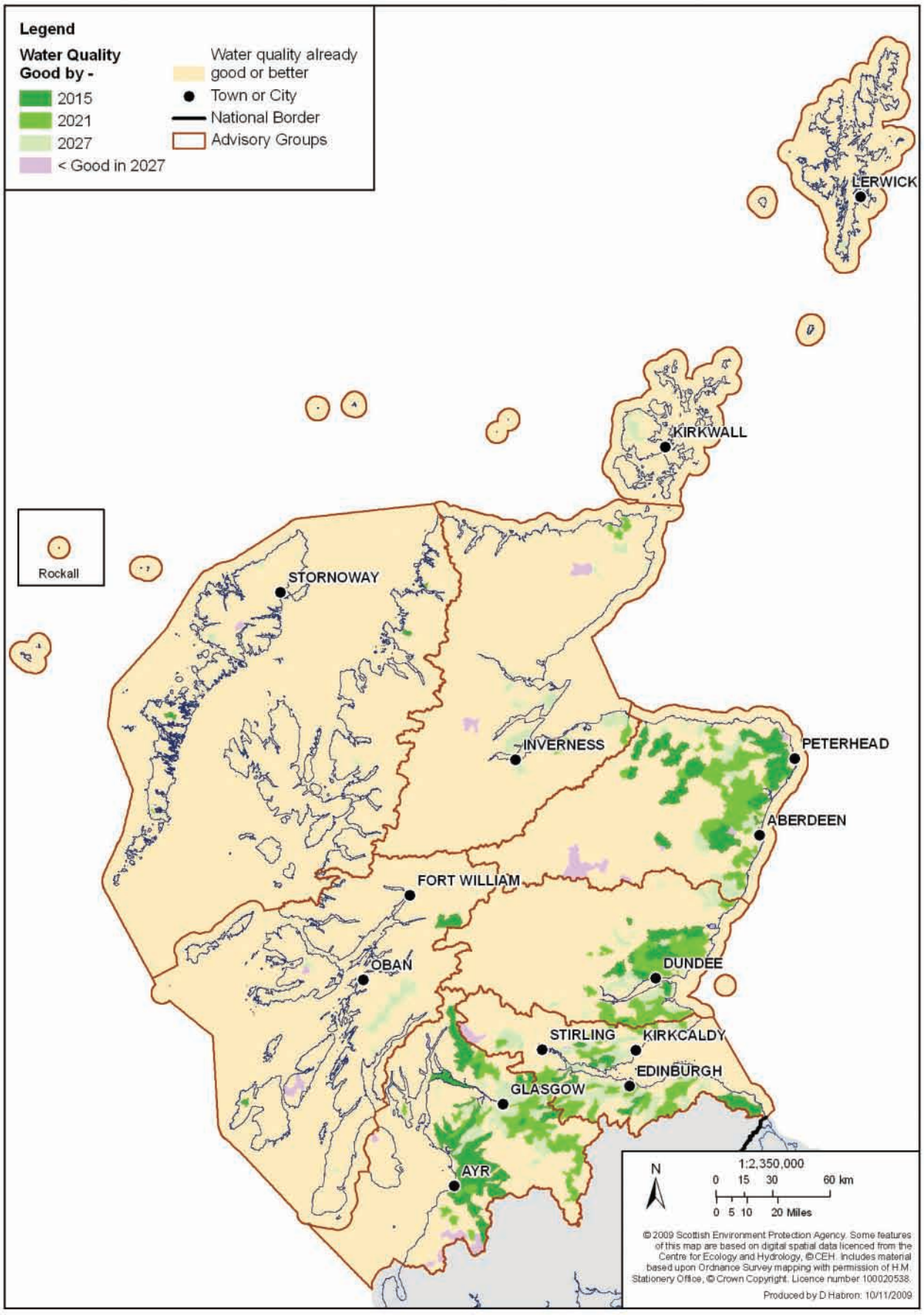
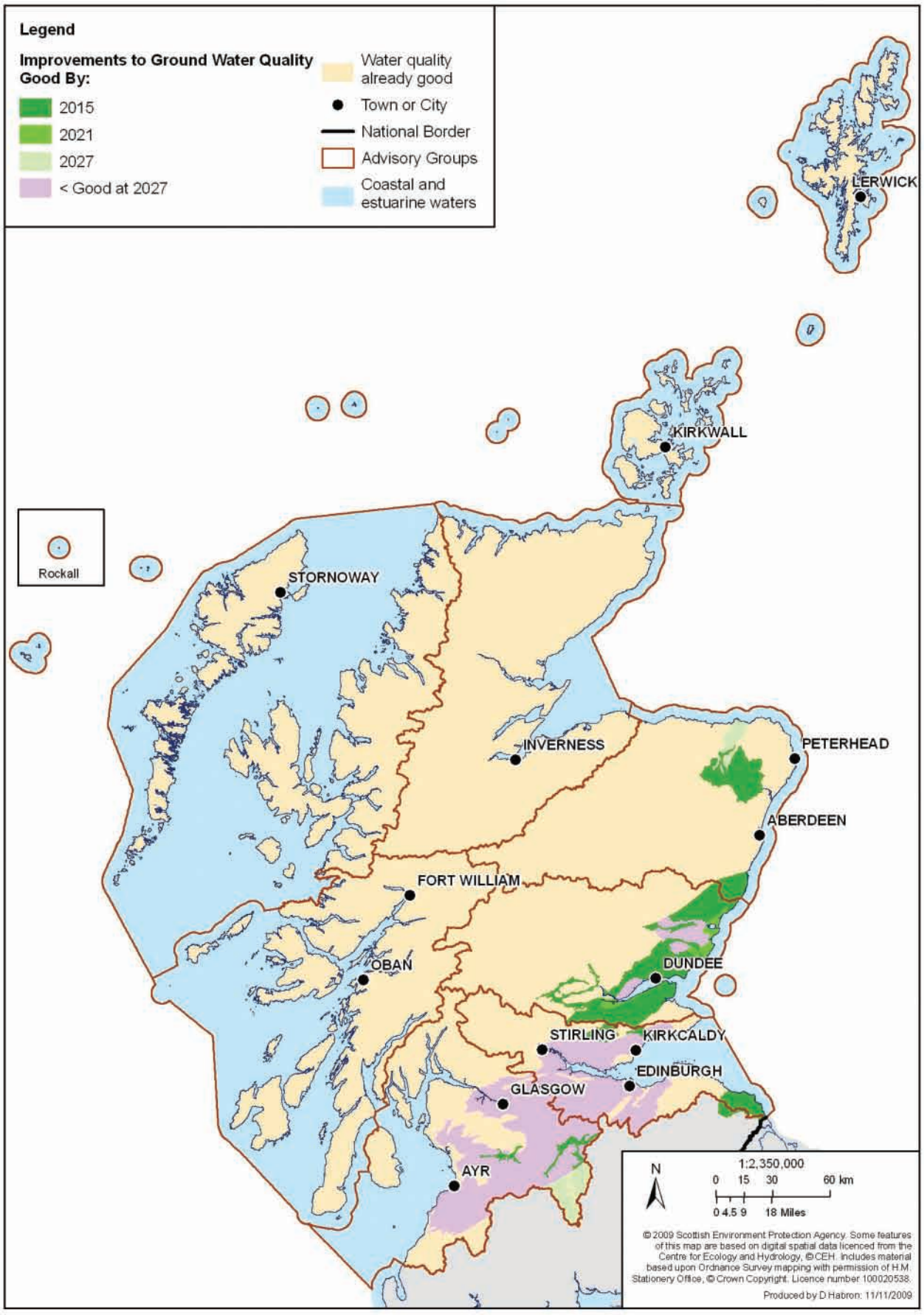


Table 12: Summary of planned improvements to the water quality of groundwater

| Chemical status | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| | Number of water bodies | Area ground-water ($km^2$) | Number of water bodies | Area ground-waters ($km^2$) | Number of water bodies | Area ground-waters ($km^2$) | Number of water bodies | Area ground-waters ($km^2$) |
| Good | 226 | 57,159 | 262 | 60,142 | 265 | 60,332 | 267 | 60,889 |
| Poor | 58 | 9,409 | 22 | 6,425 | 19 | 6,236 | 17 | 5,678 |
| Totals | 284 | 66,567 | 284 | 66,567 | 284 | 66,567 | 284 | 66,567 |
| Proportion good or better (%) | 80 | 86 | 92 | 90 | 93 | 91 | 94 | 91 |

Map 4: Projected improvements in the water quality of bodies of groundwater in the period 2008 to 2027



Tables 13 to 16 below summarise our water quality objectives for rivers, lochs, estuaries and coastal waters.

Table 13: Planned improvements to the water quality of rivers

| Water quality | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| | Number of water bodies | River length (km) | Number of water bodies | River length (km) | Number of water bodies | River length (km) | Number of water bodies | River length (km) |
| Good or better | 1,599 | 16,206 | 1,743 | 17,742 | 1,869 | 19,264 | 1,988 | 20,538 |
| Moderate | 350 | 3,923 | 235 | 2,673 | 132 | 1,414 | 25 | 279 |
| Poor | 56 | 611 | 34 | 387 | 12 | 138 | 0 | 0 |
| Bad | 8 | 77 | 1 | 15 | 0 | 0 | 0 | 0 |
| Totals | 2,013 | 20,817 | 2,013 | 20,817 | 2,013 | 20,817 | 2,013 | 20,817 |
| Proportion good or better (%) | 79 | 78 | 87 | 85 | 93 | 93 | 99 | 99 |

Table 14: Planned improvements to the water quality of lochs

| Water quality | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| | Number of water bodies | Loch area ($km^2$) | Number of water bodies | Loch area ($km^2$) | Number of water bodies | Loch area ($km^2$) | Number of water bodies | Loch area ($km^2$) |
| Good or better | 221 | 628 | 263 | 849 | 276 | 861 | 305 | 956 |
| Moderate | 73 | 315 | 37 | 101 | 29 | 95 | 3 | 4 |
| Poor | 12 | 12 | 8 | 9 | 3 | 4 | 1 | 1 |
| Bad | 3 | 5 | 1 | 1 | 1 | 1 | 0 | 0 |
| Totals | 309 | 961 | 309 | 961 | 309 | 961 | 309 | 961 |
| Proportion good or better (%) | 72 | 65 | 85 | 88 | 89 | 90 | 99 | 100 |

Table 15: Planned improvements to the water quality of estuaries

| Overall status | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| | Number of water bodies | Estuary area ($km^2$) | Number of water bodies | Estuary area ($km^2$) | Number of water bodies | Estuary area ($km^2$) | Number of water bodies | Estuary area ($km^2$) |
| Good or better | 34 | 471 | 35 | 542 | 35 | 542 | 39 | 597 |
| Moderate | 6 | 134 | 5 | 63 | 5 | 63 | 1 | 9 |
| Poor | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bad | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Totals | 40 | 605 | 40 | 605 | 40 | 605 | 40 | 605 |
| Proportion good or better (%) | 85 | 78 | 88 | 90 | 88 | 90 | 98 | 99 |

Table 16: Planned improvements to the water quality of coastal waters

| Water quality | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| | Number of water bodies | Area coastal waters (km²) | Number of water bodies | Area coastal waters (km²) | Number of water bodies | Area coastal waters (km²) | Number of water bodies | Area coastal waters (km²) |
| Good or better | 444 | 45,675 | 448 | 45,786 | 448 | 45,786 | 448 | 45,786 |
| Moderate | 5 | 121 | 1 | 9.6 | 1 | 9.6 | 1 | 9.6 |
| Poor | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bad | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Totals | 449 | 45,796 | 449 | 45,796 | 449 | 45,796 | 449 | 45,796 |
| Proportion good or better (%) | 99 | 100 | 100 | 100 | 99.8 | 100 | 99.8 | 100 |

Tables 17 to 19 describe our planned improvements in relation to the principal pollution pressures on rivers, lochs and estuaries. Water quality in more than 99 % of coastal water bodies is already good or better.

Table 17: Planned improvements to water quality in rivers in relation to the principal pollution pressures on rivers

| Water quality condition | Water bodies with good or better water quality conditions | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2008 | | 2015 | | 2021 | | 2027 | |
| | Proportion of water bodies (%) | River length (km) | Proportion of water bodies (%) | River length (km) | Proportion of water bodies (%) | River length (km) | Proportion of water bodies (%) | River length (km) |
| Nutrient levels | 83 | 16,809 | 88 | 18,053 | 95 | 19,686 | 100 | 20,818 |
| Acidity | 99 | 20,538 | 99 | 20,552 | 99 | 20,552 | 99 | 20,552 |
| Other quality indicators | 91 | 18,950 | 93 | 19,439 | 95 | 19,710 | 100 | 20,818 |

Table 18: Planned improvements to water quality in lochs in relation to the principal pollution pressures on lochs

| Water quality condition | Water bodies with good or better water quality conditions | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2008 | | 2015 | | 2021 | | 2027 | |
| | Proportion of water bodies (%) | Loch area (km²) | Proportion of water bodies (%) | Loch area (km²) | Proportion of water bodies (%) | Loch area (km²) | Proportion of water bodies (%) | Loch area (km²) |
| Nutrient levels | 80 | 754 | 82 | 841 | 86 | 853 | 96 | 948 |
| Acidity | 91 | 836 | 100 | 961 | 100 | 961 | 100 | 961 |

Table 19: Planned improvements to water quality in estuaries in relation to the principal pollution pressures on estuaries

| Water quality condition | Water bodies with good or better water quality conditions | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2008 | | 2015 | | 2021 | | 2027 | |
| | Proportion of water bodies (%) | Estuary area (km²) | Proportion of water bodies (%) | Estuary area (km²) | Proportion of water bodies (%) | Estuary area (km²) | Proportion of water bodies (%) | Estuary area (km²) |
| Nutrient levels | 95 | 594 | 95 | 594 | 95 | 594 | 95 | 594 |

Around 2% of bodies of surface water are affected by pollutants toxic to plants and animals. Table 20 describes our planned improvements to water quality in terms of these pollutants.

Table 20: Planned improvements to the water quality of bodies of surface water in terms of pollutants toxic to aquatic plants and animals

| Water quality in terms of toxic pollutants | Number of water bodies | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2008 | | 2015 | | 2021 | | 2027 | |
| | Priority sub-stances & certain other pollutants identified at EU level | Other synthetic & non-synthetic toxic pollutants[11] | Priority sub-stances & certain other pollutants identified at EU level | Other synthetic & non-synthetic toxic pollutants | Priority sub-stances & certain other pollutants identified at EU level | Other synthetic and non-synthetic toxic pollutants | Priority sub-stances & certain other pollutants identified at EU level | Other synthetic and non-synthetic toxic pollutants |
| Good or better | 2,794 | 2,766 | 2,797 | 2777 | 2,797 | 2785 | 2,811 | 2811 |
| Less than good | 17 | 45 | 14 | 34 | 14 | 26 | 0 | 0 |
| Totals | 2,811 | 2,811 | 2,811 | 2,811 | 2,811 | 2,811 | 2,811 | 2,811 |
| Proportion good or better (%) | 99 | 98 | 100 | 99 | 100 | 99 | 100 | 100 |

## 3.2 Our objectives for water flows and levels

This section describes our planned improvements to the water flows in rivers and the water level regimes in lochs and groundwater in the Scotland RBD. There are no adverse impacts on the tidal regimes of estuaries and coastal waters that are affecting the achievement of good ecological status or potential.

Tables 21 and 22 and Maps 5 and 6 below summarise our objectives for the flows and levels in bodies of surface water and bodies of groundwater, respectively.

[11]Ammonia is the principal such pollutant affecting rivers

Table 21: Summary of planned improvements to water flows and water levels in bodies of surface water

| Condition of water flows and levels | 2008<br>Number water bodies | 2015<br>Number water bodies | 2021<br>Number water bodies | 2027<br>Number water bodies |
|---|---|---|---|---|
| Good or better | 1,984 | 2,047 | 2,084 | 2,304 |
| Moderate | 103 | 87 | 78 | 3 |
| Poor | 70 | 67 | 60 | 5 |
| Bad | 165 | 121 | 100 | 10 |
| Totals | 2,322 | 2,322 | 2,322 | 2,322 |
| Proportion good or better (%) | 85 | 88 | 90 | 99 |

**Note to Table 21**
For bodies of surface water other than heavily modified and artificial bodies, the "condition of water flows and levels" means the ecological status class that the water flows or levels will support. For heavily modified and artificial bodies of surface water, the "condition of water flows and levels" means the ecological potential class that the flows or levels will support.

Map 5: Projected improvements in water flows and levels in bodies of surface water in the period 2008 to 2027

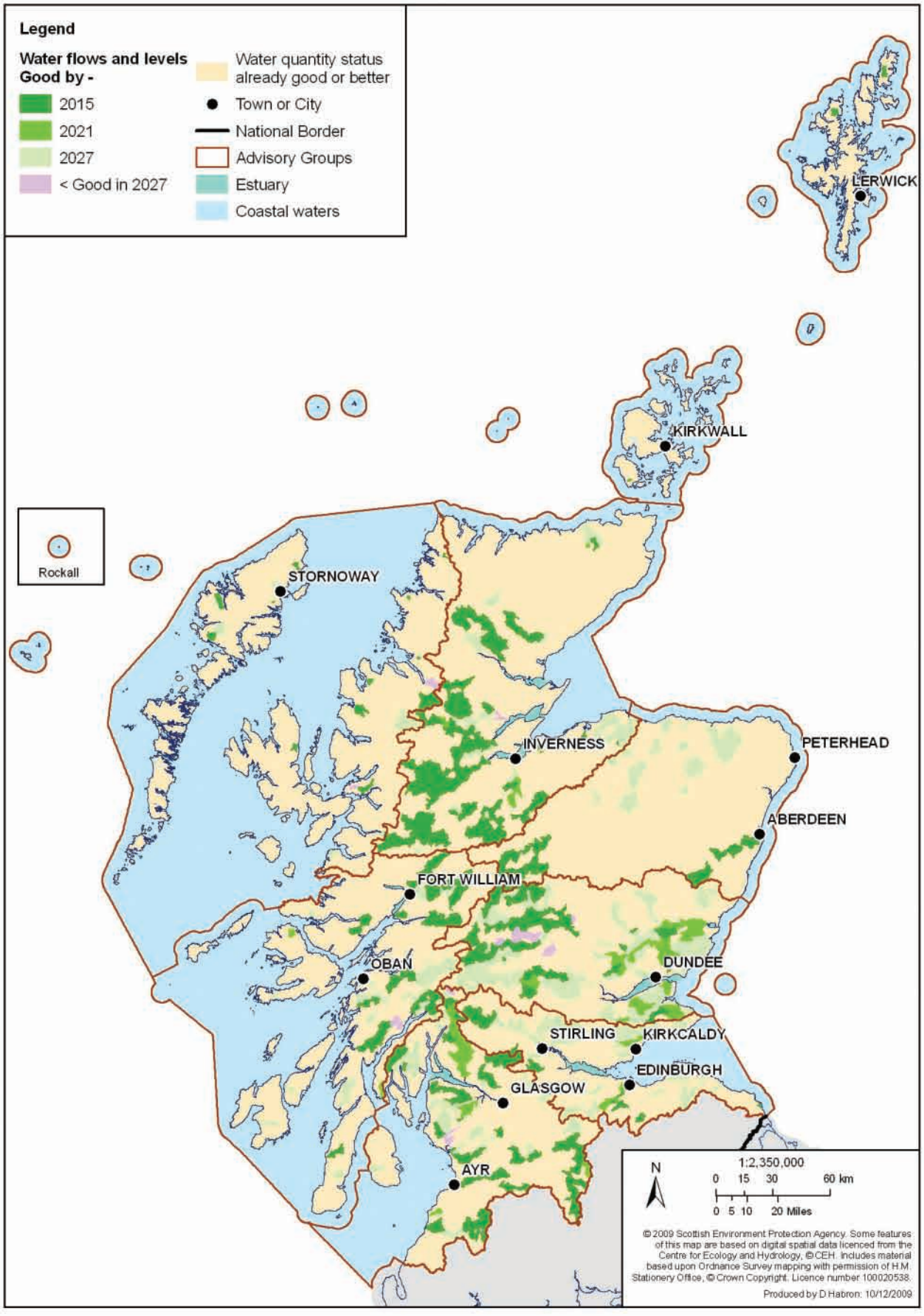
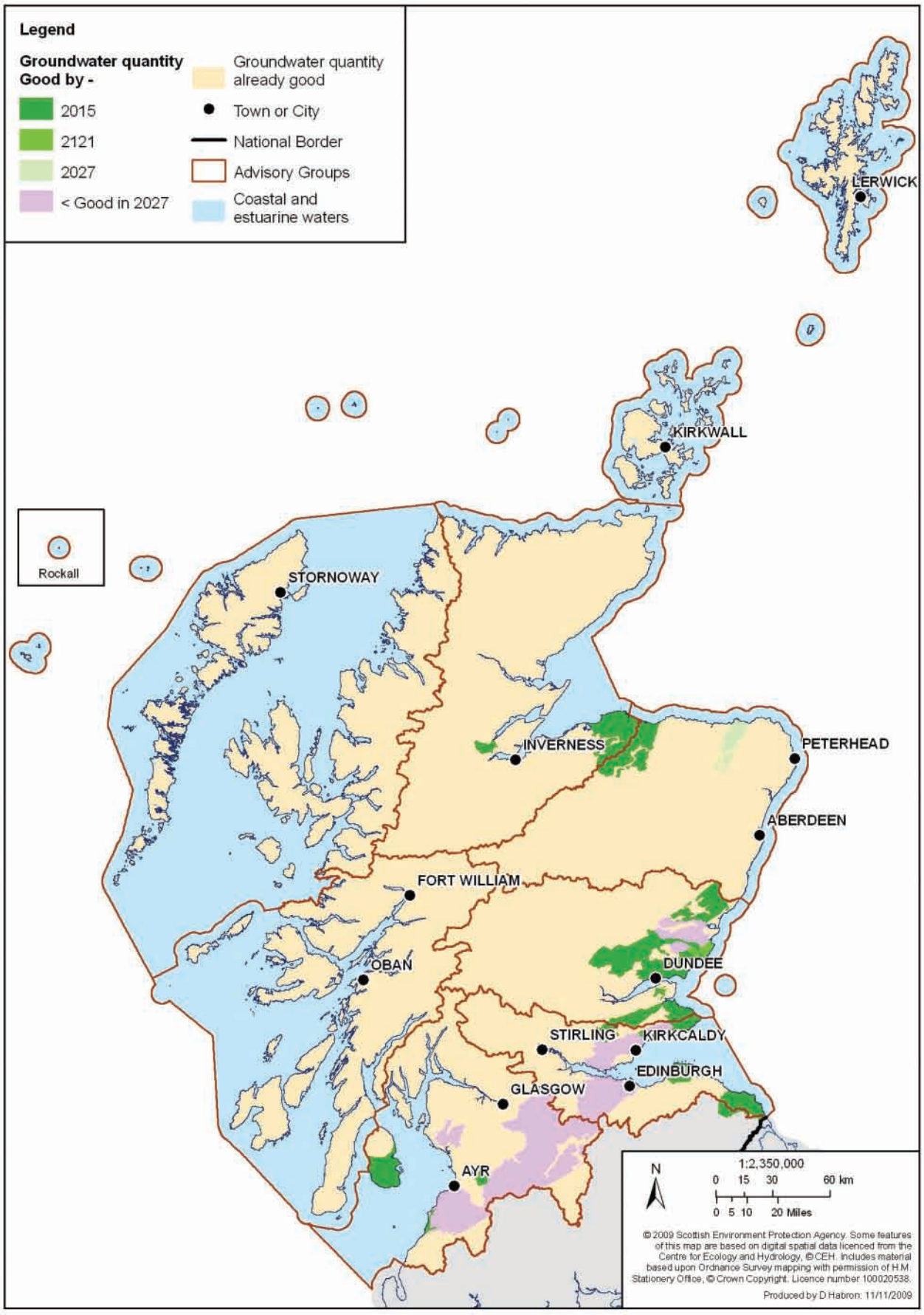


Table 22: Summary of planned improvements to the water level regime in bodies of groundwater

| Groundwater quantitative status | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| | Number of water bodies | Area of ground-water ($km^2$) | Number of water bodies | Area of ground-water ($km^2$) | Number of water bodies | Area of ground-water ($km^2$) | Number of water bodies | Area of ground-water ($km^2$) |
| Good | 250 | 59,823 | 257 | 61,505 | 263 | 61,899 | 284 | 66,567 |
| Poor | 34 | 6,744 | 27 | 5,062 | 21 | 4,668 | 0 | 0 |
| Totals | 284 | 66,567 | 284 | 66,567 | 284 | 66,567 | 284 | 66,567 |
| Proportion good (%) | 88 | 90 | 90 | 92 | 93 | 93 | 100 | 100 |

Map 6: Projected improvements in water levels in bodies of groundwater in the period 2008 to 2027



Tables 23 to 26 below summarise our objectives for water flows and water levels in rivers and lochs. Tables 23 and 25 provide information on our projected improvements in river flows and loch levels, respectively, for river and loch water bodies excluding those that are heavily modified or artificial. Tables 24 and 26 provide information on our projected improvements in river flows and loch levels, respectively, for heavily modified and artificial river and loch water bodies.

Table 23: Planned improvements to river flows in river water bodies (excluding those that are artificial or heavily modified water bodies)

| | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| **River flow** | Number of water bodies | River length (km) | Number of water bodies | River length (km) | Number of water bodies | River length (km) | Number of water bodies | River length (km) |
| Good or better | 1,496 | 15,077 | 1,531 | 15,680 | 1,553 | 15,977 | 1,699 | 17,738 |
| Moderate | 74 | 955 | 57 | 723 | 53 | 656 | 2 | 16 |
| Poor | 42 | 568 | 45 | 560 | 43 | 537 | 5 | 53 |
| Bad | 104 | 1,307 | 83 | 943 | 67 | 737 | 10 | 100 |
| Totals | 1,716 | 17,907 | 1,716 | 17,907 | 1,716 | 17,907 | 1,716 | 17,907 |
| Proportion good or better (%) | 91 | 90 | 93 | 92 | 94 | 93 | 99 | 99 |

Table 24: Planned improvements to river flows in artificial and heavily modified river water bodies

| | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| **River flow** | Number of water bodies | River length (km) | Number of water bodies | River length (km) | Number of water bodies | River length (km) | Number of water bodies | River length (km) |
| Good or better | 193 | 1,822 | 221 | 2,157 | 234 | 2,271 | 297 | 2,910 |
| Moderate | 26 | 239 | 26 | 225 | 21 | 178 | 0 | 0 |
| Poor | 26 | 272 | 17 | 173 | 14 | 146 | 0 | 0 |
| Bad | 52 | 577 | 33 | 356 | 28 | 315 | 0 | 0 |
| Totals | 297 | 2,910 | 297 | 2,910 | 297 | 2,910 | 297 | 2,910 |
| Proportion good or better (%) | 65 | 63 | 74 | 74 | 79 | 78 | 100 | 100 |

**Note to Table 24**
The condition of the flow regime in all canal water bodies is already consistent with the achievement of good ecological potential.

Table 25: Planned improvements to the water level regime in loch water bodies (excluding those that are artificial or heavily modified water bodies)

| | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| **Loch level regime** | Number of water bodies | Loch area ($km^2$) | Number of water bodies | Loch area ($km^2$) | Number of water bodies | Loch area ($km^2$) | Number of water bodies | Loch area ($km^2$) |
| Good or better | 204 | 527 | 206 | 522 | 208 | 593 | 211 | 597 |
| Moderate | 2 | 2.3 | 2 | 8.6 | 2 | 8.6 | 1 | 7.6 |
| Poor | 2 | 71 | 3 | 72 | 1 | 1.6 | 0 | 0 |
| Bad | 4 | 4.3 | 1 | 1.2 | 1 | 1.2 | 0 | 0 |
| Totals | 212 | 604 | 212 | 604 | 212 | 604 | 212 | 604 |
| Proportion good or better (%) | 97 | 88 | 98 | 88 | 99 | 100 | 100 | 100 |

Table 26: Planned improvements to the water level regime in heavily modified and artificial loch water bodies

| Loch level regime | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| | Number of water bodies | Loch area ($km^2$) | Number of water bodies | Loch area ($km^2$) | Number of water bodies | Loch area ($km^2$) | Number of water bodies | Loch area ($km^2$) |
| Good or better | 80 | 307 | 89 | 341 | 89 | 341 | 97 | 356 |
| Moderate | 2 | 4.4 | 2 | 4.5 | 2 | 4.5 | 0 | 0 |
| Poor | 1 | 5.6 | 2 | 1.9 | 2 | 1.9 | 0 | 0 |
| Bad | 14 | 40 | 4 | 8.6 | 4 | 8.6 | 0 | 0 |
| Totals | 97 | 356 | 97 | 356 | 97 | 356 | 97 | 356 |
| Proportion good or better (%) | 82 | 86 | 92 | 96 | 92 | 96 | 100 | 100 |

## 3.3 Our objectives for the condition of the bed, banks and shores of bodies of surface water, and the continuity of rivers for fish

This section describes our planned improvements to the structure and condition of the bed, banks and shores of rivers, lochs, estuaries and coastal waters in the Scotland RBD and the continuity of rivers for fish migration.

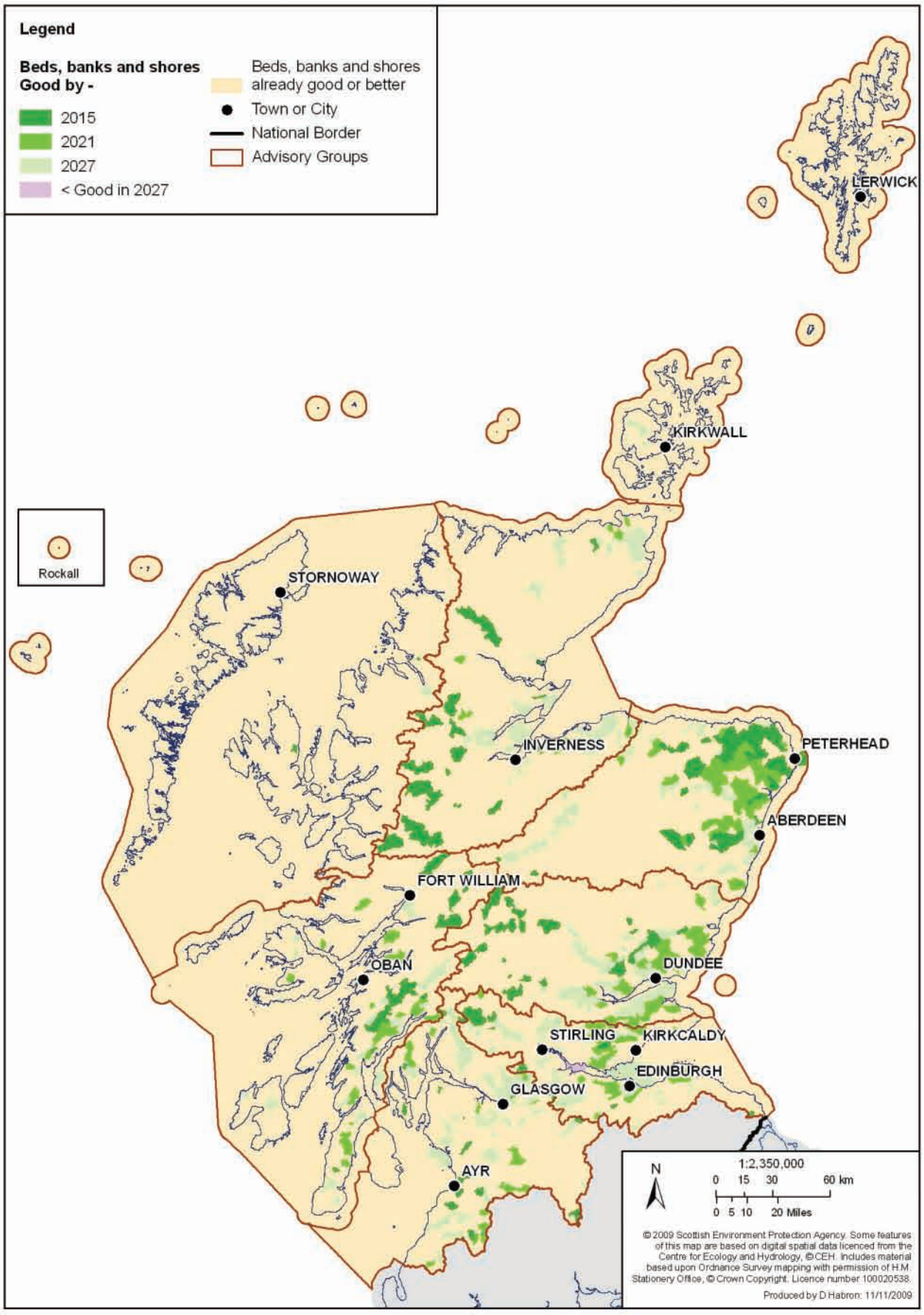
Table 27 summarises our objectives for the bed, banks and shores of surface water and for river continuity for fish. Maps 7 and 8 summarises our objectives for the bed, banks and shores, and for river continuity for fish, respectively.

Table 27: Summary of planned improvements to the structure and condition of the bed, banks and shores, and to river continuity for fish, in bodies of surface water

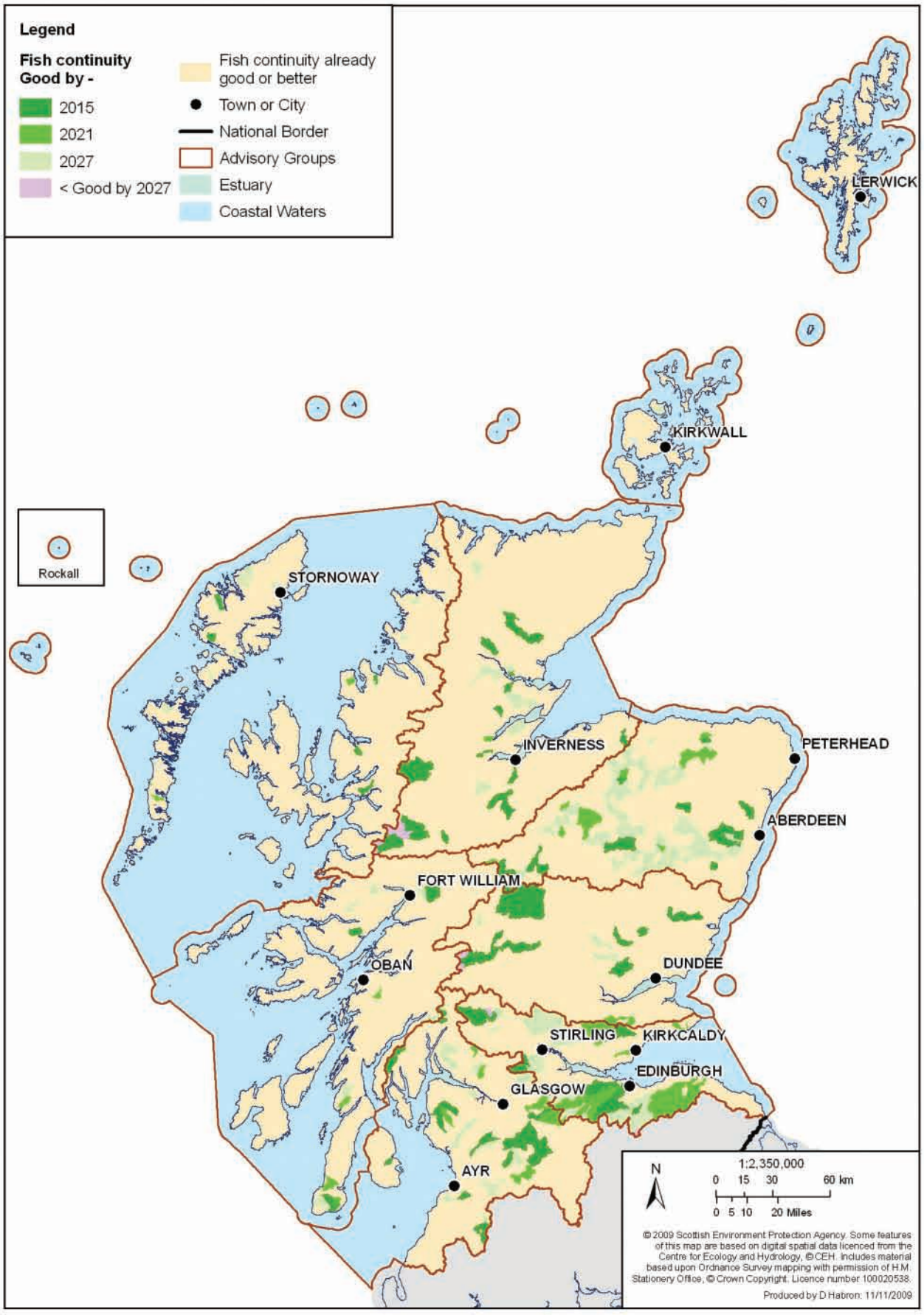
| Condition of bed, banks, shores and river continuity | 2008 | 2015 | 2021 | 2027 |
|---|---|---|---|---|
| | Number water bodies | Number water bodies | Number water bodies | Number water bodies |
| Good or better | 2,213 | 2,303 | 2,467 | 2,800 |
| Moderate | 308 | 297 | 214 | 1 |
| Poor | 264 | 190 | 117 | 10 |
| Bad | 26 | 21 | 13 | 0 |
| Totals | 2,811 | 2,811 | 2,811 | 2,811 |
| Proportion good or better (%) | 79 | 82 | 88 | 100 |

**Note to Table 27**
For bodies of surface water other than heavily modified and artificial bodies, the "condition of bed, banks, shores and river continuity" means the ecological status class that the condition of bed, banks, shores and river continuity will support. For heavily modified and artificial bodies of surface water, the "condition of bed, banks, shores and river continuity" means the ecological potential class that the condition of bed, banks, shores and river continuity will support.

Map 7: Projected improvements to the structure and condition of the bed, banks and shores



Map 8: Projected improvements to river continuity for fish, for bodies of surface water in the period 2008 to 2027



Tables 28 to 36 below summarise our objectives for the structure and condition of the bed, banks, and shores of rivers, lochs, estuaries and coastal waters, and the continuity of rivers for fish. Improvements to heavily modified and artificial water bodies are shown separately from those to other bodies of surface water.

Table 28: Planned improvements to the structure and condition of the bed and banks of river water bodies (other than heavily modified and artificial river water bodies)

| | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| **Condition of bed and banks** | Number of water bodies | River length (km) | Number of water bodies | River length (km) | Number of water bodies | River length (km) | Number of water bodies | River length (km) |
| Good or better | 1,437 | 14,885 | 1,477 | 15,370 | 1,572 | 16,401 | 1,716 | 17,907 |
| Moderate | 237 | 2,615 | 203 | 2,195 | 123 | 1,300 | 0 | 0 |
| Poor | 23 | 233 | 20 | 190 | 11 | 117 | 0 | 0 |
| Bad | 19 | 173 | 16 | 153 | 10 | 90 | 0 | 0 |
| Totals | 1,716 | 17,907 | 1,716 | 17,907 | 1,716 | 17,907 | 1,716 | 17,907 |
| Proportion good or better (%) | 84 | 83 | 86 | 86 | 92 | 92 | 100 | 100 |

Table 29: Planned improvements to the structure and condition of the bed and banks of heavily modified and artificial river water bodies

| | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| **Condition of bed and banks** | Number of water bodies | River length (km) | Number of water bodies | River length (km) | Number of water bodies | River length (km) | Number of water bodies | River length (km) |
| Good or better | 234 | 2,273 | 232 | 2,230 | 252 | 2,414 | 297 | 2,910 |
| Moderate | 43 | 427 | 45 | 465 | 31 | 326 | 0 | 0 |
| Poor | 13 | 119 | 15 | 139 | 11 | 109 | 0 | 0 |
| Bad | 7 | 91 | 5 | 76 | 3 | 62 | 0 | 0 |
| Totals | 297 | 2,910 | 297 | 2,910 | 297 | 2,910 | 297 | 2,910 |
| Proportion good or better (%) | 79 | 78 | 78 | 77 | 85 | 83 | 100 | 100 |

**Note to Table 29**
The condition of the bed and banks in all canal water bodies is already consistent with the achievement of good ecological potential.

Table 30: Planned improvements to river continuity of river water bodies (other than heavily modified and artificial river water bodies)

| | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| **River continuity condition** | Number of water bodies | River length (km) | Number of water bodies | River length (km) | Number of water bodies | River length (km) | Number of water bodies | River length (km) |
| Good or better | 1,483 | 15,272 | 1,546 | 15,952 | 1,605 | 16,611 | 1,707 | 17,847 |
| Moderate | 48 | 828 | 49 | 811 | 44 | 715 | 0 | 0 |
| Poor | 185 | 1,807 | 121 | 1,144 | 67 | 580 | 9 | 60 |
| Totals | 1,716 | 17,907 | 1,716 | 17,907 | 1,716 | 17,907 | 1,716 | 17,907 |
| Proportion good or better (%) | 86 | 85 | 90 | 89 | 94 | 93 | 99 | 100 |

Table 31: Planned improvements to river continuity of heavily modified river water bodies

| River continuity condition | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| | Number of water bodies | River length (km) | Number of water bodies | River length (km) | Number of water bodies | River length (km) | Number of water bodies | River length (km) |
| Good or better | 267 | 2,588 | 280 | 2,698 | 283 | 2,732 | 297 | 2,910 |
| Moderate | 1 | 12 | 3 | 56 | 3 | 56 | 0 | 0 |
| Poor | 29 | 310 | 14 | 156 | 11 | 122 | 0 | 0 |
| Totals | 297 | 2,910 | 297 | 2,910 | 297 | 2,910 | 297 | 2,910 |
| Proportion good or better (%) | 90 | 89 | 94 | 93 | 95 | 94 | 100 | 100 |

Table 32: Planned improvements to the structure and condition of the bed and banks of loch water bodies (other than heavily modified and artificial loch water bodies)

| Condition of bed and banks | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| | Number water of bodies | Loch area ($km^2$) | Number water of bodies | Loch area ($km^2$) | Number water of bodies | Loch area ($km^2$) | Number water of bodies | Loch area ($km^2$) |
| Good or better | 205 | 519 | 205 | 519 | 206 | 520 | 212 | 604 |
| Moderate | 7 | 85 | 7 | 85 | 6 | 84 | 0 | 0 |
| Poor | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bad | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Totals | 212 | 604 | 212 | 604 | 212 | 604 | 212 | 604 |
| Proportion good or better (%) | 97 | 86 | 97 | 86 | 97 | 86 | 100 | 100 |

Table 33: Planned improvements to the structure and condition of the bed and banks of heavily modified and artificial loch water bodies

| Condition of bed and banks | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| | Number water of bodies | Loch area ($km^2$) | Number water of bodies | Loch area ($km^2$) | Number water of bodies | Loch area ($km^2$) | Number water of bodies | Loch area ($km^2$) |
| Good or better | 75 | 301 | 83 | 334 | 84 | 342 | 97 | 356 |
| Moderate | 12 | 33 | 9 | 10 | 9 | 10 | 0 | 0 |
| Poor | 10 | 23 | 5 | 13 | 4 | 4.3 | 0 | 0 |
| Bad | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Totals | 97 | 356 | 97 | 356 | 97 | 356 | 97 | 356 |
| Proportion good or better (%) | 77 | 84 | 86 | 94 | 87 | 96 | 100 | 100 |

Table 34: Planned improvements to the structure and condition of the bed and shores of heavily modified estuary water bodies

| Condition of bed and shores | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| | Number water of bodies | Estuary area (km²) | Number water of bodies | Estuary area (km²) | Number water of bodies | Estuary area (km²) | Number water of bodies | Estuary area (km²) |
| Good or better | 5 | 5 | 5 | 5 | 5 | 5 | 7 | 53 |
| Moderate | 1 | 38 | 1 | 38 | 1 | 38 | 0 | 0 |
| Poor | 1 | 10 | 1 | 10 | 1 | 10 | 0 | 0 |
| Bad | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Totals | 7 | 53 | 7 | 53 | 7 | 53 | 7 | 53 |
| Proportion good or better (%) | 71 | 10 | 71 | 10 | 71 | 10 | 100 | 100 |

**Note to Table 34**
The beds, banks and shores of all non-heavily modified estuaries are in good or better condition.

Table 35: Planned improvements to the structure and condition of the bed and shores of coastal water bodies (other than heavily modified coastal water bodies)

| Condition of bed and shores | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| | Number of water bodies | Area of coastal waters (km²) | Number of water bodies | Area of coastal waters (km²) | Number of water bodies | Area of coastal waters (km²) | Number of water bodies | Area of coastal waters (km²) |
| Good or better | 435 | 45,449 | 431 | 43,622 | 431 | 43,622 | 437 | 45,697 |
| Moderate | 2 | 248 | 6 | 2,075 | 6 | 2,075 | 0 | 0 |
| Poor | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bad | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Totals | 437 | 45,697 | 437 | 45,697 | 437 | 45,697 | 437 | 45,697 |
| Proportion good or better (%) | 100 | 99 | 99 | 95 | 99 | 95 | 100 | 100 |

Table 36: Planned improvements to the structure and condition of the bed and shores of heavily modified and artificial coastal water bodies

| Condition of bed and shores | 2008 | | 2015 | | 2021 | | 2027 | |
|---|---|---|---|---|---|---|---|---|
| | Number of water bodies | Area of coastal waters (km²) | Number of water bodies | Area of coastal waters (km²) | Number of water bodies | Area of coastal waters (km²) | Number of water bodies | Area of coastal waters (km²) |
| Good or better | 11 | 53 | 11 | 53 | 11 | 53 | 12 | 99 |
| Moderate | 1 | 46 | 1 | 46 | 1 | 46 | 0 | 0 |
| Poor | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bad | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Totals | 12 | 99 | 12 | 99 | 12 | 99 | 12 | 99 |
| Proportion good or better (%) | 92 | 54 | 92 | 54 | 92 | 54 | 100 | 100 |

**Note to Table 36**
Our coastal water bodies include a number of very small artificial lagoons. These are water bodies that are partially separated from the wider coastal waters by a barrier of sand, other sediment or rocks. They retain all or most of their water during periods of low tide but have a persistent natural water exchange with the adjacent coastal water by percolation through, or overtopping of, the barrier or through inlet/outflow channels.

# 4. Our reasons for phasing the achievement of good status

In surface waters, the achievement of good status requires us to restore water quality, water flows and levels, river continuity for fish migration; and beds, banks and shores to a good condition. It also requires that invasive non-native species have not damaged the native aquatic plant and animal communities. In groundwater, it requires water quality and water levels to be restored to a good condition.

The following sections explain why in some cases we have phased the restoration of these conditions, and hence the achievement of good status, beyond 2015.

## 4.1 Our reasons for phasing the achievement of good water quality beyond 2015

This section explains the reasons why we have phased the achievement of the water quality necessary for good status beyond 2015 in a proportion of water bodies affected by the point and/or diffuse source pollution.

### 4.1.1 Point source discharges

For the purposes of phased achievement of good status, we have extended the deadline from 2015 to 2021 or 2027 for 162 water bodies that are currently failing to achieve good status as a result of point source discharges. Table 37 below provides a summary of how we plan to progressively address the adverse impacts of these discharges.

Appendix A lists the individual water bodies subject to point source discharges and for which we have extended the 2015 deadline for achieving good status. Details on each water body can be found using the interactive map available on SEPA's website at: www.sepa.org.uk/water/river_basin_planning.aspx

Table 37: Phased improvement in water quality of water bodies affected by point source discharges

| Source of discharges preventing the achievement of good status or potential | Phased improvements in water quality in water bodies affected by point source discharges (number of water bodies) | | |
|---|---|---|---|
| | Point source impacts addressed by 2015 | Deadline for addressing point source impacts extended to 2021 | Deadline for addressing point source impacts extended to 2027 |
| Sewage | 38 | 60 | 76 |
| Industry | 5 | 5 | 18 |

The sections below summarise our reasons for extending the deadline for good status in water bodies affected by discharges of sewage. For information on the reasons why the timetable for addressing other point source discharges has been extended beyond 2015 for specific water bodies, please use the interactive map on SEPA's website.

Information on the measures envisaged as necessary to bring the water bodies progressively to good status by the applicable extended deadline can be found in Chapter 3.

Significant improvements have been made to the water quality of Scotland's water environment over the last few decades, partly as a result of the implementation of earlier European directives, including the Urban Waste Water Treatment Directive. Of the remaining water quality problems, discharges of urban waste water account for the majority of the point source discharge impacts on the status of water bodies. Addressing these impacts will require measures additional to those required by the Urban Waste Water Treatment Directive.

#### Reason for extended deadlines

We have extended the deadline for achieving good status from 2015 to 2021 or 2027 in 136 of the water bodies affected by sewage discharges because the scale of improvements required to achieve good status in all water bodies affected by this pressure can only be achieved in phases extending beyond 2015 for reasons of disproportionate cost.

## Explanation

Over 97% of the urban waste water that is discharged to the water environment is collected, treated and discharged by Scottish Water.

Addressing the impacts caused by these discharges typically involves measures such as major upgrades to sewage treatment works or the relocation of discharges of treated urban waste water by means of new trunk sewers. Over the last few decades, measures have been implemented to improve the majority of discharges of urban waste water. The remaining impacts are amongst the most difficult impacts on the water environment to solve.

Making the improvements needed to achieve good water quality in waters affected by these discharges requires considerable investment of time and resources to plan and design the works, to obtain the necessary development permissions and to undertake the capital engineering works. Designing effective solutions is necessarily a lengthy and complex process. If adequate time and expertise is not invested, the solutions identified are likely to fail to deliver or to cost much more than necessary. Attempting to develop and implement solutions for all the impacts resulting from point source discharges of urban waste water by 2015 will result in schemes failing to deliver or incurring disproportionate expense.

Investment by Scottish Water in environmental improvements is planned through a process known as Quality and Standards[12]. The current advice from the Water Industry Commission for Scotland[13] is that a capital investment programme for Scottish Water of larger than £450 million to £500 million per year:

- is unlikely to be possible to deliver efficiently and on time[14];
- would risk disproportionate costs, including disruption to customers and inflationary impacts.

We have planned the phased delivery of improvements to sewage discharges on this basis and taking into account investment needed by Scottish Water to improve waters affected by abstraction and impoundment for public drinking water supply (see Section 4.2). The improvements planned by 2015, between 2015 and 2021 and then between 2021 and 2027 represent what we currently expect Scottish Water to be able to deliver without a high risk of disproportionate expense being incurred. We will review this when updating the plan for 2015.

In identifying priorities for improvement, we have taken into account:

(a) the severity of the impact;

(b) our confidence in the classification of the water body and hence the scale of the improvement needed to achieve good water quality;

(c) the geographic extent of the impact (ie is the impact affecting hundreds of metres, a few kilometres or tens of kilometres?);

(d) whether addressing the impact would also contribute to achieving other objectives (eg objectives for protected areas);

(e) the timing of planned measures to address any other pressures affecting the status of the water bodies concerned.

With respect to point (b) above, our confidence in the classification of water bodies varies from water body to water body. It depends on a range of factors, including the amount of monitoring information currently available; whether the water body is close to a class boundary or not; and the natural variability of the quality elements that have been assessed. The less monitoring information, the closer to a class boundary and the more naturally variable the quality element, the lower will be the certainty of classification.

To ensure investment in measures is not wasted on water bodies that subsequently turn out to have been at good status, we have taken into account the confidence in classification results in prioritising the water bodies for which action will be taken in the period up to 2015. Where improvements have been phased because of uncertainty about the classification of a water body, SEPA will target the water bodies concerned for further monitoring and assessment with the aim of improving confidence in their classification in time to identify, and secure the delivery of, any measures as may prove necessary to achieve good status or good ecological potential by the planned deadline.

[12] www.scotland.gov.uk/Topics/Business-Industry/waterindustryscot/improvingservices
[13] www.watercommission.co.uk/
[14] www.watercommission.co.uk/UserFiles/Documents/SW%20Capital%20Programme%20-%20Summary%20Final.pdf

### 4.1.2 Diffuse source pollution

For the purposes of phased achievement of good status, we have extended the deadline for achieving good status from 2015 to 2021 or 2027 for 286 of the water bodies that are currently failing to achieve good status as a result of diffuse source pollution.

Table 38 below provides a summary of how we plan to progressively address the adverse impacts of this pollution. Appendix A lists the individual water bodies subject to diffuse pollution and for which we have extended the 2015 deadline for achieving good status. Further details of the individual water bodies can be found using the interactive map on SEPA's website at: www.sepa.org.uk/water/river_basin_planning.aspx

Table 38: Phased improvement of water quality in water bodies subject to diffuse pollution

| Main source of diffuse pollution preventing the achievement of good status or good ecological potential | Phased improvements in water quality in water bodies affected by diffuse pollution (number of water bodies) | | |
|---|---|---|---|
| | Diffuse pollution impacts to be addressed by 2015 | Diffuse pollution impacts to be addressed by 2021 | Diffuse pollution impacts to be addressed by 2027 |
| Agriculture | 117 | 115 | 106 |
| Urban | 5 | 1 | 5 |
| Acid deposition* | 3 | 0 | 0 |

Note:
* The deadline for 24 water bodies affected by acid deposition has been extended beyond 2015 because natural conditions (natural recovery time) means that the water bodies will not recover to good status by 2015. The time for their recovery is difficult to predict and in most cases is likely to extend beyond 2027.

The sections below summarise our reasons for extending the deadline for good status in water bodies affected by urban diffuse pollution, agricultural diffuse pollution and acid deposition.

Information on the measures envisaged as necessary to bring the water bodies progressively to good status by the applicable extended deadline can be found in Chapter 3 on delivering the plan.

## Urban diffuse source pollution

### Reason for extended deadlines

Urban diffuse source pollution accounts for 5% of diffuse pollution impacts on the status of water bodies. We have extended the deadline for restoring good water quality in 6 water bodies affected by urban diffuse pollution for reasons of disproportionate cost.

### Explanation

Urban diffuse pollution results from rainfall becoming contaminated with pollutants on roads, car parks and other urban surfaces. The rainfall run-off from these urban surfaces typically enters a drainage system from which it is discharged into the water environment. Scottish Water together with the relevant roads authority are responsible for much of the drainage systems in urban areas. Measures to prevent pollution of the rainfall or remove pollutants before discharge to the water environment are difficult and time consuming to design and implement in densely populated urban areas. Space to retrofit sustainable urban drainage systems is at a premium and the civil works involved in installing them can cause considerable disruption if not planned and phased sensitively.

Designing and implementing effective solutions is necessarily a lengthy and complex process. If adequate time and expertise is not invested, the solutions identified are likely to fail to deliver, cost much more than necessary or impose disproportionate burdens as a result of the disruption caused. Attempting to develop and implement effective solutions for all the impacts resulting from urban diffuse pollution by 2015 would result in solutions being implemented that have a high risk of failing to deliver and thus be disproportionately expensive.

# Agricultural diffuse source pollution

## Reason for extended deadlines

Diffuse source pollution from agriculture accounts for 90% of diffuse pollution impacts on the status of water bodies[15]. We have extended the deadline for achieving good status for 221 water bodies because (a) completing the improvements by 2015 in all water bodies so affected would be disproportionately expensive; and (b), for some, the natural rate at which their ecological quality will recover once pollution has been tackled is too slow for them to achieve good ecological status by 2015.

## Explanation

We have extended the deadline for achieving good status to enable us to develop understanding of the effectiveness of our new measures. We have done this to avoid farmers having to take measures that may be either ineffective or more effective and costly than necessary and hence impose disproportionate burdens.

The risk posed by agricultural activities depends on a wide range of factors, including the characteristics of soils, the topography of the land, the prevailing climatic conditions, the number of such activities in the catchment of the water body and the characteristics of the water body. This makes it difficult to precisely predict the effects of particular measures.

Because of this uncertainty, programmes of measures need to be built up gradually and iteratively. If a learning approach is not taken, there is a high chance that a programme of measures will under-deliver or over-deliver (ie as a result of the inclusion of measures that are ineffective or that are surplus to requirements). Either the intended environmental improvements will not be realised, the measures will impose unnecessary restrictions and burdens on the agricultural sector or both will occur. This would lead to justified criticism of river basin management planning. In our judgement, imposing potentially unnecessary costs and burdens on farmers in an effort to address all impacts resulting from diffuse pollution from agricultural sources by 2015 would be counter-productive and disproportionately expensive.

In order to avoid disproportionate burdens on farmers, improvements will be phased in a way that allows iterative development and refinement of the programme of measures on the basis of feedback from our monitoring programmes on the effectiveness of earlier measures. To implement this 'learning' approach we taken a number of measures:

(a) We have introduced regulations requiring all agricultural activities that can cause diffuse source pollution to be undertaken in accordance with general binding rules without the need for prior authorisation by SEPA. The rules set out minimum standards for reducing the risk of diffuse pollution by means of good farming practice.

(b) We have prioritised an initial sub-set of affected water bodies for which we will iteratively develop a programme of measures by monitoring the effectiveness of the general binding rules and, as necessary, introducing additional targeted measures tailored to the particular sources of pollution concerned. This will allow us to build up effective programmes of measures for these water bodies during the period up to 2015.

(c) We will apply the experience so gained to develop bespoke programmes of measures for further prioritised sub-sets of affected water bodies in the second and third river basin planning cycles.

In identifying priorities for each river basin planning period, we have taken into account:

(i) the severity of the impact;

(ii) our confidence in the classification of the water body and hence the scale of the improvement needed to achieve good water quality;

(iii) the geographic extent of the impact;

(iv) whether addressing the impact would also contribute to achieving other objectives (eg objectives for protected areas);

(v) the timing of planned measures to address any other pressures affecting the status of the water bodies.

For point (ii) above, our confidence in the classification of water bodies varies from water body to water body. It depends on a range of factors, including the amount of monitoring information currently available, whether the water body is close to a class boundary or not and the natural variability of the quality elements that have been assessed. The less monitoring information, the closer to a class boundary and the more naturally variable the quality element, the lower will be the certainty of classification.

[15]See Chapter 1 of this document, available on the SEPA website at: www.sepa.org.uk/water/river_basin_planning.aspx

To ensure measures are not wasted on water bodies that subsequently turn out to have been at good status, we have taken into account our confidence in classification results in prioritising the water bodies for which targeted action will be taken in the period up to 2015.

A number of water bodies are adversely affected by excess nutrient inputs from agricultural sources or a combination of agricultural and other sources. For some of these, in particular lochs, the rate at which the natural balance of water plants and animals can re-establish itself once nutrient pollution has been addressed is slow. Because of this naturally slow recovery rate, such water bodies are not expected to achieve good ecological status by 2015. In some cases, SEPA is estimating that the water bodies' ecological quality may not reach good status until after 2027.

### Pollution from acid deposition

#### Reason for extended deadlines

Acidification as a result of pollution from acid deposition is preventing the achievement of good status in 27 surface water bodies. We do not expect to be able to achieve the water quality needed for good status by 2015 in 24 of these water bodies (listed at Appendix A Table A1) because natural conditions do not allow timely recovery of the bodies of water concerned. Instead, we are aiming to achieve the water quality required for good status as soon as natural conditions permit.

#### Explanation

Acid deposition results from the burning of fossil fuels that emit acid-forming gases (sulphur and nitrogen compounds) into the atmosphere. The gases can react with moisture in the atmosphere to form sulphuric and nitric acid. These acids can then reach water bodies following rainfall The main sources of the sulphur dioxides and nitrogen compounds are emissions from industries burning coal and oil, and vehicle emissions.

Acidification of water bodies accounts for 8% of diffuse source pollution impacts on the status of rivers and lochs in the Scotland RBD. The amount of acid deposition has substantially reduced as a result of controls on emissions of acidifying gases (in particular sulphur dioxide) within the UK and internationally[16]. UK emissions of sulphur dioxide have decreased markedly since 1970. Total sulphur dioxide emissions fell by 82% between 1990 and 2006 to 676 thousand tonnes. This compares with targets for 2010 of 625 thousand tonnes under the UNECE Gothenburg Protocol and 585 thousand tonnes under the EU National Emissions Ceiling Directive. Total emissions fell by 86% between 1980 and 2006 compared with the UNECE Second Sulphur Protocol targets of reductions of 50% by the year 2000, 70% by 2005, and 80% by 2010.

Although many water bodies have shown signs of recovery as a result of these reductions in emissions, the timetable for their full recovery is difficult to predict, dependent on natural conditions in catchment soils and the water environment and expected to take up to several decades. Because of the uncertainty about the rate of recovery and the likelihood that recovery times will be prolonged, we cannot predict with any confidence when the conditions needed for good status will be achieved. However, for up to 24 of the affected water bodies, we currently are not expecting recovery until after 2027.

## 4.2 Our reasons for phasing the achievement of good water flows and water levels beyond 2015

This Section explains the reasons why we have phased the restoration of the water flow and water levels necessary for good status beyond 2015 in 337 water bodies affected by abstraction or impoundment. For these water bodies, we are aiming to achieve the required water flow and water level conditions by 2021 or 2027.

Table 39 below provides a summary of how we plan to progressively address the adverse impacts of these pressures. Appendix A lists the individual water bodies subject to abstraction or impoundment-related impacts and for which the deadline for achieving good status has been extended beyond 2015. Further details on each water body can be found using the interactive map available on SEPA's website at: www.sepa.org.uk/water/river_basin_planning.aspx

Information on the measures envisaged as necessary to bring the water bodies progressively to good status by the applicable extended deadline can be found in Chapter 3.

[16]The EU National Emissions Ceiling Directive sets limits for emissions of ammonia, nitrogen oxides, sulphur dioxide and volatile organic compounds (VOCs) to be achieved by 2010. The Gothenburg Protocol (United Nations Economic Commission for Europe, 1999) also sets ceilings for these emissions. The UK ratified the Protocol in 2005.

Table 39: Phased improvement in water flows and water levels in water bodies affected by abstraction and/or impoundment

| Water use preventing the achievement of good status or potential | Phased achievement of improvements in water flows and water levels in water bodies affected by abstraction and/or impoundment | | |
|---|---|---|---|
| | Number of water bodies in which abstraction and impoundment impacts will be addressed by 2015 | Number of additional water bodies in which abstraction and impoundment impacts will be addressed by 2021 | Number of additional water bodies in which abstraction and impoundment impacts will be addressed by 2027 |
| Drinking water supply | 26 | 16 | 60 |
| Hydropower generation | 31 | 4 | 82 |
| Irrigation of agricultural land | 14 | 22 | 63 |
| Aquaculture (fish farming) | 1 | 1 | 3 |
| Drinks production | 1 | 4 | 37 |
| Other | 8 | 32 | 13 |

The sections below summarise our reasons for extending the deadline for good status in water bodies affected by abstraction and/or impoundment for the purposes of:

- irrigating agricultural land;
- public drinking water supply;
- hydropower generation.

For information on the reasons why the timetable for addressing other pressures on water flow or water level has been extended beyond 2015, please use the interactive map available on SEPA's website at: www.sepa.org.uk/water/river_basin_planning.aspx

## Abstraction for irrigation

### Reason for extended deadlines

We have extended the deadline for achieving good water flows and levels in 418 of the groundwater and river water bodies affected by abstraction for irrigation because completing the necessary improvements by 2015 in all water bodies so affected would be disproportionately expensive.

### Explanation

We have not yet been able to obtain sufficient monitoring data to ascertain the scale of the impact of irrigation abstractions on the status of river and groundwater bodies and hence the extent of the changes we need to make to achieve good status, with any certainty. Assessing the impact of irrigation abstractions is complex. Often adverse impacts are most likely to result not from one farmer's abstraction but from the cumulative effect of simultaneous abstractions by a number of farmers within a river catchment. The effect also depends on weather conditions. In the series of wet summers we have experienced in 2007, 2008 and 2009, farmers have needed to irrigate less and there was more water available that could have been used for irrigation without posing a risk to flows and levels in water bodies. In dry summers, crop irrigation requirements are much greater and the water availability much more limited. On top of this, irrigation requirements vary from year to year depending on the crops being grown: Some crops require much more water than others.

Designing effective programmes of measures requires a good understanding of the pattern of abstraction and the risk it poses to the water environment. Because of the complexities, this understanding will take several years to develop in each affected river basin. With relevant monitoring only commencing in the summer of 2007, there has not yet been enough time to develop a sufficient understanding for all water bodies affected by irrigation abstractions. This means we are not at all certain what measures are needed to achieve good status. Asking farmers to take expensive measures that may prove unnecessary (because the gap to good status turns out to be smaller than estimated) or insufficient

(because the gap is larger than estimated) would risk incurring disproportionate expense. In the worst case scenario, an entirely different set of measures may prove necessary and the original investment by the farmer would have been wasted.

To avoid imposing potentially unnecessary costs, and hence disproportionate burdens on farmers, we have phased the achievement of good status. For those water bodies for which we predict the gap to good status is largest, we have extended the deadline to 2027. For others, we have extended the deadline to 2021. This is because where the gap proves to be large, the necessary measures to achieve good status are likely to involve (a) the construction of large water storage ponds that the farmer would fill during the winter months or wet years when plenty of water is available and draw on to support irrigation during dry weather in the summer; or (b) a shift to alternative, lower water-demand crops or to livestock production. These measures will require significant investment of time and resources in their planning, design and implementation. Farmers will need time to deliver such measures if they are to maintain the viability of their farm businesses. Consequently, where such measures are most likely, taking account of the uncertainties in our current understanding, we have extended the deadline for achieving good status to 2027. Demanding a faster pace risks placing disproportionate burdens on farmers.

## Abstraction and impoundment for public drinking water supply

### Reason for extended deadlines

We have extended the deadline for achieving good status for 76 water bodies affected by abstraction and/or impoundment associated with public drinking water supply because the scale of improvements necessary to good water flows and levels in all the relevant water bodies can only be achieved in phases extending beyond 2015, due to disproportionate cost.

### Explanation

Scottish Water is responsible for the supply of public drinking water to 97% of households in Scotland.

Addressing the impacts caused by the abstractions and impounding works used by Scottish Water for this purpose can involve major programmes of works to:

- limit leakage (reducing the quantities of water required to be abstracted) by re-lining mains supply pipes;
- develop alternative sources and the associated infrastructure;
- raise the height of dams at existing impoundments to make additional stored water available to provide compensation flows to the downstream river.

Implementing such measures requires considerable investment of time and resources to plan and design the works, obtain the necessary development permissions and undertake the capital engineering works. Designing effective solutions is necessarily a lengthy and complex process. If adequate time and expertise is not devoted, the solutions identified are likely to fail to deliver or to cost much more than necessary. Attempting to develop and implement solutions for all the impacts caused by Scottish Waters operations by 2015 will result in schemes failing or incurring disproportionate expense.

Investment by Scottish Water in environmental improvements is planned through a process known as Quality and Standards[17]. The current advice from the Water Industry Commission for Scotland[18] is that a capital investment programme for Scottish Water of larger than £450 million to £500 million per year:

- is unlikely to be possible to deliver efficiently and on time[19];
- would risk disproportionate costs, including disruption to customers and inflationary impacts.

We have planned the phased delivery of improvements to waters affected by abstractions and impoundments for public drinking water supply on this basis and taking into account investment needed by Scottish Water to improve waters affected by sewage discharges (see Section 4.1.1). The improvements planned by 2015, between 2015 and 2021 and then between 2021 and 2027 represent what we currently expect Scottish Water to be able to deliver without a high risk of disproportionate expense being incurred. We will review this when updating the plan for 2015.

[17] www.scotland.gov.uk/Topics/Business-Industry/waterindustryscot/improvingservices
[18] www.watercommission.co.uk/
[19] www.watercommission.co.uk/UserFiles/Documents/SW%20Capital%20Programme%20-%20Summary%20Final.pdf

In identifying priorities for improvement, we have taken into account:

(a) the severity of impacts;

(b) our confidence in the classification of the water body and hence our confidence that the measures are needed to achieve good status;

(c) the geographic extent of the impact (ie is the impact affecting a few hundred metres, a few kilometres or tens of kilometres?);

(d) whether addressing the impact would also contribute to achieving other objectives (eg objectives for protected areas);

(e) the timing of planned measures to address any other pressures affecting the status of the water bodies

Where improvements have been phased because of uncertainty about the classification of a water body, SEPA will target the affected water bodies for further monitoring and assessment with the aim of improving confidence in their classification in time to identify, and secure the delivery of, any measures as may be prove necessary to achieve good status or good ecological potential by the planned deadline. Scottish Water is also undertaking a major programme of work to generate detailed records of its abstractions by installing monitoring equipment on abstractions where the water treatment works supply over 50m$^3$/day of drinking water.

## Abstraction and impoundment for hydropower generation

### Reason for extended deadlines

We have extended the deadline for achieving good status in 86 of water bodies affected by abstraction and impoundment for hydropower because completing the improvements by 2015 in all water bodies so affected would be disproportionately expensive.

### Explanation

Scotland's larger hydropower schemes typically include multiple storage reservoirs formed by large dams and numerous smaller diversion dams. The latter capture river flow and divert the water into the storage reservoirs from which it is abstracted to drive generator turbines. Many of the reservoirs and the rivers downstream are substantially altered in character and have therefore been designated as heavily modified water bodies. Some of the smaller diversion dams are sufficiently large to downgrade the status of the affected water bodies and the latter have also been designated as heavily modified water bodies.

Achieving good ecological potential in these water bodies can require major engineering works to install fish passes and/or to enable the controlled release of a proportion of the reservoir water to provide compensation flows for the downstream rivers. In these complex schemes, identifying an appropriate flow regime and designing the necessary works to deliver it is a major undertaking. It requires considerable time and resources if the best possible ecological quality in the affected rivers and reservoirs is to be realised and significant adverse impacts on Scotland's renewable energy generation avoided. The process needs the involvement of a wide range of interested parties as well as considerable investment of time and expertise by both the operator and SEPA. Consequently designing, planning and tendering for the works can take several years.

Because of the long-lead in time required to design solutions, SEPA prioritised four large hydropower schemes for action in the period up to 2015 and began the studies and investigations necessary to design measures for them in 2006. The iterative process of designing the best environmental solution is now well underway, and there are on-going discussions between SEPA, the operators and other interested parties.

Attempting to achieve good ecological potential in all water bodies impacted by hydropower schemes by 2015 would risk the implementation of inappropriate solutions that fail to deliver the desired ecological benefits or are unnecessarily expensive. There is a high risk that solutions developed without sufficient background environmental information or without sufficient input from third parties would incur disproportionate expense.

Phasing improvements up to 2027 means we can deliver better solutions for the water environment with the least possible loss of renewable energy generation capacity. It avoids having to spread too thinly the limited pool of specialist expertise needed to plan and design such improvements. It also allows the knowledge gained on the effectiveness of different solutions to be incorporated into the detailed design of measures for subsequent schemes. And it allows us to make sure that any reduction in renewable energy output at a particular scheme does not on its own or cumulatively have a significant impact on the achievement of Scotland's renewable energy targets.

## 4.3 Our reasons for phasing the achievement of good bed, banks, shores and river continuity beyond 2015

This Section explains the reasons why we have phased the restoration of good condition beds, banks and shores and good river continuity for fish beyond 2015 in water bodies affected by physical modifications to their beds, banks or shores or by dams and weirs on rivers that act as a barrier to the passage of migratory fish. For these water bodies, we are aiming to achieve the required conditions by 2021 or 2027.

Table 40 below provides a summary of how we plan to progressively address the adverse impacts of these physical modifications. Appendix A lists the individual water bodies subject to such alterations and for which the deadline for achieving good status has been extended beyond 2015. Further details on each water body can be found using the interactive map available on SEPA's website at: www.sepa.org.uk/water/river_basin_planning.aspx

Information on the measures envisaged as necessary to bring the water bodies progressively to good status by the applicable extended deadline can be found in Chapter 3.

Table 40: Phased improvement to the structure and condition of the bed, banks and shores of water bodies, and to river continuity for fish

| Cause of modifications preventing the achievement of good status or good ecological potential | Number of water bodies in which impacts on the condition of beds, banks, shore or river continuity for fish will be addressed by 2015 | Number of additional water bodies in which impacts on the condition of beds, banks, shore or river continuity for fish will be addressed by 2021 | Number of additional water bodies in which impacts on the condition of beds, banks, shore or river continuity for fish will be addressed by 2027 |
|---|---|---|---|
| All causes of modifications to beds, banks and shores | 55 | 117 | 202 |
| Engineering modifications in heavily modified urban rivers | 12 | 21 | 56 |
| Forestry plantations | 6 | 40 | 47 |
| Barriers to fish migration associated with heavily modified water bodies for water storage for hydropower, public drinking water supply; etc) | 11 | 1 | 11 |
| Other barriers to fish migration | 82 | 67 | 121 |

## Engineering modifications to beds, banks and shores

### Reason for extended deadlines

We have extended the deadline from 2015 to 2021 or 2027 for water bodies that are currently failing to achieve good status as a result of modifications to their bed, banks or shores because completing the necessary improvements by 2015 in all water bodies so affected would be disproportionately expensive.

### Explanation

We are phasing improvements to the structure and condition of the bed, banks and shores of water bodies to ensure we get best value from the investment in time and resources.

Evidence from the UK and other countries[20] demonstrates that successful habitat restoration projects need careful design and management. They are highly prone to failure if appropriate skills and expertise in design and management are lacking.

[20]Eg see S. Darby and D. Sear *River Restoration; Managing Uncertainty in Restoring Physical Habitat*, published by John Wiley & Sons, 2008

Scotland currently has limited experience and expertise on which to base the design and delivery of habitat restoration projects of the scale necessary to achieve good status or good ecological potential in all bodies of surface water. To ensure we invest resources to beneficial effect, we need to limit the number of projects we tackle initially so that we can focus the experience and expertise we do have. As our knowledge of designing and delivering habitat improvements increases, so will the number of projects we are able to undertake at any one time.

If such an iterative, learning approach is not taken, there is a high chance that we will embark on costly projects that fail to deliver the improvements necessary to achieve good status or good ecological potential. At best, this would cause delays and incur the expense of further work to design, and plan the implementation of, additional improvements. At worst, it could result in our being unable to achieve our objectives by the planned deadline and gaining no benefit from the investment made.

We need to ensure that the resources we invest deliver environmental improvements. If not, we run a high risk of incurring disproportionate cost; investment that is not balanced by the benefits it delivers. The phasing of improvements will enable the efficient and effective use of resources.

To implement a 'learning' approach:

(a) In 2008 we identified and funded a series of small scale restoration projects. We are adding additional projects each year as our experience grows. The projects are partnership projects in which the partners contribute resources. The programme is also supported by public funding. A proportion of the projects is being, and will be, intensively monitored and the results used to inform the design of subsequent projects.

(b) We prioritised action in catchments where the measures will contribute to the achievement of other objectives (eg biodiversity conservation; diffuse pollution reduction; flood management). This reduces the risk of incurring disproportionate expense if the improvements to the condition of the beds, banks or shores do not deliver as large an ecological benefit as expected.

(c) We targeted action where our confidence in the classification of the water body is high and hence our confidence that measures are needed to achieve good status is also high. Where we have delayed taking action because we are uncertain about the extent to which the ecological quality of a water body is adversely affected, SEPA will in the meantime undertake further investigations to improve confidence in its assessment of the body's status.

(d) The Scottish Government will introduce legislation that enables SEPA to facilitate restoration or, if necessary, take action itself (see Chapter 3).

## Barriers to fish migration

### Reason for extended deadlines

We have extended the deadline from 2015 to 2021 or 2027 for water bodies that are currently failing to achieve good status as a result of barriers affecting the continuity of rivers for fish migration because completing the necessary improvements by 2015 in all water bodies so affected would be technically infeasible and disproportionately expensive.

### Explanation

Many dams and other structures, such as culverts, allow for fish passage. Impacts on river continuity for fish migration result from dams and other structures that have no such provision. Dams acting as barriers to fish migration include large dams used to store water for public drinking water supply or hydropower generation and smaller dams and weirs, many of which are no longer actively used.

Providing fish passage at these large storage reservoir dams involves major engineering works to construct suitable fish passes and undertake the works needed to deliver a sufficient water flow to the river downstream of the dam to trigger and support fish migration. The principal reasons why we have phased such works at these large dams are explained in Section 4.2 on abstraction and impoundment for public drinking water supply and hydropower generation.

As well as obvious barriers to fish migration like large dams at reservoirs, there are a great many smaller dams, weirs and other potential obstructions to fish passage within the Scotland RBD. In some cases, we are not yet certain of the extent to which the structures are real barriers to fish migration. Taking action before confirming that they are a problem could result in our efforts being expended for no environmental benefit. Where we are already sure that a structure is a barrier to fish migration, the engineering of provisions for effective fish passage requires considerable knowledge and expertise that takes years to acquire. There are currently too few suitable experts available to oversee the necessary studies and come up with effective design solutions to address all the barriers to fish migration by 2015. We also need to sequence which dams we tackle first so that the installation of a fish pass provides real benefit. For example, to be of benefit to upstream fish migration, there must be no downstream barriers to migration and the fish habitat upstream must be in a suitable condition to support the fish. Consequently, we have prioritised work so that the most downstream dams are tackled first and, where relevant, work to improve river continuity for fish migration is timetabled in line with the scheduling of improvements to the quality of the fish habitat upstream.

We are planning to ensure fish passage is provided for 82 smaller dams and other barriers by 2015. We think this represents the most we can feasibly and effectively tackle in the available time without incurring disproportionate expense through installing unnecessary, ineffective or premature solutions.

## Coniferous plantations on banks and shores

### Reason for extended deadlines

We have extended the deadline from 2015 to 2021 or 2027 for 87 water bodies that are currently failing to achieve good status as a result of coniferous plantations on their banks and shores because completing the necessary improvements by 2015 in all water bodies so affected would be technically infeasible and disproportionately expensive.

### Explanation

Dense stands of coniferous forests on the banks of rivers or the shores of lochs can have a dramatic effect on the ecological quality of rivers. Too much shade leads to bare, eroding banks; wider, shallower channels; loss of aquatic plants; and reduced productivity of fish and aquatic invertebrates.

Where these problems occur, we need to re-structure the forests in order to create a buffer zone between the waters edge and the conifer plantation. This requires trees to be felled and removed and the buffer zone re-planted with an appropriate mix of tree species and other vegetation.

In most cases, creating suitable buffers is not practicable without the felling of large areas of the surrounding forest. This is because of the difficulty in accessing the affected river corridors to harvest the trees. To undertake such felling on the scale necessary to address all the affected water bodies by 2015 would be beyond the capacity of the forestry sector to deliver. It would also require many trees to be felled before maturity and result in significant economic losses for the forestry sector.

To manage these difficulties, we have brought forward felling plans for the forests we are confident that the planted forests are having significant adverse impacts on the status of rivers or lochs and phased felling work in other forests according to the severity of the risks and the maturity of the trees concerned. In the meantime, the Forestry Commission has published Forests and Water Guidelines[21] designed to ensure that new problems are not created by poor planting practice in new plantations and that wherever relevant forestry operations are being undertaken in existing forests, appropriate buffer zones are opened up between rivers and areas of conifer planting.

[21] www.forestry.gov.uk/pdf/FCGL002.pdf/$FILE/FCGL002.pdf

# 5. Lower (less stringent) objectives than good status

This section explains why, for reasons other than natural conditions affecting the rate of recovery, we do not expect to be able to achieve good status even by 2027 in a small number of water bodies.

## 5.1 Water quality problems not expected to be resolved until after 2027

### Minewater pollution

5% of bodies of groundwater are significantly polluted as a result of past mining activities. For these water bodies, we do not expect to be able to achieve the water quality needed for good status even by 2027. Instead, we are aiming to achieve an objective of less than good status. The water bodies concerned are listed in Table B1 in Annex B.

Further details about the individual water bodies can be found using the interactive map available on SEPA's website at: www.sepa.org.uk/water/river_basin_planning.aspx

### Reason for lower (less stringent) objectives than good status

In deep mines, groundwater was pumped from the mines to allow access to the minerals through underground shafts and passageways. With the cessation of mining and the closure of the pits, groundwater levels have rebounded and flooded the workings.

As the recovering groundwater has come into contact with the exposed rocks of the mine workings, it has become contaminated with iron and other heavy metals and its pH reduced (ie made more acidic) due to oxidation of naturally occurring metal sulphides. It is technically infeasible to remove the heavy metals and restore the pH of groundwater by 2015.

Over time, the quantities of metals entering the groundwater from the exposed workings will reduce and cease as the exposed rock faces become fully oxidised, and the quality of groundwater will recover as the pollutants are flushed through and diluted. The slow flushing times of groundwater mean that recovery will take many decades and water quality (ie chemical status) is not expected to reach good status until well after 2027.

### Agricultural diffuse source pollution

For 3 bodies of groundwater affected by diffuse pollution from agricultural sources, we do not expect to be able to restore the water quality needed for good status even by 2027. For these water bodies, we are aiming to achieve a lower objective than good status. The bodies are all significantly adversely affected by pollution resulting from past applications of nitrates to agricultural land. The water bodies concerned are listed in Table B2 in Annex B.

Further details about the individual water bodies can be found using the interactive map on SEPA's website at: www.sepa.org.uk/water/river_basin_planning.aspx

### Reason for lower (less stringent) objectives than good status

Nitrates are used in fertilisers to promote the growth of agricultural crops. Not all nitrates in fertilisers are taken up by the growing crops and, instead, leach into the sub-soil and then groundwater.

Concentrations of nitrates in groundwater have built up over decades. Because of the slow flushing rates of groundwater and continuing, albeit lower inputs of nitrates, the concentration of nitrates in groundwater will take decades to decline sufficiently for the groundwater quality to recover to that required to achieve good status.

It is technically infeasible to remove nitrates from groundwater or otherwise increase the rate of recovery of the affected groundwater. Consequently, good status will not be achieved until after 2027.

In the meantime, action is being taken under the Nitrates Directive to ensure that future applications of nitrates to agricultural land are closely matched to crop requirements and do not result in a further build-up of excess nitrates in groundwater.

## 5.2 Lower objectives as a result of new hydropower, flood protection and drinking water supply developments

For the reasons given in Section 6 below, we have allowed developments leading to deterioration of status of 29 water bodies, for the purposes of flood protection, hydropower generation or public drinking water supply. These developments are expected to prevent all but one of the affected water bodies from achieving good ecological status. We have set lower (less stringent) objectives than good status for most of these water bodies. The objectives represent the best ecological quality that it is practicable to achieve without disproportionate cost.

### Reason for lower (less stringent) objectives than good status

It would be disproportionate to require the achievement of an objective that would compromise the benefit to human health, human safety or sustainable development for which the developments were permitted.

The water bodies concerned are listed in Table B3 in Annex B. Further details about the individual water bodies can be found using the interactive map on SEPA's website at: www.sepa.org.uk/water/river_basin_planning.aspx

For a small number of the water bodies in which we have allowed developments leading to deterioration, the nature and scale of the development has obviously and substantially altered the bodies' physical characteristics. We have designated the water bodies concerned as heavily modified and set an objective of good ecological potential. We will review whether any of the other water bodies warrant identification as heavily modified water bodies before the first update of the plan in 2015.

## 5.3 Lower objectives than good status as a result of the impacts of invasive non-native species

### North American signal crayfish

Once established in a river or loch, North American signal crayfish cause significant damage to the native plant and animal communities. Currently, 7 river water bodies are not at good status because of the impacts of this invasive non-native species.

### Reason for lower (less stringent) objective than good status

It is currently infeasible to remove established populations of North American signal crayfish, or sufficiently mitigate their impacts, in order to enable good status to be achieved[22]. Different measures have been tried within the UK and elsewhere, including capture/harvesting techniques and the use of pesticides. Although some of the techniques tried have extremely destructive effects on the structure and function of the aquatic ecosystem, none of them has proved effective at a water body scale. Research to identify an effective method is being undertaken.

Given the resilience of North American signal crayfish to all currently available control methods, we have set a lower objective than good status for affected water bodies. The objectives represent the highest possible ecological status the bodies can reasonably achieve in the absence of effective control methods.

The water bodies concerned are listed in Table B4 in Annex B. Further details about the individual water bodies can be found using the interactive map on SEPA's website at: www.sepa.org.uk/water/river_basin_planning.aspx

Prior to each update of the river basin management plan, we will review the availability of effective control measures, taking account of studies in the UK and around the world. If and when reasonably effective techniques are developed, we will revise our objectives for the water bodies accordingly.

[22] www.snh.gov.uk/pubs/results.asp?q=signal+crayfish&trpp=10

# 6. Exemptions from the objective of preventing deterioration of status

There have been no cases to date of temporary deterioration of status as a result of extreme floods, prolonged droughts, or accidents which could not reasonably have been foreseen. However, we have allowed twenty nine exemptions from the objective of preventing deterioration of status for new developments. Table 41 below summarises the purposes of the developments. The affected water bodies are listed in Appendix C.

Table 41: Purposes for which new developments leading to deterioration of status have been permitted

| Purpose of development | Number of water bodies affected |
|---|---|
| Impoundment and/or engineering works for flood protection | 2 |
| Abstraction and impoundment for public drinking water supply | 1 |
| Abstraction and impoundment for hydropower | 26 |

We have allowed deterioration of status of these water bodies to enable new modifications to their physical characteristics. We have done this because the developments will provide benefits to human health, human safety or to sustainable development that we consider outweigh the benefits to the environment and society of preventing deterioration of status.

SEPA required prior authorisation for each of the developments under the Water Environment (Controlled Activities) (Scotland) Regulations 2005. The prior authorisation process required the developers to provide information to enable SEPA to (a) assess the risks to the water environment and (b) determine if the criteria that must be met to allow derogation from the objective of preventing deterioration of status would be satisfied.

The information was provided as part of the environmental information required under the Environmental Impact Assessment Directive, where that directive applied to the development. Alternatively, it was required by SEPA under the 2005 Regulations.

Each new modification was also subject to public consultation as part of the prior authorisation process. This enabled interested parties to provide information to SEPA to inform its assessment of whether derogation from preventing deterioration of status should, or should not, be allowed.

The method used by SEPA to determine whether or not the criteria necessary for allowing derogation from the objective of preventing deterioration of status is available on the SEPA website[23].

[23]WAT-RM-34 www.sepa.org.uk/water/regulations/guidance/all_regimes.aspx