

Gordano Valley Water Level Management Plan 2015

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WATER LEVEL MANAGEMENT PLAN: REVIEW SIGN-OFF SHEET	
GENERAL DETAILS	
Site Name:	Gordano Valley
Region/Area:	West/ Wessex (North)
Agency Project Manager:	Francis Farr-Cox / Laura Thain

NATURAL ENGLAND & ENVIRONMENT AGENCY & DRAINAGE BOARD AGREEMENT TO REVIEWED WATER LEVEL MANAGEMENT PLAN

"I confirm that I agree with the findings and recommendations of this reviewed Water Level Management Plan. I confirm that I believe that the actions set out would achieve the water level management appropriate for securing the favourable condition of the affected units of the Gordano Valley SSSI"

Position	*Name*	*Signature*	*Date*
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Executive Summary

A water level management plan for the Gordano Valley was produced in 1998. This plan revises and updates that original plan. Over the vast majority of the Gordano Valley there have been no changes to the existing system of water level management. The principal water level control structures remain unaltered at Middle Bridge and on the Sandy Rhyne and the water levels held by these structures are unaltered from those shown in the earlier plan. All existing water control structures will remain with the existing operating authorities with one exception. The outfall of the Portbury Ditch is now the responsibility of the Environment Agency.

Significant improvements have been implemented at the top of the valley where most of the land forms part of the Gordano Valley SSSI.

Here two raised water level areas have been created to achieve favourable condition on approximately 100 hectares of the SSSI including the Weston Moor Reserve and to improve water levels on the Clapton Moor Reserve. The schemes have has been designed to ensure that this can be achieved without any significant impact on water levels on land outside the SSSI and the Reserves. The works will help to restore the Gordano Valley SSSI to a Favourable, or Unfavourable Recovering condition. The schemes have been promoted by the respective land managers under stewardship agreements and comprise the following elements:

a) Blocking the ends of some watercourses to effectively isolate the zones.
b) Engineering a separate water feed into the SSSI zone from the Walton Brook from an existing weir to a spine rhyne.
c) The construction of a number of small control structures to pen water within the SSSI including the Weston Moor Reserve and the Clapton Moor Reserve.

Water levels within the RWLAs will be agreed between Natural England where appropriate and the respective land managers in liaison with the IDB who as Drainage Authority for the area will retain overall control in the normal way.

1 Purpose of the Plan

1.1 Water Level Management Plans

The concept of Water Level Management Plans (WLMPs) was originally suggested by the Ministry of Agriculture, Fisheries and Food (MAFF) in 1991. Conservation Guidance for Drainage Authorities stated that WLMPs should be produced for areas where water levels are managed and that priority should be given to Sites of Scientific Interest, in particular those which incorporated internationally important sites. Since then a range of guidance notes have been produced to help operating authorities with the process.

Water Level Management Plans (WLMPs) are required for all areas which have a conservation interest and where the control of water is important for the maintenance or rehabilitation of that interest. Priority is given to WLMPs for Sites of Special Scientific Interest (SSSIs), particularly those of international importance (e.g. Special Protection Areas, Ramsar Wetlands of international importance). The Plans are a means of balancing and integrating water level management for a range of land uses and activities within an area, including agriculture, recreation, flood risk and conservation.

Natural England is responsible for assessing the condition of SSSIs and has identified a number of wetland SSSIs in Somerset where changes in water level management are required to achieve favourable condition. One of the priority sites identified in this review was Gordano Valley SSSI, where nearly 70% of the SSSI area was considered to be in unfavourable and declining condition due to inappropriate water levels.

The WLMP will assist the Environment Agency, Natural England, Avon Wildlife Trust and the Internal Drainage Board, to carry out their nature conservation duties across the Plan area. In addition, the Plan will help the Environment Agency and the Internal Drainage Board to ensure that the investment in infrastructure is appropriate and maintenance of these assets continues in the future.

2 Site Details

Site Name: Gordano Valley

County: Somerset (North)

NGR: ST 435 730

Total area of catchment: 3000 hectares
IDB area: 1090 hectares
Site Status: SSSI 143 hectares
Date Notified: 1986

OS Sheets: 1/50,000 172
1/25,000 ST 47/57
1/10,000 ST 47 NE, SE, SW, NW; ST 57 NW

Operating Authorities: Environment Agency and North Somerset Levels Internal Drainage Board

Natural England Team: Natural England, Temple Quay House, 2 The Square, Bristol, BS1 6EB

Local Authority: North Somerset Council

3 Site Layout and Features

3.1 General Description:

The Plan area covers 1090 hectares (2700 acres) of what was once the former Gordano Valley Internal Drainage Board (IDB) district. Following the merger of the Gordano Valley IDB with the North Somerset IDB, and subsequently with the West Mendip IDB, this area now forms part of the area managed by the North Somerset Levels IDB. The location and extent of the Plan area is illustrated on Map 1 and is co-incident with that of the Internal Drainage District.

The Plan area is located east of Clevedon, south of Portishead and north of the elevated section of the M5 west of Bristol. The valley sits between the high limestone Tickenham Hills and the elevated ridge and cliffs running between Portishead and Clevedon and receives runoff from both. The valley also receives runoff from the M5 motorway, and there have been some reports of upwelling of water in the low lying peat areas. The Valley contains an intricate ecological system which has evolved partly due to geographical features and partly from the previous management of the land and the drainage system.

In general the area is divided into numerous small fields, in fragmented ownership. Land use is mainly grazing and forage harvesting, with urban and commercial development associated with Portishead and the Port of Bristol. .The fields are mostly separated by rhynes, which due to the limited availability of mains water in the moor are used to provide drinking water for livestock. The rhynes also provide wet fencing for stock management. There are limited paved roads and droves which provide access to the few residential areas in the plan area.

With the exception of the north east area, which drains into the Drove Rhyne, the majority of the water in the Valley drains to the Portbury Ditch. A small part of the Plan area (together with most of the extensive Portishead Quays housing development) drains via new and improved watercourses across Portbury Wharf to a new tidal outfall situated close to the Portbury Ditch outfall. This system is currently incomplete and accordingly the responsibility of the developer but is due for transfer to the Avon Wildlife Trust. The Drainage Board controls that part of the system within its district and acts in an advisory role for the remainder.

The Gordano Valley Plan area contains one Site of Special Scientific Interest (SSSI), one National Nature Reserve (NNR), several Local Wildlife Sites (LWS) and three reserves managed by the Avon Wildlife Trust, as shown on Maps 1 and 3. These designations are not exclusive and some parts of the Valley have more than one designation in particular at the western end of the Plan area.

There are several closed waste disposal sites within the valley area, some of which were unauthorised tipping sites. One of these lies within the SSSI whilst most of the others are concentrated to the east of the SSSI and adjacent to it. Although one of these adjacent sites is still licensed, none are receiving new waste. Only one of the sites has produced leachate that has entered watercourses. The site is still monitored but is not currently causing any significant water quality problem.

4 Nature Conservation

4.1 Conservation Interest and Designations

The Plan area supports many designated environmental areas including SSSI, National Nature Reserve and Local Wildlife Sites. Map 1 and Map 3 show the location of the SSSI and the location of other designated land parcels within the WLMP plan area – many of which overlap each other.

The Gordano Valley SSSI is 161.68 hectares (399.52 acres) and was notified in 1986. This site was designated for its botanical interest and invertebrate and bird communities. The SSSI citation is set out on the Natural England website, and a summary of the reasons for designation is set out in bullet points below:

- Species rich grassland characterised by the nationally rare Blunt-flowered Rush-Marsh Thistle, Soft/Sharp Flowered Rush–Marsh Bedstraw and Purple Moor Grass–Meadow Thistle *Molinia* community types. In all over 130 species of flowering plant have so far been recorded including 3 species of orchids, 21 grasses and 14 sedges. The Gordano Valley is one of the few remaining localities in Britain for the nationally rare Brown Galingale.

- Diverse invertebrate communities associated with the rhynes and ditches are of a type now rarely found in Britain. Species recorded include two nationally rare soldier flies, the nationally scarce Hairy Dragonfly and Variable Damselfly.

- Breeding bird populations. Of 106 bird species recorded, 73 are reported to breed including Sparrowhawk, Lapwing, Snipe, Redshank, Grasshopper and Reed Warbler.

- Historical peat deposits of considerable stratigraphic interest.

Outside the WLMP area there are several other SSSIs and conservation sites which are not affected by the management of the Gordano Valley. These include the Severn Estuary SSSI, Court Hill, Weston Big Wood and Walton Common.

Natural England manages the 126.14ha National Nature Reserve which lies almost entirely within the Gordano SSSI.

The Avon Wildlife Trust own and manage the 59 hectare Weston Moor Reserve which lies partly within the Gordano SSSI. The Trust also own 40 hectares of land just outside the SSSI, the Clapton Moor Nature Reserve, shown on Map 1. The Trust have created a raised water level area (RWLA) scheme in this reserve, to encourage winter splash flooding to attract wintering wildfowl and wading birds and to safeguard the wider wetland wildlife interest. Improved water control arrangements were installed during 2012.

There are several other Local Wildlife Sites scattered in and around the Plan area valley. These sites have been designated by North Somerset Council and individual sites may be designated for their biological or geological interest or both. Please see Map 1 for locations.

4.2 Gordano Valley SSSI: Current Site Condition

The Gordano Valley SSSI is split into 13 Natural England management units. Natural England have assessed the condition of these units and concluded that 11 units are currently in favourable or recovering condition (4 favourable, 7 unfavourable recovering), making up approximately 96% of the SSSI area.

Please see Table 1 for more information on site condition.

Table 1: Condition of SSSI units in the Gordano Valley as at July 2015

meeting PSA target	% Area favourable	% Area unfavourable recovering	% Area unfavourable no change	% Area unfavourable declining	% Area destroyed / part destroyed
96.5%	35.3%	61.18%	1.61%	1.92%	0.00%

4.3 Conservation Aims

The aim of the Environment Agency, Natural England and the North Somerset (2005) IDB was to meet the requirements of Government PAS targets for "Favourable Condition of SSSIs, to bring as many of the unfavourable declining units as possible into favourable or unfavourable recovering condition by 2010.

Natural England has reviewed the conservation objectives for the SSSI. The key objectives can be generalised as follows:

- To maintain and enhance the designated features, habitats and species in favourable / unfavourable recovering condition, which is defined in part in relation to a balance of habitat extents (extent attribute). The features for which the site has been notified include:-
    - Neutral Grassland – Lowland (MG5, MG8, MG11),
    - Fen Marsh & Swamp (M22, M23, M24, S25 & S26),
    - Standing Open Water & Canals (lowland ditch systems),
    - Neutral Grassland – Lowland & Standing Open water & canals, Fen (Assemblage of Breeding Birds Lowland damp grassland)
    - Vascular Plant Assemblage (Cyperus fuscus, Myriophyllum verticillatum and Potamogeton coleratus).
    - In addition to the above mentioned features the site is important for many rare invertebrates (associated with the water courses and the wet woodland) and this has been confirmed through a recent survey (summer 2013). An invertebrate assemblage is likely to be added to the list of notified interest features through the detailed notification review process (during 2014/15).

Favourable condition is defined at this site in terms of site-specific standards laid out with the detail site 'Conservation objectives and definitions of favourable condition for designated features of interest'.

Table 2 below details the specific objectives that have been identified for the Gordano Valley SSSI:

Table 2: Specific conservation objectives for the Gordano Valley SSSI

Site Name	Breeding Birds	Species Rich Grassland	Ditch communities	Wintering Birds	Otters
Gordano Valley	Enhance	Maintain	Enhance	Enhance	Maintain

The following is a summary of the combined objectives of Natural England and the Avon Wildlife Trust:

Water Supply

To maintain a water supply to the site that is adequate in terms of quantity and quality.

Water Levels

To control water levels to benefit nature conservation.

Nature Conservation Interest

To maintain and enhance the nature conservation interest throughout the WLMP area targeting BAP (Biodiversity Action Plan) objectives and designated sites. These designated sites include the Gordano Valley SSSI, Weston Moor NNR and the Local Wildlife Sites (LWS). Sympathetic management of ditches that fulfil the selection criteria for LWS but which are not yet designated is also required.

To encourage sympathetic channel maintenance which allows wildlife enhancement to occur but does not compromise channel conveyance. Aquatic and bank-side vegetation management prescriptions for main rivers and IDB rhynes are already periodically reviewed to encourage greater wildlife benefit, e.g. by cleaning ditches on rotation, desilting through centre of channel only. Maintenance of the private ditches within the various reserves is similarly subject to specific arrangements.

To improve winter ditch levels and achieve better water level management on land that would principally benefit from this initiative. Opportunities for this management should be sought and supported where hydrological isolation can take place.

Rhyne Habitat

To maintain and, where possible, enhance the rhyne habitat.

Notable Plants

To maintain and enhance populations of notable plants:

a.) *Cyperus fuscus*
b.) *Sium latifolium*
c.) *Myriophyllum verticillatum*
d.) *Potamogeton coloratus;*

Notable Invertebrates

To maintain and enhance populations of notable invertebrates:

a) nationally rare solider flies *Odontomyia ornata* and *Stratiomys potamida*.
b) Nationally scarce hairy dragonfly *Brachytron pratense*
c) Variable Damselfy *Coenagrion pulchellum*

Bird Populations

To maintain and enhance bird populations, particularly breeding birds including but not exclusively lapwing, redshank and snipe.

Grant Aid

Promote Environmental Stewardship Schemes to landowners and land managers where practical and available.

4.4 Conservation Management

There are two Entry Level / Higher Level Stewardship (ELS / HLS) and one Organic Entry Level Stewardship / Higher Level Stewardship (OELS / HLS) agreements within the Gordano Valley area. Additionally there is one Conservation Enhancement Scheme (CES) agreement. These agreements cover the main % of land area covered by the SSSI and NNR designations and require the land owners to extensively manage the wet grassland through sensitive grazing and rush management as well as rotationally manage the internal ditch network for the benefit of the aquatic flora and associated rare invertebrates. Areas of land not covered by any current agreements include Walton Moor Wood (north of the ash track) and the additional block of woodland to the west of Moor Lane. Discussions are underway regarding extending / entering the land tenanted by J Flower into an up to date Agri-environment agreement.

5 Other Land Use

5.1 Agricultural Land Use

Agriculture is the principal land use within the Plan area. Most of the land is divided into small fields which are separated by watercourses or a combination of hedge and watercourse. The watercourses are used to provide drinking water for livestock and act as wet fences. The North Somerset Levels Internal Drainage Board recognises the importance of agriculture within the Plan area and the key role that the effective management of water has to play in enabling this land use to prosper within the area. The Board also recognise that additional investment in the water management system will be required in the years to come in order to achieve the combined objectives of conservation and farming in the Plan area.

During the summer months the water level in the main rivers and viewed rhynes is retained in order to provide stock watering, irrigation and wet fencing. Water levels throughout the Plan area are generally controlled by the Environment Agency control structure at Middle Bridge.

Livestock farming is the primary land use, with improved, semi-improved and unimproved grassland used for grazing and for winter fodder, with a small portion of arable land. Food security, and the growing demand for quality food to supply the increasing population of the UK and elsewhere, is likely to stimulate additional investment in agriculture in the coming years. However, the Drainage Board acknowledge that there is little opportunity to increase agricultural productivity within the SSSIs because of its importance for nature conservation, the risk of flooding and the vulnerability of peat soils.

5.2 Fisheries

The Environment Agency has a duty to maintain freshwater and eel fisheries, both of which are represented in the Plan area. The fisheries are an important part of the wildlife interest. Any future planned works to improve water level management will need to take account of fisheries and any new structures should be assessed to determine whether works are necessary to allow for the free movement of eels and elvers in accordance with the Eel Regulations. In the long term measures will be put in place to improve eel passage at existing water control structures. This work will be brought forward if any other planned work is required at these structures.

The Environment Agency's fisheries officers can provide advice to ensure that fisheries are safeguarded and that the Environment Agency's duty to fisheries is not prejudiced.

The problem of low summer water depth in the Portbury ditch, caused partly by assumed leakage at the Middle Bridge tilting weir, was a common occurrence. In the past it has been necessary to use ash and sandbags to limit the losses in an attempt to maintain water levels. Recently the desired levels have been held satisfactorily. In general terms low water depth can reduce the number of species and the impact is more severe in cold weather. This does not normally cause problems provided fish have access to deeper areas in cold conditions. Low water depths are known to occur downstream of Middle Bridge at low tide because this section is unpenned.

In the Gordano Valley there is a problem with duckweed which grows on the surface and limits the penetration of light into the water and prevents photosynthesis in submerged plants – this being the main method of oxygenation in still waters. Fish species such as tench, pike and roach (as well as eel) have been identified in the watercourses although no fishery surveys have been undertaken in this catchment.

The Agency owns the fishing rights on significant lengths of the Main Rivers but since this ownership tends to be fragmented they are not leased to any organisations.

5.3 Archaeology

The wetlands of the Gordano Valley contain a wealth of archaeological information often hidden under layers of peat and clay that have built up over many millennia. This has had three significant effects:

Organic remains such as wood and leather are preserved because the waterlogging excluded oxygen and prevented the normal types of decay which destroy these materials on normal archaeological sites. The waterlogged conditions also preserve pollen grains, plant material, insects, snails and even macroscopic plant and animal remains. These constitute a unique record of the past natural and man-made environment stretching back over the last 6,000 years. They can also provide information concerning human activity on the neighbouring dry land, and past changes in climate and sea levels;

a) The normal methods of archaeological detection do not work well in wetland areas where sites can be deeply buried. The number of known archaeological sites is therefore only a small fraction of the existing total. It is extremely likely that all the river valley wetlands in Somerset contain a wealth of important archaeological sites. In addition there are several types of sites such as fisheries, medieval flood defences and small river ports of which we know very little, but may exist in considerable numbers.

b) LiDAR imaging has revealed the course of palaeochannels on many sites in lowland Somerset including the Gordano Valley.

The organic archaeological remains from the Gordano Valley depend for their continued survival on an anaerobic waterlogged burial environment. If the surrounding peat or clay dries out the organic material will shrink considerably and crack apart. The presence of oxygen will also allow bacterial and fungal decay to resume and eventually completely destroy the artifacts.

The peat itself, and the precious information contained within it, are also adversely affected by desiccation. Where field water tables are below ground level for long periods of time, the shrinkage and chemical breakdown of peat soils can be significant, and can gradually destroy all the archaeological information contained within them. In this regard the summer is the crucial period, as that is when in field water tables are generally at their lowest and therefore peat wastage highest.

All the known archaeology in the area is contained in the North Somerset Sites and Monuments Record (SMR) which is kept in paper map form and on computer. This represents information collected from aerial photographs, excavations, chance finds, observations of drainage ditches and other sources.

The Gordano Valley has different history to that of the Somerset Levels, which are in the main located to the south of the plan area. Before 1810, and the drainage of the valley for agriculture, the water levels in the Gordano Valley were always high. The particular local reason was the existence of a tide mill (the building is now the White Lion PH) at the head of Portishead docks. In operation a large volume of sea water was allowed to flood the valley and penned back after the tide had fallen. This obviously meant that other areas drained less as well, and consequently, waterlogging was historically common. This seems to have continued even after drainage, despite the 19th century Enclosures, and the closure of the mill.

The archaeological potential of the area is extremely high, especially in the SSSI area at the head of the valley, where there are waterlogged peats at or very close to the surface. No archaeological examination of these peats has ever been carried out, but the analogous case of the Somerset peat moors shows the quality and quantity of the archaeology that may be concealed in the peats. The only thing that threatens these deposits at present (barring huge changes in agricultural practice or climate) is desiccation.

The Gordano Valley and the surrounding area contain several Schedule Ancient Monument Sites which can be found detailed in the SMR held by North Somerset Council.

5.4 Built development, services and transport

A number of domestic and commercial properties in and around the Plan area depend, either directly or indirectly, on effective flood defence and water level management. Low lying properties and minor roads (which provide essential transport links) would suffer from flooding or waterlogging without the appropriate maintenance of flood defences, Main Rivers and IDB Viewed Rhynes.

The provision of adequate land for housing and employment is a national priority and Local Planning Authorities are charged with ensuring that sufficient land is made available though the new Local Development Frameworks. However, the low lying nature of much of the Plan area, and the risk of flooding, means that it is more vulnerable than other sites.

The Local Authorities consult the Environment Agency and the Drainage Boards on strategic plans, such as the new Local Development Frameworks, and on individual applications of significance. Planning Policy Statement 25 (PPS25, December 2006) sets out Government policy on development and flood risk. It aims to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas of highest risk.

In exceptional cases where new development is necessary in areas of flood risk, the policy aims to make it safe, without increasing flood risk elsewhere. Where possible, developers are encouraged to work with the Planning Authority and the Drainage Authorities to use opportunities for new development to reduce flood risk overall.

Part of the urban area of Portishead drains to the Portbury Ditch downstream of the principal tilting weir at Middle Bridge. The recent Vale and Moor Farm housing areas in Portishead drain to The Cut (IDB) via balancing facilities and thence to the Portbury Ditch (EA). Most of the recent Portishead Quays housing area drains via balancing facilities to the Moat, formed for the purpose and which discharges to the tidal Portishead Pill.

The Bristol Port Company development drainage passes mainly to the Drove Rhyne which is not connected to the Portbury Ditch and drains to the Bristol Channel separately.

6 Hydrology

6.1 Soils

Soil types over the Plan area vary from predominantly deep peat soils with earthy topsoils in the western part to deep, stone less, calcareous clayey soils in the east. On the boundaries of the Plan area the soils turn to loamy over clay soils with slowly permeable subsoil and are prone to seasonal waterlogging. Soils on the higher ground and steep slopes are very shallow and well drained loamy soils over limestone.

6.2 Hydrological Regime

The drainage system consists of Main Rivers, which are the responsibility of the Environment Agency, Viewed Rhynes which are the responsibility of the North Somerset Levels IDB and private watercourses which are the responsibility of riparian landowners. Main Rivers and Viewed Rhynes are shown on Map 2.

A spring feeds into the moor at its most western extent at the confluence of the Portbury and Black Ditches, located to the east of Clevedon. Numerous other springs emerge from the valley sides and together with the Walton Brook, direct precipitation and emergent groundwater provide the input to the system. The Portbury Ditch runs nearly the entire length of the valley and by linking with the network of other watercourses distributes this water supply throughout the Plan area.

To the east of the Plan area, Sandy Rhyne collects run off from the surrounding hills and M5 drainage system and joins the Portbury Ditch at Clapton Lane. Other main rivers on the south side of the Plan area also collect run off from the hills and carry it ultimately to the Portbury Ditch for evacuation out to sea.

Unlike the other watercourses in the area Drove Rhyne, located in the east, does not connect to the Portbury Ditch. Instead this watercourse carries drainage direct from a short section of the M5 and adjacent industrial estates to the sea at Fastings Gout Outfall.

The majority of the approx 8km length of the M5 between Junction 19 (Gordano Services) and the crest of the Tickenham Hills section is routed into the Portbury Ditch via several separate outfalls and various secondary watercourses. The associated water quality implications are discussed later in Section 7.

Until recent improvements took place there were only a few water control structures in the WLMP area, the major assets being Middle Bridge Tilting Weir which holds a pen on the Portbury Ditch, and the tilting weir at the Portbury Wharf Sea Outfall, situated at the Western end of the Commission Bank which protects the area from tidal inundation.

The tidal outfall structures on Drove Rhyne (namely Fastings Gout and Drove Rhyne Sluice) also protect the area from tidal intrusion.

As previously mentioned, the Avon Wildlife Trust maintain a Raised Water Level Area (RWLA) in the Nature Reserve on Clapton Moor. The Reserve is 40ha and the RWLA is approximately 30ha. Water levels in this RWLA are held seasonally higher than elsewhere, with target water levels for summer (1st May – 1st November) at 4.65mAOD and in winter (1st November – 1st May) 4.95mAOD.

Weston Moor is situated in the valley bottom, lying at an altitude range of 4.61-4.95m AOD. The site and the surrounding land is predominately used as pasture and is artificially divided into 2 areas:

- The new Wildlife Trust Reserve (Court Farm) purchased in 1999. This totals 53 hectares, including 31 hectares of low lying pasture intersected by rhynes and a narrow belt of woodland. Subject to agreement with Natural England the water levels will be monitored to achieve average field height, 4.7m approx AOD (1st Nov-15th April) and .15m below average field height (1st Jun-31st October).

- The original Wildlife Trust Reserve. This is approximately 10.5 hectares. The northern section of this reserve consists of an old refuse tip that has been in-filled and over planted with a grass mix. The southern section contains areas of fen-meadow and woodland with two pools and a number of rhynes.

6.3 Asset Management Systems

The Environment Agency manages its assets using a Flood Risk Management (FRM) system. An FRM system is defined as "*a group of assets that work together to reduce the flood risk to the people, infrastructure and environment within the system*". Each system has its own specific Management Plan.

Performance specifications are given to each system to guide maintenance standards. The maintenance works are then carried out by the Environment Agency's Operations Delivery Team. This process is used to direct the highest standards of maintenance to where they are needed most (i.e. people, property and environment) using a risk based approach. The Environment Agency has adopted three categories to prioritise maintenance for each FRM system:

- **High** – Generally urban areas with high populations or rural areas with high environmental designations.
- **Medium** – Urban to rural areas with relatively low population densities.
- **Low** – Sparsely populated areas and agricultural land.

There are 4 FRM systems which geographically cover the Gordano Valley Plan Area:

- FR/14/S147 Gordano Valley (Medium)
- FR/14/S099 Portbury Ditch (High)
- FR/14/S068 Portishead to New Passage (High)
- FR/14/S098 Drove Rhyne (High)

Each Environment Agency maintained asset is listed in the Asset Information Management System (AIMS). This provides a definitive store for all data on flood and coastal defences. It records inspections, identifies asset condition, residual life and recommends any works required and their urgency.

Drainage Board rhynes are subject to regular vegetation control (termed keeching). Operations vary between watercourses according to a specification agreed with Natural England and which is subject to periodic review. It normally comprises annual bank mowing and weed removal using mechanical plant with hand clearance where access necessitates, e.g. at structures. Blockage removal is carried out as required. De silting is also only undertaken on an "as required" basis. In the Plan area this has only proved necessary once in at least the past 13 years when a network of private ditches was de-silted to form the spine ditch for the raised water level scheme, currently in progress.

6.4 Watercourses

6.4.1 Main River

The Environment Agency has permissive powers to manage designated Main Rivers to reduce the risk of flooding of property and risk to human life. There are seven Main Rivers in the Plan area; Portbury Ditch, Sandy Rhyne, Sperrings Rhyne, Clapton Drove Rhyne (east), Walton Brook, Weston Drove Rhyne and Drove Rhyne. Collectively the main rivers are 20.6km in length.

The Portbury Ditch flows through the centre of the Plan area from west to east until its outfall to the sea at the marina. The other main rivers, except for Drove Rhyne, all ultimately flow into the Portbury Ditch. At Clapton Wick a short length of this watercourse is isolated by two sluices, originally installed to provide a higher water level for the adjacent landowner. The flow from upstream bypasses this section via the IDB network (Stake & Black Ditches and Cat Squint). Drove Rhyne flows along the eastern extent of the Plan area and outfalls to the sea west of the Royal Portbury Dock.

Summary details of these Main Rivers are set out in Table 3. The locations of the Main Rivers are shown on Map 2.

6.4.2 Viewed Rhynes

The Drainage Board maintains and controls a network of watercourses (known as “Viewed Rhynes”) within the Plan area which drain into the Main Rivers. There are 13 lengths of Viewed Rhyne in the Gordano Valley Plan area which are affected by this WLMP: Walton Brook, Black Ditch, Stake Ditch, Cat Squint, Clapton Drove Rhyne (west), Clapton Drove Rhyne (Central) Clapton Drove Rhyne (east) Sperrings Rhyne, Caswell Ditch West, Caswell Ditch East, Sandy Ditch, Withers Ditch and The Cut. A short length of the Moat also falls within the plan area and IDB District. The Moat system was constructed to accommodate storm drainage from the Portishead Quays housing zone and is interconnected with the remainder of the Wharf internal ditch network which prior to the Quays development discharged to The Cut. The Portbury Wharf Moat connects to the Seabank Drain and thence to the estuary via a tidal outfall situated close to that of the Portbury Ditch. The Moat, Seabank Drain and Outfall are currently owned and maintained by the developer (Persimmon) but are due at least in part for transfer to the Avon Wildlife Trust. The IDB will advise on operation and maintenance. The storm drainage outlet in the Bund (the Bund outfall) features a tide flap designed to prevent any tidal incursion into the development zone should the Wharf (which has a low standard of protection against tidal flooding) become inundated. The Bund is a secondary defence constructed to contemporary standards by the developer.

Summary details of the Viewed Rhynes maintained by the Drainage Boards are set out in Table 3 below. The locations of the Viewed Rhynes are shown on Map 2. The control structures on these watercourses are listed in Table 4 below.

6.4.3 Private Ditches

In addition to the Main Rivers and Viewed Rhynes, there are many other ditches and rhynes throughout the Plan area which are maintained by the riparian owner or land manager. This network of ditches is an integral part of the drainage and water supply network in the Plan area. They are particularly important as wet fences, to supply drinking water for grazing animals and support a substantial part of the overall biodiversity interest of the Plan area. It should be noted that these ditches are subject to Drainage Board byelaws which *inter alia* require the prior formal consent of the Board for any alteration or infilling and provide enforcement powers to address cases of lack of maintenance.

Table 3: Schedule of arterial watercourses in the Gordano Valley Plan Area

No.	Watercourse	Operating Authority	Length (m)	Location & Connections	Typical maintenance regime	Control Structures
7011	Portbury Ditch	EA	9000	Flows from the Swiss Valley, east of Clevedon, at the west of the Plan area, east through Walton, Weston and Clapton Moors before turning north through the new Portishead developments to the sea at the marina. There is a short bypass around Weirs A and B at Stake Rhyne. This Rhyne takes the main flow from the Portbury Ditch, to the Black Ditch and down Cat Squint, and back to Portbury Ditch.	Two Bradshaw weed cuts are undertaken each year in July or August, and again on review in October. The emergent vegetation on the non-working bank is retained except where it encroaches across the channel. A section of the Portbury Ditch bank side supports the Brown Galingale a feature of the SSSI and a legally protected plant species. Special measures are in place to protect the plant. Liaison with NE occurs annually prior to the weed cut.	Middle Bridge Tilting Weir Portbury Ditch Outfall Penning Weir A Penning Weir B
7012	Sandy Rhyne	EA	2500	This rhyne flows from the M5 at Cole Acre west to the Portbury Ditch at Clapton Lane. Sperrings Rhyne joins Sandy Rhyne 0.25km upstream of its confluence with the Portbury Ditch. Collects runoff from M5 Priory Farm Outfall.	Two Bradshaw weed cuts are undertaken each year in June and September. The emergent vegetation on the non-working bank is flailed once every year prior to the weed cut if it is not grazed and if access is possible.	Sandy Rhyne Tilting Weir
7013	Sperrings Rhyne	EA	750	Originating east of Sperrings Farm, this short watercourse flows east then north to its outfall to Sandy Rhyne.	Two Bradshaw weed cuts are undertaken each year in June and September. The emergent vegetation on the non-working bank is retained except where it encroaches across the channel.	None

No.	Watercourse	Operating Authority	Length (m)	Location & Connections	Typical maintenance regime	Control Structures
7014	Clapton Drove Rhyne	EA	900	A short watercourse flowing from Clapton Moor, to the Clapton Drive Tilting Weir before turning sharp left to the Portbury Ditch at How Ham Farm. At Clapton Drove Tilting Weir, the watercourse continues as an IDB Viewed Rhyne flowing parallel to the Portbury Ditch before discharging into Sperrings Rhyne.	A Bradshaw weed cut is undertaken each year in June and again on review if required. The emergent vegetation on the non-working bank is retained except where it encroaches across the channel.	Clapton Drove Tilting Weir
7015	Walton Brook	EA	3000	This rhyne flows in an easterly direction from an access bridge downstream of Walton Drove to the Portbury Ditch on Clapton Moor. The first 450m of this watercourse is viewed rhyne.	Two Bradshaw weed cuts are undertaken each year in July and October. The emergent vegetation on the non-working bank is retained except where it encroaches across the channel.	None
7016	Weston Drove Rhyne	EA	650	This watercourse flows from the Walton Brook at Weston Drove and joins the Portbury Ditch some 0.4km upstream of the confluence of Walton Brook and Portbury Ditch.		None
7000	Drove Rhyne	EA	4000	From the Royal Portbury Dock road to the east of the Plan area, this rhyne flows around the industrial area and outfalls to the sea at Fastings Grout. Via private watercourses collects runoff from M5 Dove Outfall (via balancing and treatment tank) and Court house Outfall.		Fastings Gout Rhyne
N408	Walton Brook	IDB	450	450m of this watercourse is viewed rhyne, flowing from Walton Drove to an access bridge downstream. After this bridge the watercourse is designated main river.		None
N406	Black Ditch	IDB	1900	Collects spring water from rising ground to the north and flow from Portbury Ditch via Stake Ditch, reconnecting to Portbury Ditch via Cat Squint.	Single annual keeching late summer. Desilting only as required.	None

No.	**Watercourse**	**Operating**	**Length**	**Location & connections**	**Typical maintenance regime**	**Control**

		Authority	(m)			structures
N407	Stake Ditch	IDB	450	This ditch takes the main flow from the Portbury Ditch in a clockwise direction, to the Black Ditch and down Cat Squint, where the water returns to the Portbury Ditch.	Keeching and desilting only as required.	None
N414	Cat Squint	IDB	570	Connects Black Ditch to Portbury Ditch.	Single annual keeching late summer. Desilting only as required.	None
N405	Clapton Drove Rhyne (West)	IDB	1100	Collects spring water from rising ground to the south and runoff from M5 Viaduct Outfall. Takes summer feed from the Portbury Ditch.	Single annual keeching late summer. Desilting as required.	Outfall
	Clapton Drove Rhyne (Central)			Collects spring water from rising ground to South and runoff from M5 New Farm Outfall. Connects with EA Clapton Drove Rhyne.	Single annual keeching late summer. Desilting as required.	
N403	Clapton Drove Rhyne (East)	IDB	1500	Collects spring water from rising ground to South and runoff from M5 Wood Lane Outfall. Runs from the EA Clapton Drove Rhyne at Clapton Drove Tilting Weir to the outfall into Sperrings Rhyne.	Single annual keeching late summer. Desilting as required	Clapton Drove Tilting Weir
	Sperring Rhyne	IDB/EA		Collects spring water from rising ground to South and runoff from M5 Naish Hill Outfall. Top end maintained by IDB. Lower section maintained by EA.	IDB carries out single annual keeching later summer. Desilting as required	
N402	Caswell Ditch West	IDB	550	Collects spring water from rising ground to South and runoff from M5 Bracken House Outfall. Connects to Caswell Ditch East.	Single annual keeching late summer. Desilting as required	None
N401	Caswell Ditch East	IDB	750	Collects spring water from rising ground to South. Discharges into EA's Sandy Rhyne.	Single annual keeching late summer. Desilting as required	None
N409	Sandy Ditch	IDB	320	Collects spring water from rising ground to South and runoff from M5 Caswell Cross Outfall. Discharges into EA's Sandy Rhyne	Single annual keeching late summer. Desilting as required	None
N410	Withers Ditch	IDB	200	Discharges to EA's Sandy Rhyne.	Single annual keeching late summer. Desilting as required	None
No.	**Watercourse**	**Operating Authority**	**Length (m)**	**Location & connections**	**Typical maintenance regime**	**Control Structures**

N41 1	The Cut	IDB	700	Collects runoff from part of Portbury 100 link road, all runoff from Moor Farm and The Vale housing developments, part of runoff from Portishead Quays housing development and storm overflow from Wessex Water sewage pumping station. Connects to Portbury Ditch (EA) via 230m culverted length (outside Drainage District) in private ownership	Single annual keeching late summer. Desilting as required. 250m modified section d/s of disused railway including weed screen currently responsibility of developer. Permission under IDB supervision. Weed screen cleared and associated chamber desilted as required.	Weed screen as downstream end of IDB length currently responsibility of developer.
	The Portbury Wharf Moat and Sea Bank Drain	Private (Persimmon) but will transfer to AWT with ongoing advice from IDB		Drains area east of the Bund and water discharged through the Bund Outfall	To be arranged	Sea Bank Drain Outfall

6.5 Structures

6.5.1 Structures controlling inflows

There are no structures that directly control water flows into the Plan area. Water supply is from springs within the valley, and runoff from the surrounding hills and the M5 motorway.

A new structure is proposed to ensure a satisfactory split of spring water inflow between the Portbury Ditch and the Black Ditch at the head of the system.

In connection with the RWLA currently being implemented, a new structure will be provided to divert some water from the Walton Brook into the head of the recently formed Spine Ditch.

6.5.2 Structures controlling outflows

A number of structures are currently operated to control the water leaving the Plan areas, as set out in Table 4 below. Please see map 1 for the location of these structures.

Table 4: Structures controlling outflows from the Gordano Valley Plan area

The entire plan area lies below the level of spring tides. Extreme high tides can exceed lowest ground levels in the Plan area by more than 4 metres. All these structures are primarily tidal exclusion sluices and are thus paramount to the protection of the area.

Asset No.	Outfall	Grid Ref.	Maintained by	Operated by
1122370000103B01001	Fastings Gout Defences (Outfall)	ST 4903 7726		EA
112GES8350501C07001	Portbury Ditch Outfall	ST 4783 7725	EA	EA
112GES8350501C07002	Sea Bank Drain outfall	ST 4781 7723	Developer (Persimmon)	Private Developer (Persimmon)
112GES8350504C01003	Drove Rhyne Sea Defence Sluice	ST 4938 7724		EA
	Bund Outfall	ST 4817 7647	Developer (Persimmon) but due for transfer to EA or NS Council	Developer (Persimmon) but due for transfer to EA

6.5.3 Structures controlling flows in the area

A number of structures are operated to control water flows and water levels in the network of arterial watercourses within the Plan area. These are summarised in Table 5 below. Please see map 2 for the location of these structures.

A raised water level scheme is being implemented by private owners in the upper part of the Plan area and is described further in Section10.

Table 5: Water level control structures in the Gordano Valley Plan area.

Asset No	Control Structure	Grid ref	Maintainer	Operator	Watercourse	Type	Description	Ideal Summer Level	Ideal Winters Level	Flood Operation
112GES8350501C07001	Portbury Ditch Outfall	ST 4779 7722	Private	Private	Portbury Ditch	Flap and penstock	2 flapped outfalls and 2 penstocks act as a sea defence structure preventing tidal inundation to the Portbury Ditch	No pen (3.0 approx)	No pen (3.0 approx)	No operation
112GES8350501C07002	Portbury Wharf Outfall	ST 4783 7725	Private (Persimmon)	Tilting weir operated by IDB	Seabank Drain and Moat (Non Main River)	Flap Penstock and tilting weir.	Flap and penstock drain all of Portbury Wharf. Area includes majority of Portishead Quays housing zone, Wessex STW and Avon Wildlife Trust reserve all of which sit outside the WLMP area. Tilting weir at outfall holds level to head of Moat.	5.4m AOD	5.4m AOD	No operation
1122370110108B01001	Middle Bridge Tilting Weir	ST 4733 7556	EA	EA	Portbury Ditch	Tilting Weir	3.7m wide tilting weir located upstream of and integral to the Bristol Road bridge culvert0	4.40	3.60	
1122370110206B01004	Fixed Weir A	ST 4392 7277	Private	Private	Portbury Ditch	Fixed Weir	Drop boards 1.5m wide, in a 2.7m wide concrete headwall with foot bridge	5.15 approx	5.15 approx	No operation
1122370110206B01002	Fixed Weir B	ST 4440 7300	Private	Private	Portbury Ditch	Fixed Weir	0.9m wide stop logs in a 3.9m headwall concrete with footbridge over it.	5.0 approx	5.0 approx	No operation
1122370120101B02002	Sandy Rhyne Tilting Weir	ST 4732 7496	EA	EA	Sandy Rhyne	Tilting Weir	Tilting Weir structure used to maintain a pen in the Sandy Rhyne	4.80	4.5	

Asset No	Control Structure	Grid ref	Maintainer	Operator	Watercourse	Type	Description	Ideal Summer Level	Ideal Winters Level	Flood Operation
1122370140101R01002	Clapton Drove Rhyne Tilting Weir	ST 4638 7402	EA	n/a	Clapton Drove Rhyne	Tilting Weir	Tilting weir structure no longer in operation.	No pen (4.54)	No pen (4.54)	
	Clapton Moor Reserve RWLA Control Sluice	ST 4550 7356	AWT	AWT	Private ditch	Tilting Weir	Installed 2012	4.65	4.95	
	Black Ditch Hatch	ST 4231 7253	IDB	IDB	Black Ditch	Stop log Sluice	Proposed 2012	TBC	TBC	
	Walton & Weston Moor RWLA Intake	ST 4296 7312 & ST 4303 7306	Owner	IDB	Walton Brook & Spine Ditch		Penstock at established fixed weir, pipeline to outfall on Spine Ditch	N/A	N/A	Closes
	Walton Moor Hatch	ST 4385 7354	Owner	IDB	Spine Ditch		Tilting Weir	TBC	TBC	Opens
	Weston Moor Hatch	ST 4440 7377	AWT	IDB	Spine Ditch		Tilting Weir	TBC	TBC	Opens
	Fastings Gout Defence Outfall (Sea Outfall)	ST 4903 7730	EA	EA	Drove Rhyne	Flap	This structure is in two separate parts and consists of a fixed weir (maintain pen in Drove Rhyne) and a tide flap on the seaward side of the defences	None	None	Closes
Asset No	**Control Structure**	**Grid ref**	**Maintainer**	**Operator**	**Watercourse**	**Type**	**Description**	**Ideal Summer Level**	**Ideal Winters Level**	**Flood Operation**

	Drove Rhyne Sea Defence Sluice	ST 4938 7724	EA	EA	Drove Rhyne	Penstock	This structure consists of three parts: 1 tide flap (1.8m high), a 43m long x 1.8m diameter culvert and an electronically operated 1.8m x 1.8m steel penstock	No pen (3.0 approx)	No pen (3.0 approx)	
	Fixed Weir C	ST 500 759	Private	Private	Drove Rhyne		No record	No info	No info	
	Fixed Weir D	ST 4982 7637	Private	Private	Drove Rhyne	Fixed Weir	Interlocking sheet piles	3.3 approx	3.3 approx	No operation

6.5.4 Sea defence structures

Along with linear defences, there are a number of structures which are operated as sea defences, preventing the tide entering the Plan area. All of the sea defence structures also control the outflow of water in the valley, and are therefore all listed in table 4 above. Please see map 2 for the location of these structures.

6.5.5 Raised Water Level Areas

There is currently only one operational Raised Water Level Area (RWLA) some 30 hectares in area located in the Clapton Moor Nature Reserve. This is managed by the Avon Wildlife Trust and keeps the ditch water levels seasonally higher than the general level in the Moor by isolating the watercourses from the Drainage Board system. Water levels in this RWLA are held seasonally higher than elsewhere, with target water levels for summer (1st May – 1st November) at 4.65mAOD and in winter (1st November – 1st May) 4.95mAOD.

A second RWLA, described more fully in Section 10, is currently being implemented to benefit the Gordano SSSI which includes land in both Walton and Weston Moors. This scheme is designed to achieve favourable condition on approximately 100 hectares and to ensure that this can be achieved without any significant impact on water levels on land outside the RWLA. The scheme is being promoted by the respective land managers under HLS agreements.

6.5.6 Gauge Boards

The locations of gauge boards within the Gordano Valley area are summarised in Table 6 below. All gauge board measurements are metric and levelled to metres above ordnance datum (m AOD). Gauge boards are read as required during the summer, and winter readings are less frequent.

Table 6: Gauge Boards in the Plan area.

Location of gauge board	Grid Reference	Notes	Operator
Portbury Ditch			
Windham Way	ST 4716 7640	u/s	EA
Middle Bridge	ST 4733 7557	u/s & d/s (level mark)	EA
Clapton lane	No record	d/s (level mark)	
Walton Drove (bridge)	ST 4331 7260	d/s	EA
Sandy Rhyne			EA
Sandy Rhyne Tilting Weir	ST 4733 7496	u/s & d/s (level mark)	
Walton Brook			
Weston Drove	To be confirmed	u/s	
Seabank Drain at Portbury Wharf			
Outfall tilting weir	ST 4783 7725	u/s	IDB
Drove Rhyne			
Fastings Gout Outfall	No record	u/s (level mark)	
Drove Rhyne Sea Defence	ST 4938 7724	u/s	EA

6.5.7 Telemetry

The Environment Agency has a network of telemetry sites installed at key control structures across North Somerset.

In the Gordano Valley there is telemetry on Middle Bridge Tilting Weir and at the Drove Rhyne Sea Defence Sluice. Alarms generated from this telemetry are received 24 hours a day, seven days a week by a National Incident Communication Service. The alarms are then passed on immediately to the most appropriate duty officer in the local area.

6.6 Current Water Level Management Regime

6.6.1 Water level management

In general, water levels are maintained at a relatively high level during the summer months to provide wet fences and, to a certain extent, to keep water tables high to promote the growth of grass and other crops. During the winter periods, water levels are lower in order to accommodate increased rainfall and runoff, and to reduce the risk or severity of flooding.

The dates upon which these changes in water level are implemented each year are normally 1 April for summer levels and 1 December for winter levels. In practice, however, the seasonal water levels are usually phased in two weeks either side of these dates, depending on the prevailing weather conditions at the time. This system has come about through custom and practice and generally works well.

From time to time, depending on the prevailing weather conditions, requests may be received by the Drainage Board to advance or delay these seasonal operations. Should these requests require operations to be advanced or delayed by more than the two weeks either side of the 'normal operating dates', then the Drainage Board will seek the views of Natural England on this proposal. Requests requiring relevant site operations are recorded. A situation report detailing requests and Environment Agency actions will be issued to associates at regular intervals in order to strengthen the working partnership.

Table 7: Target water levels at control structures.

Control Structure	Summer Level (m AOD)	Winter Level (m AOD)	Operator
1. PORTBURY DITCH Outfall Middle Bridge Tilting Weir Weir A Weir B	 No pen (3.0 approx) 4.40 5.15 approx 5.00 approx	 No pen (3.0 approx) 3.60 5.15 approx 5.00 approx	 BCC Agency Riparian Riparian
2. SANDY RHYNE Tilting Weir	4.80	4.50	Agency
3. CLAPTON DROVE RHYNE Tilting Weir	No pen (4.54)	No pen (4.54)	Agency
4. DROVE RHYNE Fastings Gout Outfall Drove Rhyne Sea Defence Weir C (Fixed Crest Level) Weir D (Fixed Crest Level)	 3.0 approx No pen (3.0 approx) see note 3.3 approx	 3.0 approx No pen (3.0 approx) see note 3.3 approx	 Agency Agency Riparian Riparian
5. CLAPTON MOOR RWLA	4.65	4.95	Wildlife Trust
6. WALTON MOOR RWLA	TBA	TBA	IDB
7. WESTON MOOR RWLA	TBA	TBA	IDB
8. SEABANK DRAIN &MOAT	5.40	5.40	IDB

6.7 Current Maintenance Regime

Typical routine maintenance practice for each watercourse is described in Table 3 and the overall approach adopted by the Environment Agency and the Drainage Board is described below.

6.7.1 Environment Agency maintenance practices

The Environment Agency assesses all maintenance works on the basis of flood risk to people and property, and whether the management system is high, medium or low risk. As a result, annual maintenance is targeted towards high risk systems.

The Environment Agency operates a flexible, annual weed cutting programme during the summer months. The Main Rivers are inspected prior to starting, and the programme can be changed to accommodate urgent cuts or abnormal weather and vegetation conditions. It is normal practice to provide good access for weed-cutting machinery, which consists of culverting side ditches and providing gates and side fencing so that travel across field boundaries is unrestricted. The Environment Agency does not typically use herbicides in the Plan area, but carries out essential maintenance using tractors and large tracked vehicles to cut vegetation on the banks and in-channel.

In advance of the annual weed cutting or other work in the field containing the Brown Galingale the EA will liaise with Natural England. Natural England will then identify the location of any plants so that these can be safeguarded. Where possible during the weed cut the EA will also deploy their machine to enhance the habitat for the species with on site guidance from Natural England

Channels are de-silted when their condition has deteriorated to the extent that they are no longer capable of sustaining a reasonable flow of water.

Trees, branches and bushes within the channel area are trimmed, coppiced or pollarded to allow maximum flow whilst retaining as much shade as possible to reduce weed growth. Tree removal will take place in exceptional circumstances where blockage of the channel has occurred or is likely to occur. The Environment Agency expects riparian landowners to maintain trees and vegetation that could cause flood risk. Where necessary, the Environment Agency will serve notice on landowners to ensure works are completed as requested. Where the Environment Agency owns land, it will carry out any required tree maintenance.

Intermittent maintenance is not normally carried out by the Environment Agency without prior consultation with the Drainage Board and with Natural England. The Environment Agency will inform Natural England of any repairs or maintenance required during emergency situations as soon as is practically possible.

6.7.2 Drainage Board maintenance practices

The Drainage Board's practice is to undertake vegetation clearance on Viewed Rhynes once per year in late summer. The majority of the work is undertaken by specialist contractor using a Bradshaw bucket or weed rake. Handwork is carried out where access for machinery is not possible e.g. at structures. A few minor rhynes are weed cut on an 'as necessary' basis, the situation being re-assessed each year. The contractor may flail the banks where considered appropriate.

The cutting of vegetation adjoining rhynes is the responsibility of the riparian occupiers. The Board have powers under its Byelaws to require occupiers to fulfil their obligations in this respect where they fail to do so.

Channels are de-silted when their condition has deteriorated to the extent that they are no longer capable of sustaining a reasonable flow of water in them. Aquatic herbicides are not routinely used in the Viewed Rhynes, but may be used to control invasive plants where necessary. The use of aquatic herbicide in any watercourse requires consent of the Environment Agency.

No raised flood banks are present in the Plan area. Other structures are inspected on a regular basis and repaired as necessary. The Drainage Board does not accept liability for the maintenance of bridges and culverts over Viewed Rhynes, however they are prepared to consider making an ex gratia contribution of a share of the cost of such maintenance, approximately in proportion to its usage by the Boards.

The Drainage Board does not accept any liability for the maintenance of droves, and only carries out such maintenance, or contributes to the cost of maintenance, where the drove is essential to

the Board for gaining access to a channel, or where damage has been caused by works carried out on behalf of the Board.

The Drainage Board will ensure the necessary functionality of private ditches, if necessary using its Land Drainage Act powers.

6.8 Abstraction

There are no known significant, ongoing water resource issues which directly influence, or are influences by water level management within this catchment.

The Water Act (2003) has introduced a new statutory framework for managing water resources. Under the Act the abstraction of up to and including 20 cubic metres per day (approximately 4,400 gallons per day) from surface water or groundwater does not require a licence from the Environment Agency regardless of the purpose for which the abstracted water will be used. Abstractions above 20 cubic metres per day require a licence, issued by the Environment Agency. The Water Act (2003) also removes a range of exempt activities that currently do not require an abstraction or transfer licence. However, this section of the legislation has not yet been enacted (see the EA website for further information on licensing requirements under the Water Act (2003).

The Environment Agency will consult the North Somerset Levels IDB and Natural England regarding its consideration of applications for an abstraction licence.

There are three abstraction licences that may affect water management in the Plan area, which are summarised in Table 8 below.

Table 8: Abstraction licences in or near the Gordano Valley

Licence No.	Description	Point Name	Max Daily Vol. (m^3)	Max. Annual Vol (m^3)
16/52/016/S/024	Spray Irrigation - direct	Walton Moor Spring. ST423735	46	4,545
16/52/016/G/029	Industrial, Commercial and public use	Large Borehole A ST50597683	660 not exceeding this here or in aggregate with borehole B	230,000 not exceeding this here or in aggregate with borehole B
16/52/016/G/029	Industrial, Commercial and public use	Large Borehole B ST50637680	600 not exceeding this here or exceeding 660 in aggregate with borehole A	230,000 not exceeding this here or in aggregate with borehole A

7 Water Quality

7.1 Water quality

There have been 20 years of steady water quality improvements across the Somerset Levels and Moors catchments, including the Gordano Valley; however, phosphate levels remain a concern. There are some local water quality issues in the Plan area related to diffuse and point sources of pollution. Diffuse pollution is primarily caused by high phosphate levels from nutrient enrichment (fertilisers) and septic tanks.

The Environment Agency and Natural England are currently developing 'Diffuse Water Pollution from Agriculture' plans that aim to reduce nutrient enrichment of watercourses and promote good agricultural practice through the Catchment Sensitive Farming Programme. The Environment Agency has also undertaken nutrient modelling to identify the relative importance of diffuse and point sources to nutrient enrichment in the catchment and is working with the water companies to reduce nutrient discharges from sewage treatment works.

When water levels are penned in the summer months heavy weed growth and algal blooms can cause large diurnal fluctuations in dissolved oxygen. When surface growth inhibits light penetration plants underneath stop photosynthesis and can also die. Both will cause serious drops in dissolved oxygen with implications for fish populations in particular.

Weed-cutting can alleviate the problem but by disturbing the water column and silt the process of cutting can also contribute to drops in dissolved oxygen (DO) levels. The Environment Agency's Operations Delivery team take DO readings before and during weed cutting to ensure water quality does not deteriorate rapidly. If DO levels are poor all operations stop immediately. This practice helps to prevent fish kill and unnecessary damage to the aquatic environment.

It is illegal to discharge raw sewage or trade effluent directly into any controlled watercourse. Controlled discharge of treated effluent requires consent to discharge, which must be obtained from the Environment Agency. The Environment Agency should be informed of any water pollution problems, particularly septic tank discharges, to allow investigation and improvement. In the event of a pollution incident being noted, assistance should be sought immediately from the Environment Agency's incident pollution hotline on 0800 80 70 60.

Historically there have been two known leachate breakouts from landfill at the lower end of Weston Drove resulting in localised pollution of some ditches. In each case the leachate has been contained however there is always the potential for leachate breakout in those parts of the Gordano Valley where land fill has taken place.

Pollution has occurred in the past where the drainage from the M5 carriageway enters the valley. Proposals to re-route the runoff from a short length of the M5 via an attenuation/reed bed facility and direct to the Drove Rhyne were incorporated into the scheme which created a crawler lane on the Naish Hill section of the motorway. The improvements only became operational in March 2013 when key services had been relocated. The major part of the 8km length of M5 which drains into the Plan area does so via 10 separate outfalls with no facilities to attenuate discharges or capture pollutants. The outfalls connect to open channels which continue to accumulate considerable quantities of silt and debris, contaminated with salt and oil. Instances have occurred of overflow onto adjacent fields when these watercourses have become choked. Improvements to the operation and management of these outfalls are a future action.

Natural England has raised concerns about nitrate concentrations which have increased in the Walton Brook. This is also a future action.

7.2 Waste Regulation

Under the Waste Management Licensing Regulations 1994 all keeping, disposing or treating of "Directive Waste" on land is subject to a waste Management Licence unless the activity complies with the conditions of an exemption from waste management licensing. A Waste Management Licence cannot be issued without the benefit of Planning Permission. The technical and financial competence of the applicant is required to be assessed before a Waste Management Licence can be issued.

Relevant exemptions include the spreading of waste on land to improve the quality of the land (without harm to flora or fauna), deposit of inert waste on land for reclamation purposes, deposit of waste on land for construction purposes and the deposit of dredgings on the banks of a water course.

8 Water Level Management Objectives

The Water Level Management Plan is based on the following objectives which have been adopted by the signatories to the Plan. The signatories acknowledge that not all the objectives can be achieved on each and every occasion or location.

Objective 1 – Balance of interests
Firstly, ensure that all legal obligations and responsibilities are met, and secondly to balance different interests by managing water in a way that reflects the local hydrology and topography of the area and which best serves the owners and farmers of the majority of the land within each sub-catchment.

Objective 2 – Agriculture
Maintain seasonal water levels that provide wet fences, stock watering and drainage appropriate for the principal land management and farming practices in each sub-catchment.

Objective 3 – Biodiversity
Maintain and enhance, when suitable opportunities arise, wet grassland, wetland and freshwater aquatic habitats and species throughout the Plan area, with particular attention being given to those protected by law or designated in some way.

Objective 4 – Favourable condition of SSSIs
Implement a programme of improvement works to ensure that the management of water that affects the SSSI in the Plan area helps to secure, or makes significant progress towards achieving and maintaining the SSSI in favourable/unfavourable recovering condition by December 2020

Objective 5 – Organic soils and archaeology
Maintain a stable, year round water table that avoids desiccation and oxidation of the organic soils.

Objective 6 – Settlements and highways
Ensure the proposed changes in water management do not increase the flood risk to settlements, property, highways or rights of way.

Objective 8 – Watercourse maintenance operations
Maintain the watercourses in the Plan area on rotation and in a sympathetic manner, so as to maintain an adequate flow of water around the sub-catchments, and to enhance the diversity of ditch habitats and their associated flora and fauna.

Objective 9 – Water quality
Sustain the ditch flora and fauna in the Plan area through the provision of an adequate supply of water of high quality (defined as having water in a ditch at a given season of sufficient chemical quality and volume to sustain the full diversity, abundance and distribution of all aquatic plants and animals recorded in the area).

Objective 10 – Flood management
Avoid prolonged and deep flooding where this is damaging to the biodiversity and agricultural interests of the Plan area.

Objective 11 – Drought management
Avoid prolonged drought where this is damaging to the soils, biodiversity, archaeology and agricultural interests of the Plan area.

9 Constraints & Impacts on Adjacent Ground

9.1 Works adjacent to Main River

Any work proposed in, over, under or adjacent to Main River requires Flood Defence Consent (FDC) from the Environment Agency. Land Drainage Byelaws require third parties to apply for consent for any alterations or new works within an eight metre strip on either side of the Main Rivers. Where consent is applied for on land which forms part of an SSSI or other designated sites, the applicant is obliged to consult Natural England, and the Environment Agency will only consider giving consent on the basis that there is no objection to the proposal from Natural England.

This condition will also apply to proposals that lie outside the boundary of an SSSI or designated site but which may adversely impact on them.

9.2 Works adjacent to IDB rhynes

Under the Land Drainage Act 1991, the Drainage Board has administrative responsibility for all the Viewed Rhynes and ordinary watercourses within the Plan area for the purposes of consenting activities as set out in the Board's Byelaws. The Board exercises this administrative control using a series of policy documents adopted by the Board for this purpose.

The Byelaws of the Drainage Board require third parties to apply for consent for any alterations or new works within a nine metre strip on either side of a Viewed Rhyne. Where consent is applied for on land within an SSSI, the Board consults Natural England before arriving at its decision. The form of consent given by the Board states that such consent does not override the necessity of obtaining other statutory consents (including that of Natural England).

10 Raised Water Level Areas

10.1 Introduction

There are two raised water level areas (RWLAs) in the Gordano Valley.

The Clapton Moor Reserve, on the south side of the Portbury Ditch, is owned and managed by the Avon Wildlife Trust and has featured a raised water level zone for some years. A tilting weir was installed at the outfall to the system during 2012 to improve control arrangements

In order to address the lack of local water level control in the Gordano Valley SSSI which was precluding the achievement of 'favourable condition', a separate RWLA scheme was promoted by Natural England in 2008 and was commissioned in 2014. The benefited area of about 100 hectares covers more than half of the SSSI and comprises a tenant farm managed under a Natural England (NE) farm stewardship agreement together with the Avon Wildlife Trust's (AWT) Weston Moor Reserve

10.2 Existing water level control

Until these RWLAs became operational the only readily adjustable structure capable of managing water levels in the greater part of the Gordano Valley SSSI was the main tilting weir sluice at Middle Bridge, Portishead. This is altered seasonally by the Environment Agency to give water levels of 4.40m and 3.60m in the summer and winter respectively. Occasionally during wet autumns an interim level may be held. Very rarely the summer level cannot be maintained owing to losses from the system exceeding the input, the lowest level being recorded as 4.00m in the 1990s. These figures apply at the sluice itself, levels at the top of the system being in the order of 100mm to 400mm higher, depending on the amount of flow down the system and the amount of channel weed growth present. The average hydraulic gradient generally matches the slope in ground levels, giving freeboard figures under normal conditions for the zones outside of the RWLAs of 300mm to 500mm (summer) and 600mm to 900mm (winter). Although these summer levels are on average reasonably satisfactory for both the reserves and the farming interests, the winter levels are not. The predominantly low winter levels in the major drain network in conjunction with a lack of winter rainfall can occasionally result in over-dry field conditions and bed exposure in the shallower ditches. Conversely, because certain zones were not hitherto well connected to the main drain network, undesirably high water levels could develop locally during wet weather at any time of the year, with adverse consequences for farming interests.

10.3 Target water level condition

The structures in the two RWLAs have been designed to permit variable penning levels right up to typical field level, but the actual water level regimes adopted are chosen to reflect the varying constraints posed by the interlinked wildlife and farming considerations. Because elevated winter levels would be unacceptable for some farming and other interests outside the reserve zones, the two RWLAs feature perimeter structures which isolate them from the watercourses outside the zones.

10.4 The Gordano SSSI RWLA

This scheme was completed in late 2014 having been delayed by funding restrictions and ground conditions. It should help to restore approximately half the area of the Gordano Valley SSSI to a favourable, or unfavourable recovering condition.

The principal features are shown on Map 3. The main drainage/ feed channels are coloured blue (IDB and EA maintained).

Many of what appear on the plan to be intersections between the ditches within the isolation zone and the main channels are either blind or defunct, but those shown with blue crosses were previously open ended and have been blocked off. Two of the ditch ends have been provided with adjustable overflow structures in order to ensure adequate flood dispersal under extreme conditions. A spine ditch has been provided which follows the route of existing ditches, enlarged and interconnected as necessary. The route is coloured purple, and in accordance with the NE practice most reaches of the enlarged watercourse are generously proportioned in order to avoid the necessity for frequent heavy maintenance. At some of the wind breaks new connections have been required.

Feed for the system is obtained from the Walton Brook adjacent to Brook Cottage. A satisfactory head is provided by a low weir, restored as part of the scheme. The quantity of water flowing down the Walton Brook was checked during the dry autumn of 2009 and found to be adequate for the purpose required. A buried pipeline some 85 metres long conveys water to the head of the spine ditch, with a manually operated control valve at the weir end.

The other end of the spine ditch discharges back into the Walton Brook some 500 metres upstream of Weston Drove. At this point a small tilting weir provides adjustments for the retained water level at the downstream end of the system. To accommodate the fact that the fields here are typically 400m lower than those at Walton Drove another tilting weir is positioned near the boundary between the NE and AWT holdings to provide independent adjustment for the upper end of the system.

In order to ensure that the desired water levels could be achieved throughout the intended areas, some clearance work has been carried out on other ditches and connecting culverts.

Water levels within the RWLAs will be agreed between Natural England where appropriate and the respective land managers in liaison with the IDB who as Drainage Authority for the area will retain overall control in the normal way.

11 Contingency Measures

11.1 Contingency measures for flooding

The Environment Agency will carry out active monitoring of raised flood banks during high flows, and ensure that outfall structures are kept clear of debris to allow evacuation of flood water. The Environment Agency will also carry out emergency works as required to protect people and property.

The Drainage Board clears blockages as soon as possible should they arise during flood events.

11.2 Contingency measures for drought

During a drought situation the Environment Agency will encourage the public and industry to practice water efficiency and conserve water, whilst all abstraction licence holders will be encouraged to minimise water abstraction. There will be close liaison between the Environment Agency and the Drainage Board to conserve what water is available and to ensure its fair distribution between all occupiers so far as possible.

If there is an exceptional shortage of rain, and a serious deficiency in the supply of water or a deficiency in flows or low water levels that threatens flora or fauna, drought permits or orders may be issued.

Drought permits are applied for by the Water Companies and issued by the Environment Agency to enable companies to take water from new sources or to alter restrictions on existing abstractions. Drought orders, issued by the Secretary of State, go further and restrict the non-essential use of water.

12 Unresolved Issues

12.1 Climate change

The potential effects of climate change and sea level rise on the Plan area are unclear at present. Current studies by the Environment Agency, and others, should inform the Drainage Boards on these matters and the mitigation or adaptation required in water management to accommodate these impacts.

12.2 Water quality

As noted in the appropriates section above further action is needed to resolve potential water quality issues associated with M5 drainage and to investigate apparent deterioration in quality of the Walton Brook

13 Other Matters

13.1Amendments agreed during the period of the Plan

Amendments to this Plan which are agreed by the Environment Agency, Drainage Board and Natural England are set out in Table 9.

Table 9: Amendments agreed during the period of the Plan

No.	Date	Amendment	Agreed

13.2 Review arrangements

The Environment Agency propose to review this plan five years after it has been adopted. If any alterations to operating procedures or maintenance are required before, these will be discussed by the Environment Agency, the Drainage Board and Natural England and can be agreed as interim measures pending the full review.

14 Consultees

Francis Farr-Cox – Environment Agency
Chris Westcott – Natural England
Dan Alsop – Internal Drainage Board
Bernie D'Arcy – Avon Wildlife Trust

List of abbreviations

AIMS – Asset Information Management System

AOD – Above Ordnance Datum

AWT – Avon Wildlife Trust

BAP – Biodiversity Action Plan

CES – Conservation Enhancement Scheme

DO – Dissolved oxygen

EA – Environment Agency

ELS – Entry Level Stewardship

FDC – Flood defence consent

FRM – Flood Risk Management

HLS – Higher Level Stewardship

IDB – Internal Drainage Board

LWS – Local Wildlife Site

MAFF – Ministry of Agriculture, Fisheries and Food

NNR – National Nature Reserve

OELS – Organic Entry Level Stewardship

RWLA – Raised Water Level Area

SMR – Sites and Monuments Record

SSSI – Site of Special Scientific Interest

WLMP – Water Level Management Plan

References

Gordano Valley Water Level Management Plan June 1998, Environment Agency.

Conservation Guidance for Drainage Authorities 1991. Ministry of Agriculture, Fisheries and Food (MAFF).

Appendix 1

SSSI Citation

UNITARY AUTHORITY: NORTH SOMERSET

SITE NAME: GORDANO VALLEY

Status: Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act, 1981, (as amended)

Local Planning Authority: NORTH SOMERSET COUNCIL

National Grid Reference: ST 435730 Area: 161.68 (ha.) 399.52 (ac.)

Ordnance Survey Sheet 1:50,000: 172 1:10,000: ST 47 SW

Date Notified (Under 1949 Act): 1971 Date of Last Revision: 1972

Date Notified (Under 1981 Act): 1986 Date of Last Revision: 1990, 1998

Other Information:

A Nature Conservation Review Site. Site Boundary amended by extension at this revision.

Description and Reasons for Notification:

The Gordano Valley is an extensive low-lying and poorly drained peat moor situated between Carboniferous Limestone ridges. It supports a wide variety of the wet-meadow, reedbed and carr communities which were widespread on the levels and moors of Somerset. The valley is of botanical, ornithological, entomological and stratigraphic interest.

The grasslands support a variety of unimproved wet-meadow communities. These largely consist of variants of the nationally rare Blunt-flowered Rush–Marsh Thistle *Juncus subnodulosus–Cirsium palustre*, Soft/Sharp Flowered Rush–Marsh Bedstraw *Juncus effusus/acutiflorus–Galium palustre*, Purple Moorgrass–Meadow Thistle *Molinia caerulea–Cirsium dissectum* and Crested Dog's-tail–Common Knapweed *Cynosurus cristatus–Centaurea nigra* community types.

Over 130 species of flowering plant have so far been recorded including 3 species of orchids, 21 grasses and 14 sedges. Characteristic species include: Meadow Thistle *Cirsium dissectum*, Meadow Rue *Thalictrum flavum*, Ragged Robin *Lychnis flos-cuculi*, Marsh Ragwort *Senecio aquaticus*, Devil's Bit Scabious *Succisa pratensis*, Sneezewort *Achillea ptarmica*, Marsh Marigold *Caltha palustris*, Lesser Spearwort *Ranunculus flammula*, Marsh Arrowgrass *Triglochin palustris*, Brookweed *Samolus valerandi*, and Marsh Orchid *Dactylorhiza praetermissa.* The Gordano Valley is one of the few remaining localities in Britain for the nationally rare Brown Galingale *Cyperus fuscus.* This species is given special protection under Part 1 of the Wildlife and Countryside Act, 1981 (as amended).

There is a small area of tall fen vegetation of the Common Reed–Hemp Agrimony *Phragmites australis–Eupatorium cannabinum* type. This is dominated by dense Common Reed, with scattered Meadowsweet *Filipendula ulmaria*, Yellow Flag *Iris pseudacorus* and Valerian *Valeriana officinalis.*

The extensive system of rhynes and field ditches contains a rich flora which includes three nationally scarce species: Water Parsnip *Sium latafolium*, Whorled Water Milfoil *Myriophyllum verticillatum* and Fen Pondweed *Potamogeton coloratus*. Frogbit *Hydrocharis morsus-ranae*, Lesser Water Plantain *Baldellia ranunculoides* and Arrowhead *Sagittaria sagittifolia* also occur.

A small wood dominated by Hazel *Corylus avellana* exists along the southern boundary and the ground flora includes: Bluebell *Hyacinthoides non-scripta*, Primrose *Primula vulgaris*, Dog's Mercury *Mercurialis perennis* and Yellow Archangel *Lamiastrum galeobdolon*.

The mosaic of habitats has resulted in a diverse invertebrate fauna. The communities associated with the rhynes and ditches are of a type now rarely found in Britain. Species recorded include two nationally rare soldier flies *Odontomyia ornata* and *Stratiomys potamida*, the nationally scarce Hairy Dragonfly *Brachytron pratense* and Variable Damselfly *Coenagrion pulchellum*.

The Gordano Valley is included in the British Trust for Ornithology register of ornithological sites. Of 106 bird species recorded, 73 are reported to breed including Sparrowhawk *Accipiter nisus*, Lapwing *Vanellus vanellus*, Snipe *Gallinago gallinago*, Redshank *Tringa totanus*, Grasshopper Warbler *Locustella naevia* and Reed Warbler *Acrocephalus scirpaceus*.

The peat deposits of the Gordano Valley are of considerable stratigraphic interest. Cores extracted from Walton Moor provide evidence of the vegetational and climatic conditions that prevailed in this part of South West England from late Glacial times until the Romano British marine transgression.

SITE NOTIFIED TO THE SECRETARY OF STATE ON 6 NOVEMBER 1998

Maps

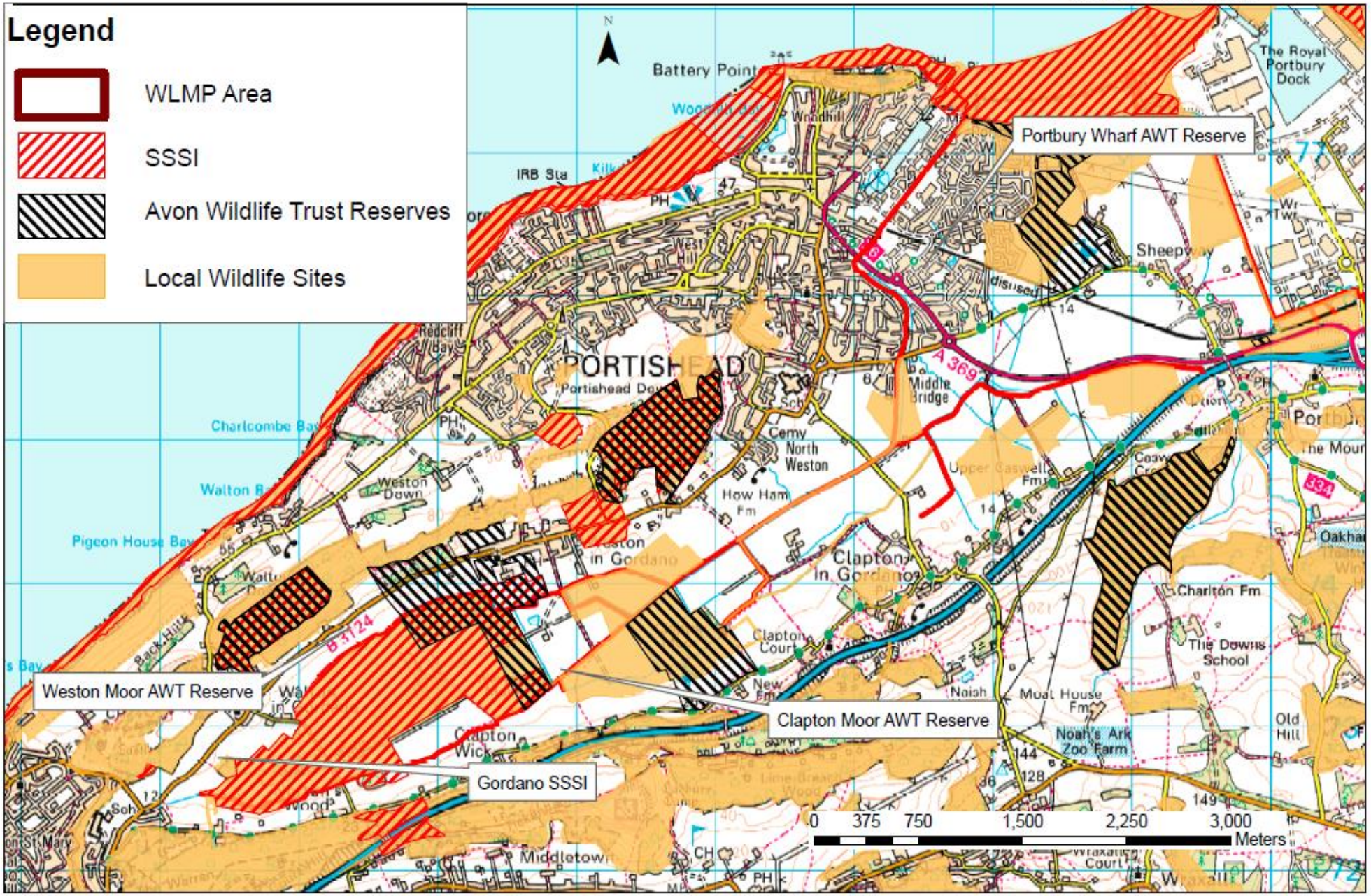
Map 1	**Plan area, SSSI's AWT Reserves and Local Wildlife Sites**
Map 2	**Gordano Valley watercourses and principal water control structures**
Map 3	**Gordano SSSI and National Nature Reserve showing improved water level management system.**

Environment Agency

GORDANO VALLEY WATER LEVEL MANAGEMENT PLAN
Map 1: Plan area, SSSIs, AWT Reserves and Local Wildlife Sites

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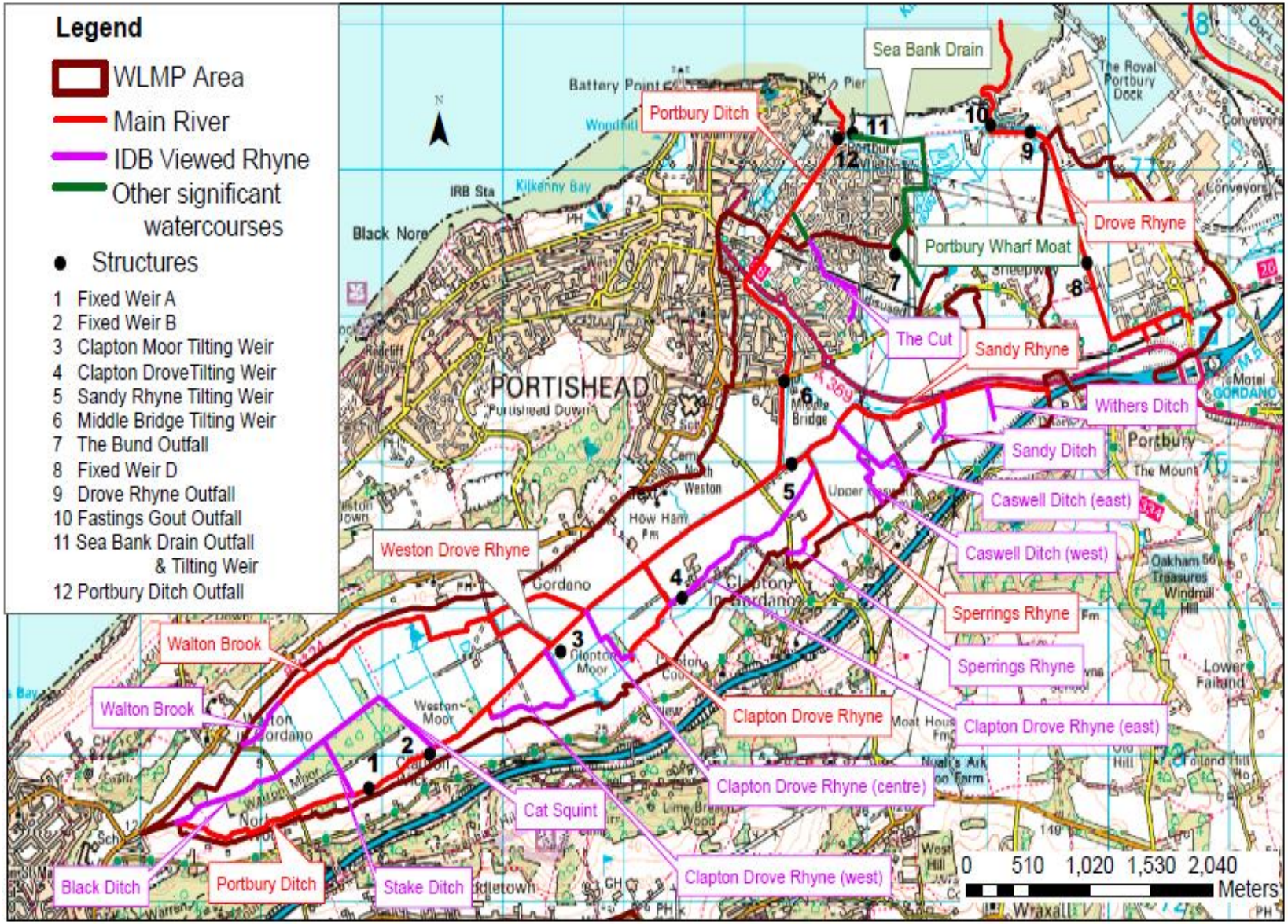


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GORDANO VALLEY WATER LEVEL MANAGEMENT PLAN
Map 2: Watercourses and principal water control structures

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GORDANO VALLEY WATER LEVEL MANAGEMENT PLAN

Map 3: Gordano SSSI and National Nature Reserve showing improved water level management system

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