

Eastern Yar

Flood Investigation Report



Flood Investigation Report

Document Information

Document Information	
Document Reference	2013-IWC-LLFA-001-13
Document Revision	
Report Status	FINAL
Date	24 th June 2014
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Executive Summary

This Flood Investigation Report has been compiled by the Isle of Wight Council as Lead Local Flood Authority (LLFA). As LLFA it has a duty to investigate significant flood events as defined under the Flood and Water Management Act 2010.

Upon becoming aware of a flooding event which meets a set criteria deeming the event as 'significant', the Isle of Wight Council will consider whether an investigation should be carried out under the requirements of Section 19, sub-section 3 of the Flood and Water Management Act 2010. This investigation will determine which risk management authorities have a responsibility for managing flooding at the identified flood site and will ensure that there is an appropriate response to the flood incident.

It was deemed necessary to undertake an investigation into the flooding incidents in the Eastern Yar area (Brading) due to the number of incidents, properties being affected and the main Brading – Sandown road being closed on a number of occasions.

This report provides a summary of the extent and consequences of the flooding and actions undertaken or proposed by each of the identified authorities with a responsibility for flooding within the identified area. This includes information relating to options for improvement works or general maintenance carried out in the area.

Whilst this report has sought to identify causes of flooding within the Eastern Yar area and has made recommendations as to how the risk and / or impact of flooding may be reduced, this does not provide the Isle of Wight Council with the mandate or funding to implement any measures to reduce or remove the risk of flooding at this site.

Introduction

Requirement for Investigations

The Isle of Wight Council, within their role as Lead Local Flood Authority, have a responsibility to record and report flood incidents, as detailed in Part 1, Section 19 of the Flood and Water Management Act 2010.

<p style="text-align: center;">Part 1 FLOOD AND COASTAL EROSION RISK MANAGEMENT</p> <p>3. Supplemental powers and duties Section 19: Local authorities: Investigations</p> <p>1) On becoming aware of a flood in its area, a lead local flood authority must, to the extent that it considers it necessary or appropriate, investigate –</p> <p>(a) which risk management authorities have relevant flood risk management functions, and</p> <p>(b) whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to a flood.</p> <p>2) Where an authority carried out an investigation under subsection 1) it must –</p> <p>(a) publish the results of its investigations; and</p> <p>(b) notify and relevant risk management authorities</p>
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This report investigates the flooding incident in the Eastern Yar area as the impacts to people, property and infrastructure were deemed to trigger the need for an investigation.

This report aims to provide details of the flooding incident that occurred with a review of the roles and responsibilities of all risk management authorities having a responsibility for flooding at the identified site. It will also include an overview of any works undertaken or options proposed at the site in order to reduce the risk of flooding at the identified site.

Site location and description



Figure 1: Aerial photograph showing location of the area of flooding

Brading is classified as a Rural Service Centre and is situated on the north western side of the Eastern Yar floodplain on the eastern limb of Brading Downs. The Brading Downs follow the central ridge of chalk which runs across the Island. This chalk stratum is present under the middle of the settlement. Despite Brading's inland location, flooding from extreme tides is a real risk to the settlement.

The topography of Brading is dominated by a finger of high ground which extends from the West, which almost divides the drainage catchment in two. Water is gathered and routed off the north east facing slope or the south west facing slope. Once off the high ground it is routed along the topographical low points which are either highway or field edges and/or agricultural drainage ditches.

Nicholas Close is situated to the East of the main road between Brading and Sandown (A3055 Morton Road) road, with the Close itself sloping down to the east towards the railway line and Brading Marshes. Nicholas Close is built on a peat marsh at a low elevation of between 1.5 – 3m AOD. A ditch runs parallel to the railway bank which is culverted under the railway and then joins the Eastern Yar. Flooding is caused by excess water levels in the ditch and water backing up through the culvert in the Eastern Yar.

Incidents triggering investigation

Nicholas Close, Brading was affected by flooding on 24th December 2013, with Numbers 5 and 6 in particular affected and the occupants of both properties seeking alternative accommodation. Both properties have to undergo extensive repair works.

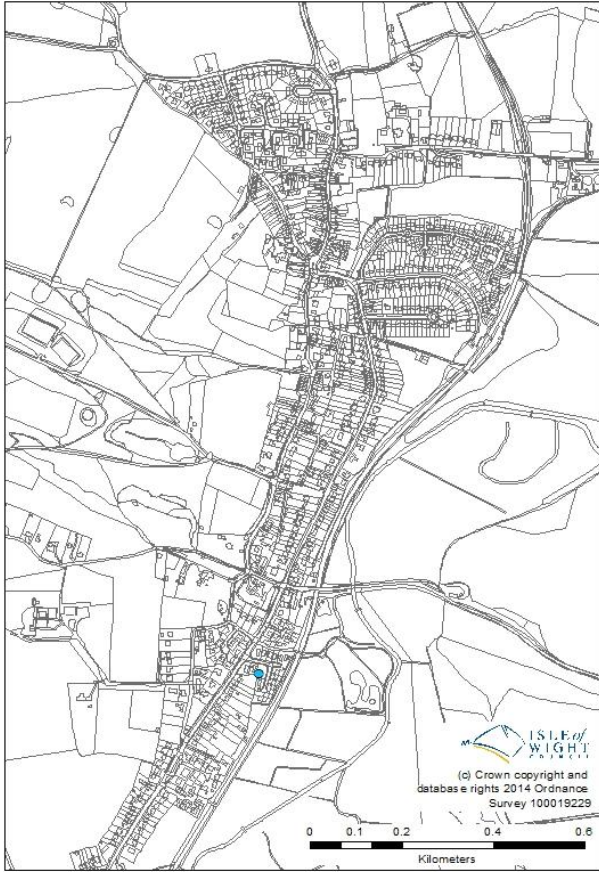


Figure 2: Properties affected by flood events

IWF&RS attended on site on 24th December when the properties flooded, but were not able to provide flood relief by pumping water away. Sandbags were provided to the affected properties and the residents were evacuated to neighbouring properties.

Between 24th December 2013 and 7th February 2014 9 separate incidents of highway flooding were recorded in the Morton Common, Morton Road, Morton Brook area, and Morton Common was closed to traffic on several occasions.

Flooding occurred as a result of sheer volume of surface water run off together with high tide impacting on water outfall from Bembridge Marshes.

History of flooding

The area of Nicholas Close is shown to be at risk from river and sea flooding on the Environment Agency's Flood Maps.

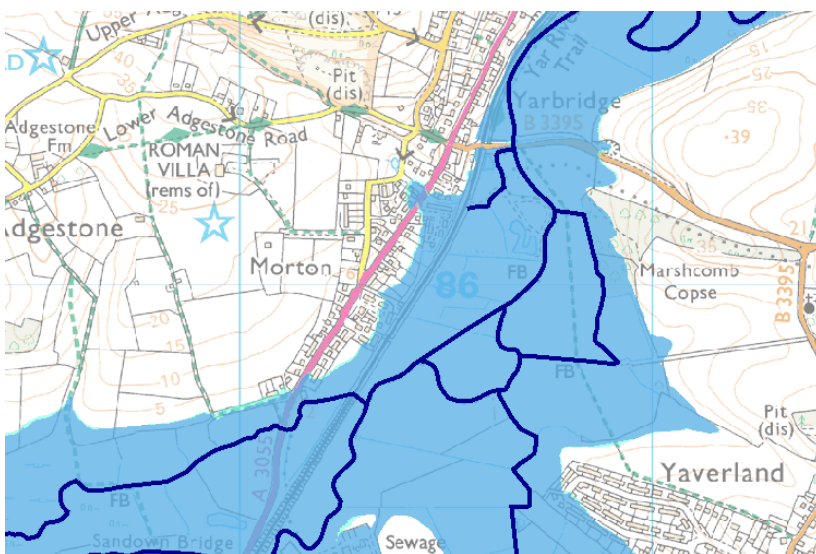


Figure 3: EA Flood Maps for the area

This area consists of ribbon and small cul-de-sac developments off of the main Brading – Sandown road with foul drainage throughout the area drained by Southern Water Services, pumped to the treatment plant at Sandown (to the south of Nicholas Close). There is a pumping station located in Nicholas Close. Some highway drainage flows into Nicholas Close and emerges in the garden of Number 6 (via a culvert) before the drainage channel makes a 180' turn to flow via a culvert under the railway and into the Eastern Yar marsh area. Surface water run-off from the Morton Common area is directed into ditches in the common area.

Morton Road was significantly impacted by the flood events and there is further work required to investigate the condition and ownership of the ditches in the land either side of the road between Brading and Sandown. In particular there is an entrance gate on the western side of the roadway where access has not yet been attained to enable inspection of the ditch and culvert under the access.

The wider Eastern Yar area is a low-lying valley and floodplain, bordered by the towns and communities of St Helens, Bembridge, Brading, Sandown and Alverstone. Large parts of the floodplain are environmentally designated of international importance for freshwater and maritime habitats.

Brading marshes, in the lower part of this valley are mostly reclaimed land and the elevation of the marsh surface is generally below the mean high tide level.

The Eastern Yar Valley area is protected from inundation by the sea by the Embankment Road seawall to the east (Bembridge, in conjunction with the Environment Agency's tidal gates and Yaverland seawall to the south (Sandown), and without both of these structures in place, tidal flooding would already be affecting the area.

The hydrological regime of Brading Marshes is controlled by numerous structures. There has been a structure regulating flows at the downstream end of the Eastern Yar since reclamation in the 1800s. There are a number of points at which flow along the Eastern Yar river is constrained, resulting in varying water levels in different parts of the flood plain and along the valley. The flood plain of the Eastern Yar valley stores water during periods of high flow and tide-locking, until tides drop and the water can be released out to sea.

In recent years a series of plans and strategies have set policies for how this area should be managed, to look at how the risks of sea flooding and tidal flooding to the valley should be addressed, and how water levels should be controlled to affect the designated habitat of Brading Marshes. These plans are the Shoreline Management Plan (2011), the Catchment Flood Management Plan (2009), the Eastern Yar Flood and Erosion Risk Management Strategy (2010) and the Brading Marshes Water Level Management Plan (2006). Plans have also been developed by landowner the RSPB, and for upstream areas at Alverstone and beyond.

These reports conclude that the significant works should be undertaken in due course to continue to address the key risk to the area, to prevent tidal inundation from the sea at Embankment Road Bembridge and Culver Parade Yaverland. They also recommend only minor works to the Eastern Yar river itself, where assets at risk are more limited. At a more local level, the Water Level Management Plan has been working towards managing water levels in the lowest part of the valley, Brading Marshes, to improve and restore the condition of the freshwater habitat. The current procedures were tested in 2009-10 and are currently being implemented. The quantity of internationally designated freshwater habitat at risk was the primary reason for the decision made

to maintain the defences preventing sea flooding of the Eastern Yar Valley, as well as the important flood risk benefit to the communities and properties bordering the floodplain.

The Shoreline Management Plan (2011) and the Catchment Flood Management Plan (2010) address coastal and inland flood risks respectively, for the whole of the Isle of Wight. The Eastern Yar Flood and Erosion Risk Management Strategy (2010) examines both coastal and fluvial flood risks for the Eastern Yar valley area in greater detail. At the more local level, the Water Level Management Plan looks at how water levels should be managed, and their consequences, in a specific part of the catchment. Each of the reports involves the key agencies with responsibilities for managing the risks and has been developed with consultation from the public and (at the local level) with specific landowners.

Summary of the SMP’s preferred plan affecting the Eastern Yar valley:

‘There are several important factors relating to the management of this area [Bembridge Harbour]. The overall intent is to maintain the flood defence provided by the embankment at back of the harbour, reducing flood risk to the Eastern Yar river valley. In managing this, the intent is also to continue to manage the flood risk to St Helens and the properties at Bembridge Point. Alongside this is the intent to sustain use of Bembridge Harbour, together with the aim of supporting continued use of areas of St Helens Duver. This Management Area has been examined in detail through the Eastern Yar Flood and Erosion Risk Management Strategy (Environment Agency, 2010).’

‘As outlined by the Eastern Yar Flood and Erosion Risk Management Strategy (led by the Environment Agency, 2010), sustaining Embankment Road will primarily meet obligations to protect the internationally protected freshwater habitat in and around Brading Marshes (under Article 6 of the habitat regulations), as well as protecting around 450 properties and the key road between Bembridge and St Helens from flooding to a standard of 1:25 and meets obligations under the Bembridge Harbour railways act.’

PREFERRED POLICY TO IMPLEMENT PLAN:	
<i>From present day</i>	<i>Maintain the embankment and flood defence along Embankment Road. Support riparian owners undertaking local defence to St Helens the harbour area. Maintain defence of St Helens Duver. Manage the harbour entrance channel to ensure no adverse effect upon coastal processes.</i>
<i>Medium term</i>	<i>Maintain the embankment and flood defence along Embankment Road and to properties at Bembridge Point. Support riparian owners undertaking local defence to St Helens the harbour area. Maintain defence of St Helens Duver, with consideration of the intent to reduce management of the area in the long term.</i>
<i>Long term</i>	<i>Maintain the embankment and flood defence along Embankment Road and to properties at Bembridge Point. Support riparian owners undertaking local defence to St Helens the harbour area. Maintain defence to the northern end and control of the southern end of the Duver in line with a management plan for realignment of the Duver and management of the main channel.</i>

SUMMARY OF SPECIFIC POLICIES

Policy Unit (& length)		Policy Plan			Comment
		to 2025	to 2055	to 2105	
PU3A.	Priory Bay	NAI	NAI	NAI	

1	(1,515m)				
PU3A.2	St. Helens Duver (1,958m)	HTL	HTL	MR	HTL with public and private defences; Realignment in the third epoch in line with a plan for management of the harbour entrance.
PU3A.3	St Helens (879m)	HTL	HTL	HTL	Maintain the defences at the current level. Securing central government funding will be difficult for this frontage and homeowners and businesses should be prepared to take action to protect their properties from flooding.
PU3A.4	Embankment Road (1,497m)	HTL	HTL	HTL	Strong links to PU3C.2.
PU3A.5	Bembridge Point (583m)	NAI	NAI	NAI	No intervention will be undertaken at public expense along the shoreline of Bembridge Point (allowing the groyne to collapse/disappear and continuation of natural coastal processes along the beach and the sand dunes). However, NAI does not preclude private maintenance of the groyne. Nb. During epoch one a new defence alignment to be defined that links Embankment Road (PU3A.4) with higher ground at the back of Bembridge Point; this will provide a continuous defence around properties that will be held in future epochs (nb. Eastern Yar Strategy 2010).
Key: HTL - Hold the Line, A - Advance the Line, NAI – No Active Intervention, MR – Managed Realignment					

The IW CFMP has the following 'sub-areas' (with policies), with the two highlighted in blue of relevance for the Eastern Yar:

- Sub-area 1: Western Yar
- Sub-area 2: Newtown River and the Chines
- Sub-area 3: Lower River Medina and Gurnard Luck
- Sub-area 4: Palmers Brook, Wootton Creek and Monkton Mead Brook
- Sub-area 5: Lower Eastern Yar
- Sub-area 6: Upper Eastern Yar and Upper River Medina

Sub-areas of the Isle of Wight CFMP:

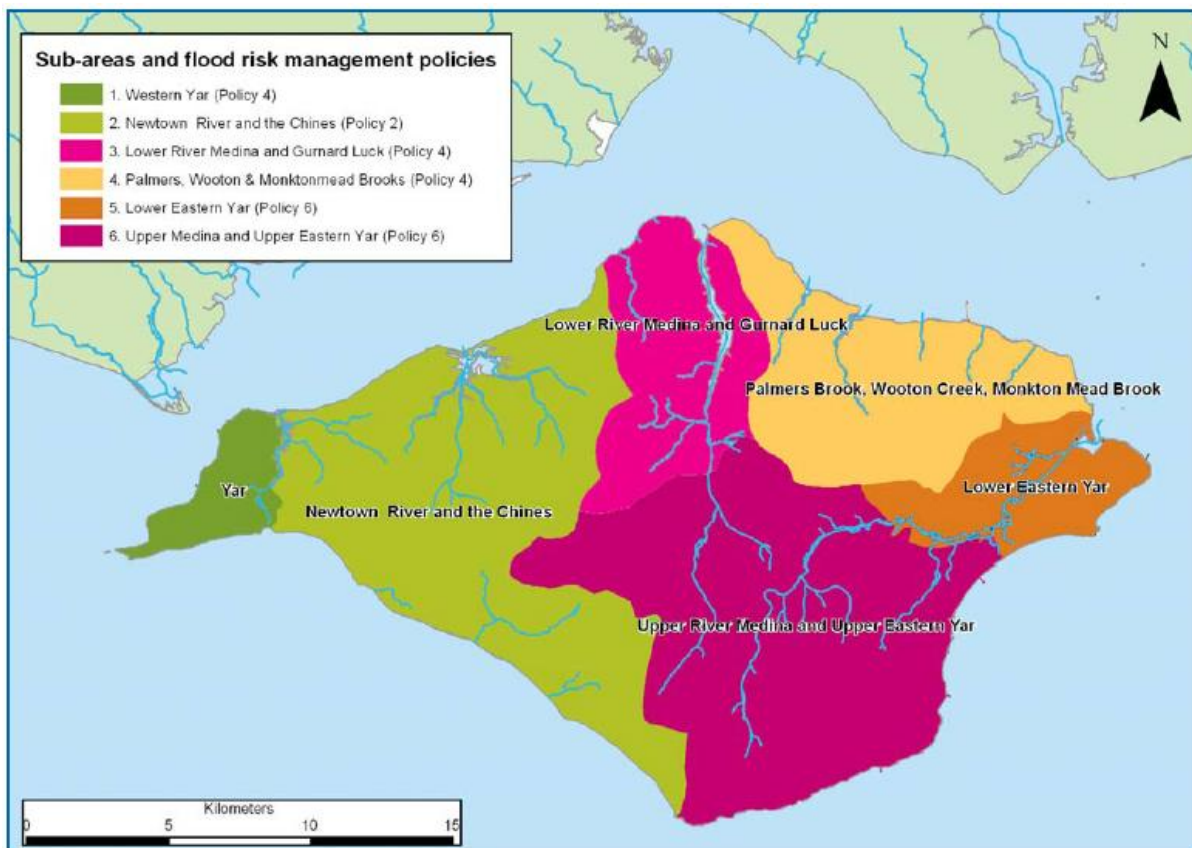


Figure 4: CFMP Sub-areas

Further detail is provided on the policies applicable to the Eastern Yar area:

Sub-area 5: Lower Eastern Yar:

'Impact of a 1% annual probability flood event -Number of properties at risk:

<i>Today</i>	<i>13</i>
<i>Future (2100):</i>	<i>80</i>

- *Key Partners: Environment Agency, Isle of Wight Council, Natural England, Island 2000*
- *The issues in this sub-area: This sub-area covers the lower section of the Eastern Yar catchment from Alverstone to its mouth at the tidal sluice at St. Helens. The tidal defence at Embankment Road stops seawater from travelling up the river and allows a freshwater habitat upstream. The area is largely rural in nature and contains a number of villages including Bembridge, St. Helens, Brading, and Alverstone. There are two designated sites at Brading Marshes and Alverstone Marshes which require flooding to maintain their status.*

Flood flows in the policy unit largely result from overbank flooding of fluvial flows which spill out onto the floodplain. The downstream end of the catchment is protected from tidal ingress by a tide locked sluice, however this can lead to tide locked fluvial flooding. In addition there have also been incidents of surface water drainage flooding and a very limited amount of groundwater flooding.

- The vision and preferred policy: Policy Option 6 – areas of low to moderate flood risk where we will take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits.
- Proposed actions to implement the preferred approach:
 - Develop System Action Management Plans (SAMPs) to review maintenance regimes.
 - The implementation of the Brading Marshes and Alverstone Marshes Water Level Management Plan to meet the needs of flood risk management and the enhancement of wetland habitat and species.
 - A co-ordinated action to support the outcomes of the Eastern Yar fluvial and coastal strategy.'

Sub-area 6: Upper Eastern Yar and Upper River Medina:

'Impact of a 1% annual probability flood event -Number of properties at risk:

<i>Today</i>	<i>6</i>
<i>Future (2100):</i>	<i>Minimal change</i>

- Key partners: Environment Agency, Isle of Wight Council, Natural England
- The issues in this sub-area: This sub-area covers the upper sections of the Eastern Yar catchment from Alverstone to its source, and the upper sections of the River Medina from Blackwater to its source. The area is largely rural in nature, and contains a number of villages including Wroxall and Whitwell. Flood flows in the subarea result from either overbank flooding of fluvial flows or surface water drainage flooding.
- The vision and preferred policy: Policy Option 6 – areas of low to moderate flood risk where we will take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits.
- The key message: This policy applies where the current risk is acceptable and action can be taken to increase the frequency of flooding to deliver benefits locally or elsewhere.
- Proposed actions to implement the preferred approach:
 - The implementation of the Water Level Management Plan at Cridmore Bog and the Wilderness to meet the needs of flood risk management and the enhancement of wetland habitat. Any potentially damaging works forthcoming under this policy will be subject to Habitats Regulations Assessment.
 - Undertake System Asset Management Plans (SAMPs) that will benefit sustainable conveyance and provide the opportunity for environmental and flood risk benefit to upland villages.
 - A co-ordinated action to support the outcomes of the Eastern Yar fluvial and coastal strategy. Monitor future action within the policy unit and inform on any fluvial aspects of the project outcome. Support future minor works identified by the Eastern Yar fluvial and coastal strategy including the drainage improvements at Wroxall and Whitwell.

Additional information on the definition of 'Policy 6':

→ Policy 6

Areas of low to moderate flood risk where we will take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits

This policy will tend to be applied where there may be opportunities in some locations to reduce flood risk locally or more widely in a catchment by storing water or managing run-off. The policy has been applied to an area (where the potential to apply the policy exists), but would only be implemented in specific locations within the area, after more detailed appraisal and consultation.

Summary of the policies in the Eastern Yar Strategy:

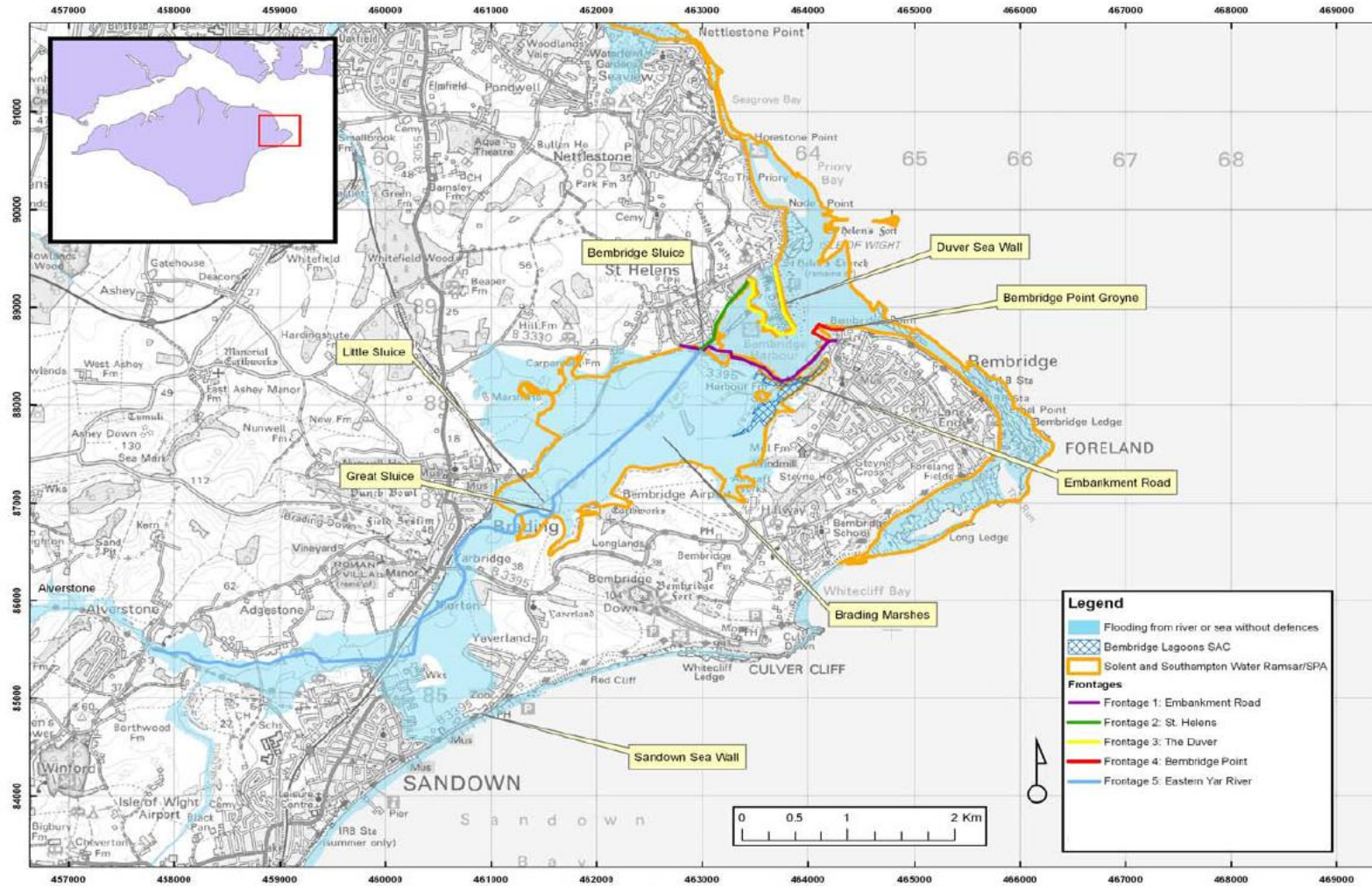
The Eastern Yar Strategy identifies policies for five Strategy Frontages. A summary of the policies is provided here. The two key frontages regarding the future of the Eastern Yar valley (highlighted in blue) are then expanded upon in the text below this summary.

- **Frontage 1: Embankment Road: *Hold the line – Sustain*** (see below for details).
- **Frontage 2: St Helens: *Hold the line – Maintain***. *‘Maintain the defences at their current level for the next 100 years. It is recognised that securing central government funding will be very difficult for this frontage. We encourage homeowners and businesses to be prepared to take action to protect their properties from flooding. We encourage riparian owners to continue ongoing maintenance of the harbour wall.’*
- **Frontage 3: The Duver: *Hold the line – Maintain (for 50 years)***. *‘Maintain the sea wall until around 2060.’*
- **Frontage 4: Bembridge Point: *Do nothing –continue coastal monitoring***. *‘Do not maintain or repair the groyne. Regularly review our coastal monitoring data to ensure that coastal processes are not changing over time.’*
- **Frontage 5: Eastern Yar River: *Do minimum*** (see below for details).

An explanation of the policy terms is provided in the table on the next page:

Management Option	Description
Do Nothing	Let nature take its course – no work will be carried out to maintain or repair defences, allowing them to deteriorate over time.
Do Minimum	Maintain existing defences until they fail and then do nothing as above.
Hold the line – by maintain, sustain or improve	Maintain – defences are maintained as they are, but as sea levels rise flood and erosion risk increases over time. Sustain – defences are raised and strengthened keeping the levels of flood and erosion risk the same as now. Improve – defences are improved to increase the standard of protection over time, beyond the requirements of rising sea levels.
Managed realignment	Improve coastal stability by moving coastal defences to a more sustainable location further inland.

strategy boundaries and flood risk



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Figure 5: Eastern Yar Strategy boundaries and flood risk

The key policies (and policy wording) affecting the Eastern Yar Valley are as follows:

Frontage 1 - Embankment Road:

'Embankment Road links St Helens to Bembridge. It is a sea defence structure that prevents tidal waters from entering the Eastern Yar River, reducing salt water in Brading Marshes and protecting the land behind it from erosion. Embankment Road is the most important flood defence structure in the Eastern Yar catchment and is managed by the Environment Agency. At the moment the defence has a 1 in 25 chance of being overtopped in any year.

We are planning to sustain the defence to ensure Embankment Road continues to provide this standard of protection for the next 100 years. This will protect around 450 properties that are currently at risk of flooding if the road was not there. The option will also protect Brading Marshes, a wildlife rich open space which the local community values highly. Most people responding to our consultation supported this option.

- *Approved Strategy Option: Hold the line – Sustain*

'Raise the sea defence around Embankment Road in line with sea level rise predictions. This would include building a sea wall along the length of Embankment Road which varies in height from a few centimetres to 1.4 metres. Refer to [the map below] for details.

The next stage is to produce a Project Appraisal Report which will look in detail at the costs and benefits and how to protect as many properties as we can economically justify. It will determine what to build new defences from, what they will look like, the exact alignment and how high they need to be. It is likely that this scheme will gain funding in the next five years.'

'We recommend that the sea wall goes on the harbour side so that it protects the road from flooding. We seek to maximise the benefit from any flood and erosion management we undertake and so we will consider extending the sea wall to protect the properties at risk of flooding in St Helens.'

Frontage 5 - Eastern Yar River:

'This area extends from Alverstone down the Eastern Yar River to Bembridge Harbour. Flood risk upstream of Alverstone is low. It was not appropriate to consider this risk within this strategy and so we have produced a separate local options report which can be downloaded from our website.

Much of this area was reclaimed from the sea when Embankment Road was built. There is a significant risk of flooding from the sea, but this risk is reduced by Embankment Road and Sandown Sea Wall. The sea wall at Sandown is being considered separately in the Sandown Bay Strategy.

There are three structures which are used to manage water levels and flood risk from the river in and around the marshes: Bembridge tide gate, Middle Sluice and Great Sluice. There are a low number of properties at risk of river flooding on the Eastern Yar River and for some of these properties, the chance of flooding in any year may be 1 in 75.

- *Approved Strategy Option: Do Minimum*

We will support the people living and working in the properties that are at risk of flooding to take local action to reduce the impact of flooding on their lives.'

The Brading Marshes Water Level Management Plan (2006) outlines the functioning of the hydrological system for Brading Marshes and the Eastern Yar and it details the conservation objectives and aspirations for the designated site. It also looks at the current flooding regime, the implications for other land uses in the valley, and develops a vision for future water levels, and details a series of works and further investigations needed to implement that plan. The WLMP contains the following extracts:

Current flooding regime:

- *'The floodplain of the Eastern Yar is actively used for flood storage. Three spillways connect the river with the floodplain and enable water to flow out onto the floodplain when periods of tide-lock and high flows coincide (Section 6.5.2.1). Water starts to spill onto the floodplain when water levels in the Eastern Yar exceed the levels of the spillways.'* *'Under most conditions, this leads to conditions of temporary flooding. ..Water levels reach 0.20m OD at least once every winter. This is sufficient to cause extensive surface flooding of the Brading Marshes, although the duration of flooding is typically short.'*
- *'However, more extensive flooding can occur.'* For example, in November 2000. *'This flood was due to the coincidence of extremely high flows and neap tides causing a longer than normal period of tide-lock. The maximum water level recorded at Bembridge Sluice during the flood event...was 0.45m OD. Within the Brading Marshes part of the SSSI, most of the flooded area was adjacent to the main river channel and in the ditches that dissect the Brading Marshes. Water levels of 0.39m OD have also been reported in December 1993 by Lewin, Fryer and partners (1994).'*
- *'Flooding within the Brading Marshes is managed by the Environment Agency. There is typically a lag of between 12-24 hours between the onset of heavy rains in the upper parts of the Eastern Yar catchment and flooding at Brading (A. Matthews, Environment Agency, pers. comm. 13/08/2005). This gives Environment Agency operatives time to fine-tune the penning levels of the Bembridge Sluice in preparation for a flood event.'*

Climate: *'Mean annual rainfall around the Brading Marshes is 800mm/yr according to isohyets provided by the NRA (1995). On the Brading Marshes, evapotranspiration between May and August is almost twice as great as rainfall, leading to soil moisture deficits in late summer'* (Ref. Section 6.2).

Soils: *'Overall, the soils of the Brading Marshes are impermeable, and have a low hydraulic conductivity. This means that the vertical movement of water through the soil is slow and attempts to raise in-field water tables typically require inundation of the field surface'* (ref. Section 6.2).

Land uses susceptible to changes in water levels: The Water Level Management Plan identifies *'land uses susceptible to changes in water levels'*, and states the intentions of the *'desirable water levels'* on them. Categories include: (Ref. Extracts from Table 5.1)

- *'Flood Storage: Penning levels on the Eastern Yar are managed to provide floodplain storage to minimise flood risk upstream. Desirable Water Levels: Low enough to provide flood storage for protection of urban areas upstream.*
- *'Property & urban development: A number of developments occur within and upstream of the Brading Marshes. This includes Harbour Farm within the Brading Marshes, and housing at Yaverland, a caravan and chalet park and industrial estate upstream at Sandown. Desirable water levels: Low enough to limit impacts of flooding on properties.*
- *'Roads and Bridges: The following roads run across or adjacent to the Brading Marshes SSSI: B3330, B3395 Yar Bridge, B3395 Embankment Road. Desirable water levels: Low enough to keep roads passable and limit impacts on road foundations.*

- *Southern Water Wastewater treatment Works: The WwTW (completed in 2001) processes most of the wastewater for the Sandown area. The WwTW lies within the floodplain of the Eastern Yar. An embankment has been constructed around the works to protect the works from flooding. Desirable water levels: Low enough to ensure the embankment is not overtopped.'*

'Current vision' for Water Levels, set by the Water Level Management Plan:

A water level vision for the Brading Marshes was developed in 2006 by the WLMP Review Steering Group consisting of the IW Council, Environment Agency, Natural England and the Royal Society for the Protection of Birds.

'The water level vision addresses the need to provide the winter inundation and high water levels in summer required by the species and habitats for which the site is designated.'

'The vision water levels are aspirational and will be refined during further stages of the WLMP process, once further information regarding the constraints associated with them are known. For example, the WLMP tries to draw agreement from other parties (mainly on flood risk issues) and it will be necessary to initially raise water levels in a precautionary way whilst monitoring effects on (a) direct flooding and (b) the ability to drain down the site prior to a flood event. The water levels delivered by the Plan also need to acknowledge that water levels may not be able to be kept as high in the winter due to increased risk of flooding.'

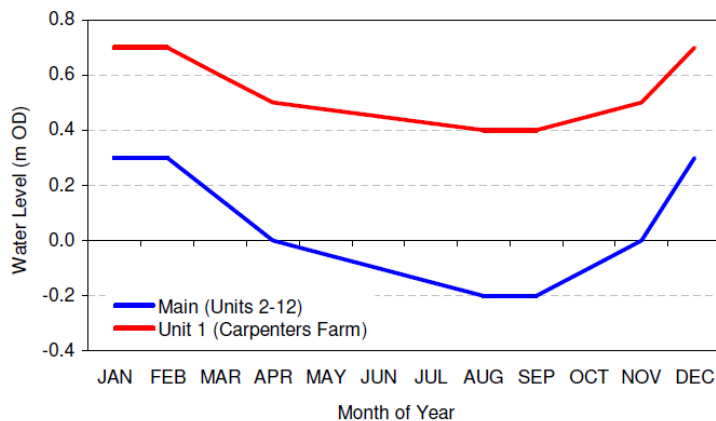
Because the elevation of the marsh surface within the Brading Marshes is variable, the vision proposes different water levels for (a) land to the west of the old sea wall currently owned by the landowner D (owners of Carpenters Farm) and (b) the main part of the site (hydrological units 2-12 in Map 6.9). 'Table 8.1' below summarises the vision for water level management for different parts of the site:'

Table 8.1. Proposed water level vision

Season	Months	Water level vision (m OD)	
		Unit 1 (Carpenters Farm)	Units 2-13 (Main)
Winter	January-March	+0.70	+0.30
Spring	March-April	+0.50	0.00
Summer	August-September	+0.40	-0.20
Autumn	October-December	+0.70	+0.30

'The water level vision set out above provides the shallow inundation of 25-30% around water course margins as required by overwintering and breeding waders and wildfowl.'

Figure 8.1. Water level vision for different parts of the site



As outlined above, the vision for water level management of +0.3 is constrained by the maximum operating capability of the sluices of 0.0m OD.

Flood Risk: *'Historically, one of the main constraints on raising water levels across the Brading Marshes has been the perceived impacts on flood storage and knock-on effects on flood risk, both within the Marshes themselves and upstream at Sandown and Yaverland. Impacts on flood risk associated with raised water levels can be sub-divided into (a) direct impacts on land use and property within and adjacent to the Brading Marshes, and (b) indirect impacts on areas and assets upstream.'*

(a) Direct impacts on land use and property within and adjacent to the Brading Marshes: *'All landowners with land or property within or adjacent to the Brading Marshes were consulted during the development of this Plan. Of the landowners consulted, only the owners of Harbour Farm have rejected the water level vision for the site. The owners of Harbour Farm accepted water levels of -0.2m OD (summer water level vision) as tolerable but rejected the spring and winter water level vision in-principle due to impacts on winter grazing, access and because 'the farm would be surrounded by water'.*

The varying responses from different landowners reflect their location within the floodplain. Whilst Harbour Farm lies directly on the floodplain of the Eastern Yar, land and properties owned by the remaining landowners are on the fringes of the floodplain area and would not be so significantly impacted by the raised water levels resulting from the WLMP water level vision.'

At the time of writing this flood risk investigation, the IW Council has not been able to confirm whether the then owners/occupiers of Nicholas Close commented upon what was the emerging plan.

(b) Indirect impacts on areas and assets upstream of Brading Marshes: *'The main assets considered to be potentially impacted by revised water level management on the Brading Marshes are as follows:*

- *Properties identified as at risk in Sandown and Yaverland;*
- *The rail link between Ryde and Sandown that runs parallel to the Eastern Yar upstream of the Brading Marshes;*
- *Yar Bridge (carrying the B3395);*
- *Southern Water Wastewater Treatment Works at Sandown;*

- *Southern Water abstraction at Burnt House, a critical asset for the whole island supplying water to Sandown and other areas of tourism importance on the Isle of Wight;*
- *Amenity assets at Sandown such as the County Council golf course and council playing fields; and*
- *Areas earmarked for future development in and around Sandown.*

'Prior to the implementation of any of the proposals set out in this Plan, a Flood Risk Assessment will be required. It will be necessary to prove that proposals do not result in a net increase in flood risk to the built environment within or on the boundaries of the Brading Marshes, and in the catchment of the Eastern Yar more generally.'

The Environment Agency produced a Brading Marshes SSSI WLMP 'Assessment of flood risk' in January 2009. The Report sets the scene by stating *'The EA historical penning levels for the Bembridge tide-gate were -1.0m OD in summer (April to September) and -1.5m OD in winter. Over the past three years the summer penning level has been -0.5m OD.'*

The Conclusions of the report (section 6) outline the impact of the WLMP on flood risk in the area, as follows:

'This report has assessed whether the water level objectives associated with the Brading Marshes WLMP result in additional adverse impacts above those that would result from the historical management of the system, and to identify, in principle, how any increases in flood risk might be mitigated. The Brading Marshes WLMP proposes to increase the penning level of the Bembridge Tide-gate from -1.0m OD in winter and -0.5 in the summer as currently, to -0.2m OD throughout the year.

The study has assessed the impacts of the WLMP relative to a historic base-case scenario describing the management and condition of the drainage system in 1995. Three residential properties (5 Nicholas Close, 6 Nicholas Close and the Holiday Cottage at Harbour Farm) and most agricultural land within the lower Eastern Yar catchment would be flooded under the basecase scenario.

*The WLMP model run shows that increasing the river penning level **results in additional impacts at two of the three residential properties affected under the historic base-case (5 and 6 Nicholas Close)**. At these two properties, implementation of the WLMP results in an increase in the duration and earlier onset of the flood. No additional impacts above those that would result from historical management are recorded at Harbour Farm, although flood risk indicators increase for most agricultural land within and upstream of the Brading Marshes.*

As part of the proposed mitigation for the WLMP, the river penning level would be dropped in advance of the flood. The existing structure at Little (or Middle) Sluice would be replaced by a tilting weir, increasing the effective width of the structure by removing a series of posts that currently support the structure. The Little (or Middle) Sluice tilting weir would also be opened to its minimum level in advance of the flood.

*Modelling has shown that the proposed mitigation would result in a **reduction in both the duration of the flood and the area under the hydrograph, and would delay the onset of the flood for two of the three residential properties at risk under the base-case scenario (5 and 6 Nicholas Close)**. No changes relative to the historic base-case are recorded for the third 'at risk' property at Harbour Farm. An equivalent outcome is registered for agricultural land upstream of the Brading Marshes: although the onset of the flood would occur earlier, mitigation reduces the area under the*

hydrograph and the duration of the flood at most assets due to the increased effective area and associated conveyance of flood waters through the Little (or Middle) Sluice.

For agricultural land within the Brading Marshes, mitigation actually results in an increase in most flood risk indicators. However, all land within the Brading Marshes is under existing HLS agreements that provide compensatory payments to landowners for the losses in agricultural productivity resulting from flooding for the benefit of over-wintering and breeding wetland birds and the scheme may potentially be used as one of the suite of mitigation tools to support the WLMP.'

Water level management procedures have now been put in place for Brading Marshes, with the first full year underway from winter 12/13 to winter 13/14. (ref. KB, RSPB, phone call Feb 2014).

The Environment Agency manages the water levels at Bembridge Sluices. A copy of the EA Procedures for managing the sluice gates is provided at Appendix A of this document.

In summary, under the current arrangements, the penning level is raised to -0.2m AOD. If significant rain is forecast, levels are dropped back (in advance of the rain) to -1.0m AOD. The EA Procedures have not changed through the winter of 2013/14 as the EA believe they are adequate measures to take.

Conclusions

The WLMP accepts that there would be an increase in most flood risk indicators for some areas of agricultural land. This however is compensated for by land within the Brading Marshes being under existing HLS arrangements that provide payments to the landowner for the loss of agricultural productivity resulting from flooding. Future payments may be affected by changes to the way in which this scheme operates.

The WLMP also acknowledges that there will be an additional impact at 5 and 6 Nicholas Close, which results in an increase in the duration and earlier onset of flooding. The mitigation included in the plan results in a reduction of duration of flooding and the onset of flooding but unlike the situation re agricultural land there is no compensatory payment process in place.

Roles and responsibilities

- The IW Council is responsible for highway drainage, which is managed for council by Island Roads under the Isle of Wight Highways PFI Contract. In addition, under the Emergency and Reactive Response section of the PFI contract Island Roads provide 24/7 emergency assistance in accordance with their Flood Management Plan. In addition, where the council is also landowner, the council has riparian landowner rights to maintain flows of water through watercourses (which includes ditches).
- Island Roads are responsible for a defined Project Network which is made up of assets such as public roads, footways, verges, gullies, street furniture etc.
- The Environment Agency The Environment Agency are responsible for main river and coastal related matters. They provide a 24 hour response to incidents, so if anyone notices debris or a blockage that is likely to cause flooding or any form of pollution it can be reported. However, there is no obligation to maintain or construct new works. The Environment Agency monitor and operate the sluice gate activities for the Harbour and the Eastern Yar itself.

- Southern Water Services are responsible for foul drainage and operate the local pumping station at Nicholas Close and the Treatment plant at Sandown and its accompanying infrastructure.
- The RSPB manage the Brading Marshes area. More information on the management objectives are included in Appendix B of this document.
- Residents are riparian landowners. Where an individual owns land that has a watercourse running through it or owns land that adjoins a watercourse it is the responsibility of that landowner to maintain the flow of water through the watercourse. In addition where riparian landowners are affected by main rivers they can undertake works to keep water flow clear, with permission from the EA. The riparian owner has no duty to maintain the defences along the main river or to remove trees and other structures on the bank that could fall into the watercourse. However if a defence collapses, the riparian owner has responsibility to remove the material from the watercourse.
- Islandline/South West Trains have responsibility for the culvert under the railway line.

Actions carried out following flooding

Sluice gates operating on the Eastern Yar (under the responsibility of the EA) have automatic hydraulics which are fed via feedback from upstream and downstream sensors. The levels are monitored remotely and the sluices then adjusted remotely by duty officers.

The sea level at the harbour has to be approximately 100mm below the river level before the sluice gates at the Harbour open; as a fail-safe the gates are programmed to open fully when the penned river level is more than 200mm above the set level. During dry periods the penning level is set at -0.2mAOD, the penning level is lowered to -1.5mAOD in advance of heavy rainfall or during prolonged wet periods. The decision to lower the penning level is made by Environment Agency Duty Officers and usually takes place 24 to 48 hours in advance of weather warnings.

At times of excessive rainfall/river flow normal operating procedures can be over-ridden, but such actions are likely to be less accurate in terms of response than automatic control, there is a risk of allowing seawater ingress. This option is usually only used by the EA when they have a fault with the control unit and any action such as this is used under caution to avoid placing harbour users at risk.

Funding is actively being sought through the national Flood Defence Grant in Aid (FDGiA) budget to progress the proposed scheme at Embankment Road, Bembridge in the coming years. This progress is being led by the Environment Agency.

Funding is allocated nationally and priority given to schemes protecting large numbers of houses, where flooding and erosion are an immediate risk and likely to cause significant damage. Environmental issues can also be a significant factor, and are a key issue for the Eastern Yar Valley and Embankment Road. The EA will typically look for contributions from private, public or sector voluntary organisations or the communities who will benefit most from schemes.

The Embankment Road Scheme is listed in the current medium term plan published on the Environment Agency [website](#)¹. Inclusion in the MTP does not guarantee funding and the costs are

¹ <http://www.environment-agency.gov.uk/research/planning/118129.aspx>

likely to change as more work is undertaken to develop proposals. The EA and the IW Council wish to progress this scheme, but the timing, design of the scheme and the combination of public and private funding it may need to progress requires further examination and development in the coming years.

The Parish Council have asked South East Trains/Islandline to clear the culvert under the railway line and the extent of the culvert on their land ownership. There may be third party land ownership issues in relation to other parts of the culvert that need clearing/maintaining and this will require further investigation.

Recommendations and Future Actions

1. EA and IWC to continue to review and determine the proposals required for works at Embankment Road, including seeking funding through FDGiA and sources of partnership funding.
2. EA to continue to monitor and manage the water levels in response to weather and flood warnings, as appropriate to the conditions at the time of the warnings.
3. IWC with Island Roads to investigate the drainage ditches to both the east and west of Morton Road to ensure that the watercourses are flowing appropriately and that they are not in any way impeded. This is likely to include working with landowners to make them aware of any issues and agree actions that need to be undertaken.
4. Brading Town Council have approached Island Line/South West Trains re the need to investigate cleaning the culvert under the railway to the rear of Nicholas Close. Further investigation of other landownership issues is required.
5. IWC to continue discussions with EA and RSPB about the various land and wetland management regimes within the area to continue to review their appropriateness and response to risk of flooding. Specifically discussions should be undertaken in respect of potential for compensatory measures that could be considered for the residential properties of 5 and 6 Nicholas Close, impacted upon by the WLMP; and a greater understanding of the potential impact on compensatory payments to agricultural landowners when the current HLS scheme closes.

Table 1: Indicative costs of actions included within the Eastern Yar Flood Investigation Report

Action Number	Indicative cost	Budget/funding
1. Embankment road scheme	tbc vi EA	FDGiA + Partnership funding and capital bid
3. Ditch investigation		PFI contract

Appendix A: Operating Procedures for the Bembridge Sluices:

Environment Agency South East, Solent and South Downs Area, Hampshire & IOW
Flood Incident Duty Officer Procedures

EASTERN YAR

Budbridge

Eastern River Yar, IOW

Notes	<p>Alarm level confidence 'high' – based on Autumn/Winter 2000 event. Christmas 1999 maximum level not recorded Autumn/Winter 2000 maximum recorded level at 15.92 mAOD (significant property and caravan flooding downstream).</p> <p>Notify Dan Ross (APT) the following morning if the penning level at Bembridge is lowered.</p>
H 1	No Alarm
H 2	Monitor conditions on the Eastern Yar via RTS and Hyrad. Consider rainfall accumulation over the previous 2-3days and forecast for the next 2-3days.
H 3	<p>Liaise with the FWDO over catchment conditions and call out the IOW officer during day light hours to inspect the Eastern Yar flood patrol sites (see appendix 6), check river levels and assess flood risk. In particular inspect level at Bembridge Sluice, Middle Sluice, Yarbridge, Alverstone, Langbridge, & Sandown/Yaverland caravan parks. Staff on site should check bridges & culverts etc for blockages.</p> <p><i>Use information from the ground to aid decision making at Bembridge Sluices.</i></p> <p>If levels are rising and there is <u>high</u> confidence of rainfall accumulations of ≥ 50 mm over the next few days FIDO to discuss with the FWDO and consider dropping the penning level at Bembridge to -1.0 mAOD. OR if this is the second time this threshold has been reached in the last week lower the penning level to -1.0 mAOD. The AFIDO can do this remotely through RTS upon instruction from the FIDO. Ensure if the penning level is dropped at Bembridge the tilting weir at Middle Sluice is fully open</p> <p><i>N.B. It is important to draw water levels down at Bembridge in advance of the flood peak arriving in the lower catchment due to the tide locking conditions. This is especially important prior to a neap tidal cycle.</i></p> <p>Once the flood risk has passed raise the penning level at Bembridge to -0.2mAOD</p>

Issue Date December 2012

Appendix B: RSPB Management Plan² for Brading Marshes

The RSPB has had a nature reserve at Brading Marshes since 2001.

'The site's protection by UK and European Law as part of the Solent and Southampton Water SPA, was also an important consideration in the Eastern Yar Flood and Erosion Strategy which identified the need to protect the freshwater habitats and lagoons from tidal flooding by continuing to maintain and sustain the existing Embankment Road sea defences and therefore also protected Harbour Farm from flooding from the sea.'

As a conservation charity and a landowner, they have been participating, over the last 10 years, in implementing the EA's Water Level Management Plan for this SSSI.

Activities in the area seeking the implementation of the WLMP have included water level trials in the late 2000's and the use of Environmental Stewardship Scheme moneys working with landowners.

Further inland of Brading Marshes, the land upstream of the Morton road is not in the ownership of the RSPB.

The RSPB vision for the reserve over the next 25 years is provided below, along with the RSPB conservation objectives and summary management from their 5 year plan (2012 to 2017).

The management of the reserve is in general accordance with the prescriptive Environmental Stewardship Scheme that the whole reserve is entered into. Management is targeted primarily at restoring the designated SSSI, SPA & SAC areas to favourable condition status. Elsewhere, some parts of the designated SSSI, SPA and SAC at Brading Marshes are in other ownership, and some of those other areas are also managed in accordance with Environmental Stewardship schemes that those owners have entered into, and have similar wetland management prescriptions.

RSPB Brading Marshes Management Plan 2012 – 2017

Vision for the site in 25 years:

'RSPB Brading Marshes includes the largest area of wet grassland and reedbed on the Isle of Wight, encompassing most of the Eastern Yar's tide-locked floodplain. It is the key breeding site on the island for Lapwings and Redshanks, is the core of the Brading Marshes SSSI, and is part of the Solent & Southampton Water SPA. The rich mosaic of wetland habitats at Brading Marshes developed following the reclamation of the Yar valley from the sea, a process which began in the 13th Century but was primarily achieved in the 19th Century. Changes to drainage patterns in the 60 years up to 2001 then caused a gradual decline in the wildlife value of the site.

By 2040, the implementation of the actions identified in the Brading Marshes Water Level Management Plan, together maintenance of the current grazing management, will have restored the floodplain hydrology and brought the wetland habitats into favourable condition with a more extensive and diverse wetland mosaic with the current wet grasslands at its heart. The populations

² <http://www.rspb.org.uk/community/getinvolved/b/specialplaces/archive/2013/12/13/a-tangled-tale-of-wetland-conservation.aspx>

of breeding and wintering wetland birds will have grown, there will be healthy breeding populations of Lapwings, high numbers of wintering waterfowl (especially Teal and Wigeon), and breeding Snipe will have recolonised. The reserve contributes in particular to the Brent Goose populations and the overall waterfowl numbers for which the SPA is designated. In addition, the saline lagoons will have been brought into favourable condition.

The surrounding areas of woodland habitat will be in coppice rotation that will have restored their biodiversity, benefiting woodland biodiversity including increased Dormice numbers and attracting resident Red Squirrels.

Much of the arable land will have been restored as chalk downland, benefiting wildlife such as such as Chalkhill Blue butterflies and calcareous flora. Low-input spring-sown cereals will have boosted populations of Skylarks and Yellowhammers,

The reserve will largely be managed through sustainable and economically viable livestock farming using the local farming community and local contractors. Partnership working with neighbouring farmers and the National Trust will have allowed the reserve to be at the core of landscape-scale conservation management. This will include working with Environment Agency, Natural England and I of W Council to develop robust plans for the migration of freshwater and saline lagoon interest in advance of the anticipated potential of tidal inundation in 100 year's time.

The reserve will be functioning at the very least as a successful quiet enjoyment reserve and a presence for the Society on the Isle of Wight, offering a pleasant and appropriately provisioned countryside experience to a minimum of 10,000 visitors making some 20,000 visits per year. There will be improved access to the reserve, and management work off the SSSI will have been done explicitly to enhance the direct wildlife experience available to visitors. In the short term, Brading Station will continue to be the reserves gateway and information point. In the medium to long term, opportunities to acquire non designated land adjacent to the reserve, which lends itself to habitat manipulation and infrastructure development for provision of increased visitor experience will be taken.'

Conservation Objectives and summary management:

1. *'To increase the extent of floodplain grasslands and achieve favourable condition, (currently un-favourable recovering) of the SSSI and SPA areas, principally to increase the populations of wintering and breeding waterbirds*

Summary management:

- *Carry out management prescriptions outlined in HLS agreement*
- *Ensure EA operate Bembridge sluice to maintain a late Spring and summer penning level >-0.2 mod .*
- *Seek to achieve with EA operation of the main sluices on River Yar to achieve a minimum level of 0.0 mod in early spring and to delay spring draw down.*
- *Develop project plan to excavate of pools, scrapes and ditches across Yaverland and Sandown Marshes.*
- *Grazing with cattle on wet grassland, at mean 0.6 – 0.7 LSU/ha/year*
 - *Spring grazing 0.5 LSU/ha*
 - *Summer/autumn grazing 0.7 – 1.2 LSU/ha*
 - *Winter grazing at 0.2 LSU/ha.*
- *Adjust grazing plans to reflect delivery of Brading Marshes WLMP*

- Control *Crassula helmsii* encroachment from loW council land at Sandown & encourage landowner to do likewise.
- Maintain levels of hay cutting at max 25 ha
- Control of Rushes, Ragwort & Thistles by mowing
- Maintain absence of scrub and trees across floodplain
- Varied rotational cleaning out of ditch system

Summary monitoring:

- WeBS Core Counts throughout year
- Annual breeding wader and waterfowl surveys
- Monitor lapwing productivity
- Monitor water levels via Environment Agency data
- Monitor sward height in November and mid-April
- Monitor spread of *Crassula helmsii* from neighbouring land
- Monitor SSSI plant species once in the Management Plan cycle

2. To restore the existing areas of reedswamp and fen and increase the amount of wet reedswamp

Summary management:

- Carry out management prescriptions outlined in HLS agreement
- WLMP implementation to create depths of >300mm on lower parts of marsh and existing reedbed areas.
- Maintain open water for fish biomass
- Clear invasive scrub and trees within old river channel (ox-bow)
- Re-instate rotational mowing of established reedswamp
- Excavate and remove accumulated litter and silt

Summary monitoring:

- Monitor breeding birds (annual)
- Monitor wintering bittern population (annual)
- Monitor water vole population (once in the Management Plan cycle)
- Monitor water levels

3. To enhance the management of the existing coastal lagoons and brackish inundation marsh and maintain favourable SSSI condition

Summary management:

- Manage inflows of saline water and freshwater through sluices to reach desired salinity levels of >1.5%
- Maintain water levels
- Net and remove carp
- Summer cut marginal and over hanging vegetation
- Rotationally mow/excavate encroaching *Scirpus* and reed to maintain open water

Summary monitoring:

- Monitor Salinity and Nutrient levels
- Monitor distribution of Starlet sea anemone (once in Management Plan cycle)
- Survey Foxtail stonewort (once in Management Plan cycle)
- Monitor distribution of Bembridge water beetle (once in Management Plan cycle)

4. To achieve favourable condition of the SSSI woodland copses and manage those and additional copse areas to develop their biological diversity.

Summary management:

- *Thin 4 ha of ancient woodland*
- *Thin 0.7 ha of secondary woodland*
- *Coppice 10 ha of mixed coppice on 15 year rotation*
- *Control Sycamore regeneration with herbicide*
- *Scallop woodland paths*
- *Create standing deadwood by ring barking*
- *Plant trees of local provenance*
- *Remove dense scrub*
- *Protect woodlands from grazing*

Summary monitoring:

- *Monitor breeding BoCC bird species annually*
- *Monitor dormouse distribution twice in Management Plan cycle*
- *Survey red squirrel population twice in Management Plan cycle*

5. *To manage 78 ha of ex-arable and high fields to create c.50 ha of chalk grassland and spring cereal crops with wildlife margins, principally to demonstrate the benefits of spring crops and over-wintering stubbles to wintering farmland passerines and breeding lapwing and skylark*

Summary management:

- *Graze grassland with cattle and/or sheep*
- *Mow areas of coarse vegetation to aid establishment of chalk grassland*
- *Re-seed upto five 0.25 ha plots with seed harvested from local downland*
- *Plough and sow spring arable fields and wild bird seed in March/April*
- *Harvest, cut or leave arable crops as winter stubble*

Summary monitoring:

- *Monitor breeding BoCC bird species annually*
- *Monitor establishment of chalk grassland*
- *Monitor presence of chalkhill blue*
- *Monitor Grazing pressure*

5. *To maintain the historic or archaeological features on site*

Summary management

- *Avoid machinery impact, ground disturbance and brash fires on or adjacent to identified sites*
- *Ensure a watching brief is maintained by archaeologists during major habitat works'*