

Holes Bay Nature Park: ecology & human activity



Spoonbills in Holes Bay (source: Steve Davis, 2014)

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2019

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Glossary

BOP	Borough of Poole (now BCP - Bournemouth, Christchurch & Poole Council)
BSA	Bird Sensitive Area
BTO	British Trust for Ornithology
DCC	Dorset County Council
DERC	Dorset Environmental Records Centre
DWT	Dorset Wildlife Trust
EA	Environment Agency
EC	European Council Regulation
EU	European Union
FCIR	False Colour Infrared
FOCI	Feature of Conservation Interest
GES	Good Environmental Status
HBNP	Holes Bay Nature Park
IFCA	Inshore Fisheries & Conservation Authority
IUCN	International Union for the Conservation of Nature
IUU	Illegal, Unreported and Unregistered (fishing)
JNCC	Joint Nature Conservation Committee
LIDAR	Light Detection And Ranging
MAFF	The Ministry of Agriculture, Fisheries and Food
MoA	Memorandum of Agreement
MCZ	Marine Conservation Zone
MHW	Mean High Water
MHWS	Mean High Water Springs
MLW	Mean Low Water
MLWS	Mean Low Water Springs
MLW	Mean Low Water
MMO	Marine Management Organisation
MPA	Marine Protected Area
MSFD	Marine Stewardship Framework Directive
NE	Natural England
NERC	National Environment Research Council
OSPAR	The Convention for the Protection of the Marine Environment of the North-East Atlantic (the 'OSPAR Convention')
PEL	Probable Effect Level
PERS COMM	Personal communication
PHC	Poole Harbour Commissioners
PHCI	Poole Harbour Catchment Initiative
PSTW	Poole Sewage Treatment Works
SANG	Suitable Alternative Natural Greenspace
SNCI	Site of Nature Conservation Interest
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
TGH	The Great Heath
TBT	Tributyltin
WACA	Wildlife and Countryside Act (1981)
WeBs	Wetland Bird Survey
WFD	European Water Framework Directive (Directive 2000/60/EC)
WW	Wessex Water

Acknowledgements

Thanks to:

Andrew Powell, Poole Harbour Study Group

Dave Jones, Wessex Water

Durwyn Liley, Footprint Ecology

Elisabeth Dyrinda

Jez Martin, Cally Barnes, Justine Hawkes, Tom Gaze, Steve Dean & Glen Wells, Borough of Poole

John Humphreys, JHC Research

Margi Dillon, Steve Pearce & Andy Ramsbottom, Poole Harbour Commissioners

Members of the Great Heath Lytchett & Holes Bay Group 2014-16

Simon Cripps, Imogen Davenport, Stephen Baynes, Nicki Brunt, & Nicky Hoar, Dorset Wildlife Trust

Neil Garrick-Maidment, The Seahorse Trust

Paul Morton, Birds of Poole Harbour

Peter Dyrinda

Rachel Pearce, Urban Heaths Partnership

Robert Clark, Patrick Cooper & Sarah Birchenough, Southern IFCA

Roger Brewer, Upton Country Park

Roger Herbert & Ann Thornton, Bournemouth University.

Susan Burton, Natural England

Suzanne Powner, Dorset Dogs

Suzy Witt, Environment Agency

I EXECUTIVE SUMMARY

Partners

A large area of Holes Bay was purchased by Poole Harbour Commissioners and Dorset Wildlife Trust under “The Great Heath” Initiative. In 2015, the Holes Bay Nature Park was established and is now managed by a consortium of these two and other landowners and stakeholders including Poole Harbour Commissioners, Dorset Wildlife Trust, Marina Developments Limited, Borough of Poole, Davis’ Boatyard and Royal National Lifeboat Institution. Dorset Wildlife Trust facilitates the stakeholder group and has written this desktop report to gather information on the ecological status and human uses of Holes Bay to better understand, manage, and conserve the Holes Bay Nature Park.

Designations

Holes Bay lies within the Poole Harbour Site of Special Scientific Interest (SSSI), the Poole Harbour Special Protection Area (SPA) and Ramsar Site, the latter two being international designations.

Historical Changes

Holes Bay has suffered greatly over the last 150 years: used as a dumping ground for vessels, industrial chemicals and raw sewage; the area has faced many challenges in addition to heavy urbanisation and infilling of the natural environment. In the mid nineteenth century, the coastal vegetation of Poole Harbour was very different to what we see today; acres of intertidal mudflats were dominated by seagrass *Zostera* spp.

A recent Condition Assessment of the Poole Harbour SSSI/SPA/Ramsar by Natural England in 2017 confirms three of the six units of Holes Bay as ‘Unfavourable-declining’. Results from this assessment have found the water quality to be ‘Unfavourable’, the saltmarsh ‘Unfavourable-declining’, and shelduck population *Tadorna tadorna* ‘Unfavourable’. These results show Holes Bay has declined in condition since Natural England’s previous assessment in 2010.

Important Habitats & Species

The sheltered, Overwintering Bird Sensitive Area (BSA) on its northern shore offers a long low tide exposure and offers safe refuge for birds providing a large visual area to anticipate danger. In a Poole Harbour disturbance study, Holes Bay north was found to be one of the few sites in Poole Harbour to attract the highest number of species and largest number of birds. Wetland Bird Surveys (2003-16) have recorded 26 different species throughout Holes Bay. These contribute to the 54 separate habitats and wildlife of internationally important wildfowl and waders, coastal vegetation, marine invertebrates or commercially valuable finfish species.

The subtidal channels of Holes Bay were extensively surveyed in the 1980s. Of the 120 species noteworthy species were the flat oyster *Ostrea edulis*, rare sea sponge *Suberites massa* and a solitary peacock worm *Sabella pavonina*.

More recent records have documented that Holes Bay is also a nursery area for 11 species of commercially important fin fish, eight non-native species and perhaps the most surprising; the short-snouted seahorse *Hippocampus hippocampus* and the spiny seahorse *Hippocampus guttulatus*. The current classifications of both benthic invertebrates and fish in Poole Harbour is ‘Good’ under criteria set by the Water Framework Directive.

Pollution

Historically, Holes Bay was regarded as the most polluted embayment of Poole Harbour. Consented raw sewage and industrial waste was previously discharged into the north-eastern aspect until legislation tightened in the 1960s. Research in the 1970s showed copper, nickel and zinc to exceed typical levels in the English Channel. This contamination was exacerbated by the very low fluvial and tidal flushing rate, locking heavy metals away into the sheltered sediments. Tributyltin is

still above Probable Effect Levels in the water column of Backwater Channel and this forms part of the failure for Poole Harbour to meet 'Good Chemical Status' for tributyltin under the current classification of the Water Framework Directive.

The Poole Harbour nitrogen load has doubled in 50 years, and currently macro-algae, dissolved oxygen and dissolved inorganic nitrogen do not meet 'Good' status under the Water Framework Directive. It is understood that nitrate leaching from historical agriculture is the main source of nitrogen causing eutrophication within the Poole Harbour. This along with other pollutants has contributed to the visible algal mats covering 75% of Holes Bay.

Fishing

These historical contaminants prohibit shellfish classification and any such bivalve fishing in Holes Bay is prohibited, creating *de facto* protection. The area is now a shellfish refuge and will receive indirect benefits from the nearby Marine Stewardship Council certified Poole Harbour cockle and clam fishery and vice versa. Bait digging, dragging, nets and handlines for finfish occur.

Human Uses

Holes Bay remains an area of high commercial importance; home to the Harbour's largest marina at Cobbs Quay, RNLI headquarters, slipways, yacht club and the iconic Twin Sails and Poole lifting bridges.

The Holes Bay Nature Park reflects current access that exists, the challenges this brings to balance and achieve priorities for wildlife and habitats, increasing recreational pressure and the public health role it provides. It is a highly popular area for a range of recreational and commercial users and is accessed widely by all transport. Holes Bay Nature Park provides an ideal opportunity for engagement with nature, green travel and public health initiatives. Green travel options meet a hub in Holes Bay with links to the national cycle network, Poole Harbour trails walks, local bus and train routes.

The primary impact of land-based human activities is attributable to direct access and recreation and is likely to be highly seasonal and weather dependent. Visitor numbers associated with Upton Country Park show steady increase year on year, and associated land-based activities, particularly the exercising of dogs, associated waste, reedbed trampling and general litter deposition appear to be the strongest influences. Longer-term changes driven by local development plans are likely to lead to further increased visitor pressure.

Conclusions

Given the informal status of Holes Bay Nature Park, the primary challenge is to achieve management coordination and clear designation of focal points within responsible partner agencies. Management will build upon the framework matrix completed for the Poole Harbour Aquatic Management Plan and respond to the identified changes in anthropogenic pressures.

It is anticipated that the findings in this report along with recommendations made for further survey work and management of the area, will continue to inform planning applications and develop the Holes Bay Nature Park Memorandum of Understanding and Management Plan. The resulting public engagement will highlight potential human impacts and the need for sensitive access promoting Holes Bay as a commercially important, highly prized and ecologically sensitive Nature Park.

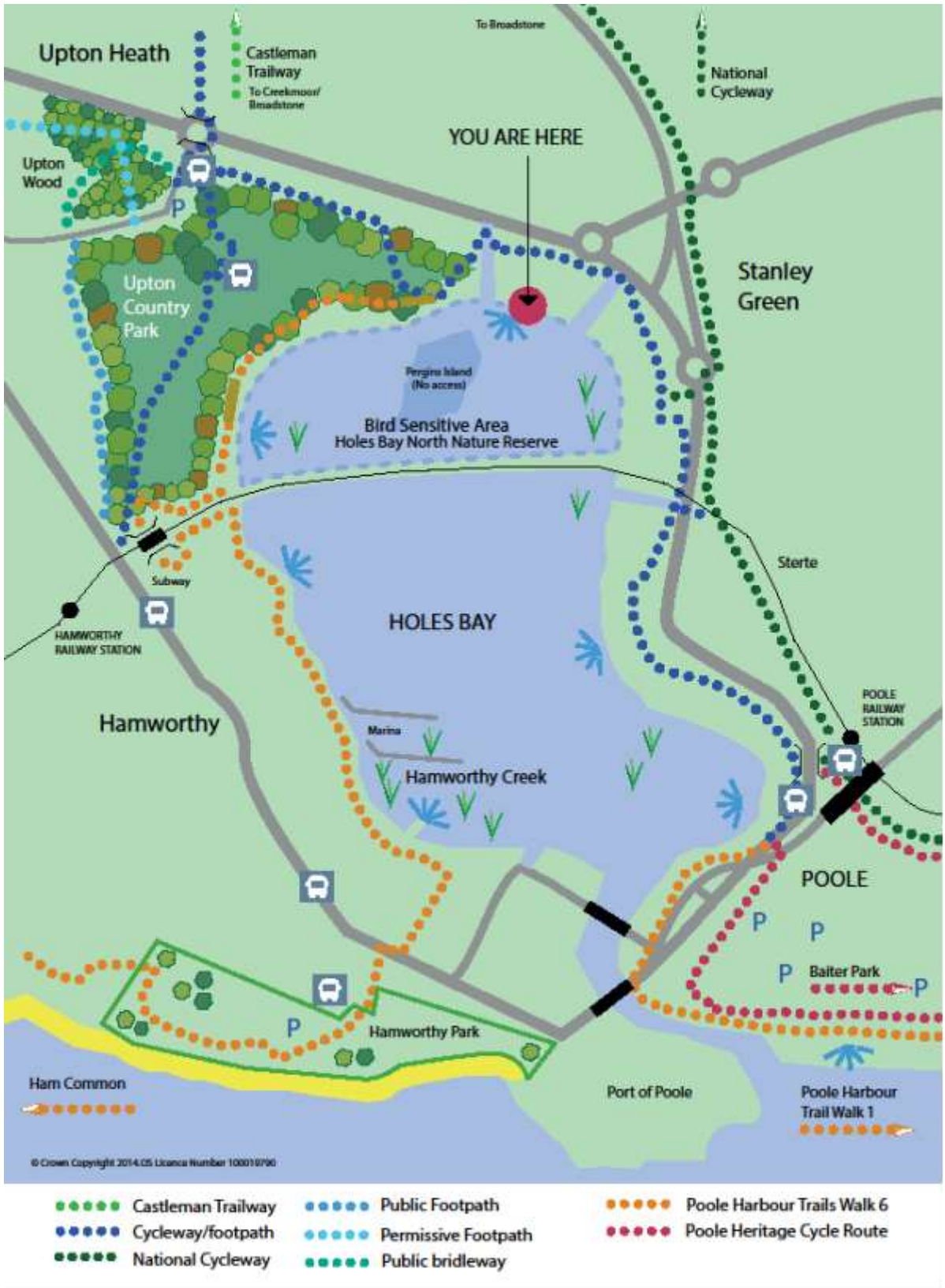


Figure 1: Holes Bay Public Interpretation Map (DWT, 2015)

2 INTRODUCTION & BACKGROUND

Holes Bay, together with its surroundings, is a very special area providing habitats for a huge diversity of wildlife and open space for people to enjoy a variety of activities. Holes Bay is situated in the northern aspect of Poole Harbour – Europe’s second largest natural harbour covering 3300 hectares. It is located in the heart of the commercial area and makes a huge contribution to the high quality natural environment enjoyed by residents, visitors and local businesses.

PHC in partnership with DWT, through The Great Heath initiative, has purchased a large area of Holes Bay. This purchase provided an opportunity to develop a partnership of organisations with an interest in the area. BOP has a major interest in Holes Bay and owns Pergin’s Island in the northern section and also Upton Country Park (UCP) and most of the shoreline and access routes around the bay.

HBNP was established in 2015 by a partnership of PHC, BOP and DWT. Subsequently, a number of other organisations with a stake in Holes Bay have expressed an interest in joining the partnership and working together to ensure the sustainable management of Holes Bay. With a view to establishing a formal partnership agreement and a joint management plan, DWT undertook to carry out an in-depth study of Holes Bay, its wildlife and its use by people.

The HBNP partnership will provide a framework to ensure that the area is well managed both for its outstanding wildlife and for the benefit of the people and communities that live and work in the area. The partnership will work together to manage the area for its special features and its value to people and wildlife.

The Great Heath is a living landscape partnership project that brings together charities, local authorities and conservation organisations of BOP, DWT, PHC, Amphibian and Reptile Conservation Trust, The Erica Trust, Dorset County Council and is supported by NE with Bournemouth Borough Council and Christchurch and East Dorset District Councils.

The project was brought together in a common desire to ensure places like Holes Bay, SSSI, SPA and Ramsar sites are managed for their conservation interest, protected for the future and to enable people to learn about, enjoy and help to conserve their natural heritage.

The identity of the area as HBNP encompasses a partnership of voluntary organisations, local authorities, businesses and communities working together to create a living landscape in which both people and wildlife can prosper. It reflects the historic human impact and the current range of activities and the special status of birds, marine flora and fauna, the wildflowers and plants of the roadside verges, the semi-natural country park and the unique opportunities to get up close to international and nationally significant waders and wildfowl.

The Great Heath consortium Heritage Lottery Project commenced in May 2014 with the early achievement of purchasing 581 hectares of land of high conservation value including large intertidal mudflats of Holes Bay. The project has established a range of new interpretation and enhanced access provision around Holes Bay. The cycle and walkways are well used, sitting close to bird sensitive areas and creating opportunities for people who use them every day to find out more. The Great Heath team has also worked closely with BOP (nature conservation, transport, sign shop, litter picks, littering surveys, Walking and Cycling Officer) to determine preferred locations, sign sizes etc. and opportunities to promote the Poole Heritage Cycle Way and UCP onward links.

3 HISTORY

Research suggests Holes Bay might have been named in memory of William Hole; a reputable 17th century Dorset map engraver (Corby, 2017. pers. comm., 16th February).

Moving forward to more recent times, Holes Bay has changed dramatically both in structure and water movement over the course of the last 150 years. Used as a dumping ground for vessels (Drake and Bennett, 2011), industrial chemicals and sewage, the area has also faced many challenges in addition to heavy urbanisation and infilling of the natural environment. Between 1924 and 1985, Holes Bay intertidal area reduced from 330ha to 250 ha (Gray, 1985 cited by Scopac, 2004).



Figure 2: Hamworthy Power Station (Poole Maritime Trust, 1965)

The Poole Oyster Company imported live oysters for aquaculture from Southern Europe and North America in the late 1800s, before Poole's fish trade collapsed after Napoleon's defeat (Philpots, 1890 cited by Dyrinda, 2005, Humphreys & May, 2005). This former oyster plant was based in Backwater Channel opposite the cooling water intake of the power station (Figure 2), as shown in Figure 3.

Building work began on the railway embankment in 1847 (Le Pard, 2010), spanning the northern aspect of Holes Bay thus joining Poole (and later Weymouth) with the mainline railway to London. The 'Holes Bay Curve', bridged the upper stretches of the tidal channels and finally opened in 1893 (May, 1969, Buxton, 2010; Anon, 2012). Further details concerning the structural changes to Holes Bay resulting from this development, are detailed in *Section 5: Geography, Geology and Hydrography*.

The foreshore of Holes Bay, much of which is now infilled with infrastructure, has shown the most dramatic transformation. As early as 1914, the area parallel to West Quay Road was taken by the Admiralty as a stores base and existing buildings were demolished (Buxton, 2010).

Pergin's Island is situated north of the railway embankment in the BSA and inaccessible by foot. However, during the 1930s, it was a popular leisure spot and families would travel 'up between Quays' (referring to New Quay and Town Quay – now termed Backwater Channel) for picnics on the sandy beach there and northeast Holes Bay (Burt, 2010). Fifty years later, the eastern shoreline would be lost to the Holes Bay Relief Road.

Motorboat races were common between the wars and in the 1950s, occurring in the Harbour and between the Quays to Holes Bay (Burt, 2010). By the 1960s all types of leisure boating were popular, resulting in increased demand for sheltered moorings, particularly in Holes Bay. (Burt, 2010). This location now contains 26 swinging moorings and 32 pontoon berths, managed by PHC (PHC, 2016).

In 1946, 30 acres of mudflats in south western Holes Bay were reclaimed to site a coal fired power station (Figure 2), which later changed to oil-fired in 1960 (Hübner, 2009). The power station was finally decommissioned in 1982 and demolished in 1993 (Slade, 2014).

British Drug Houses (BDH) Limited (later bought out by Merck), began discharging an unknown substance into northeast Holes Bay in 1946 (GPL, 2004 cited by Hübner, 2009). Merck chemicals factory, located just south of the RNLI boatyard, also discharged its waste into Backwater Channel (White, 1991). During this time, the effluent deposited into Holes Bay was untreated and had potential to cause harm to the environment and to public health. This industrial legacy now resides as historical contaminants locked into the sediments of Holes Bay. This is detailed further in *Section 7.7: Water Quality Including Eutrophication in Poole Harbour*.

The 1970s saw a huge increase in the industrial use of Holes Bay with the extension of New Quay for a new ferry terminal at the entrance, a new national headquarters and training college for the RNLI in the south-east corner and Cobbs Quay Marina to the south west (Dyrynda, 1985). These are shown in *Figure 3*. Town access improved greatly with the opening of the Towngate flyover in 1971 and the Lytchett Minster and Upton bypass in 1975 (Buxton, 2010). The Holes Bay Relief Road (A350) followed in 1988 connecting Sterte to the Upton bypass but infilled substantial intertidal areas of north-east and south east of Holes Bay (Dyrynda, 1989a). The total area of reclamation was calculated at 125 acres - 16% of Holes Bay (Wallingford, 1971.)

Poole Sewage Treatment Works (PSTW) in Fleetsbridge began discharging untreated wastewater into a tributary of north-eastern Holes Bay in 1922 (Bowles & English, 2005). By the 1950s PSTW had increased in size, providing the capability for treating effluent (Sheldrick & Willows, 2010). It served three plating factories located in Sterte, until they began to treat their own wastewater (White, 1991).

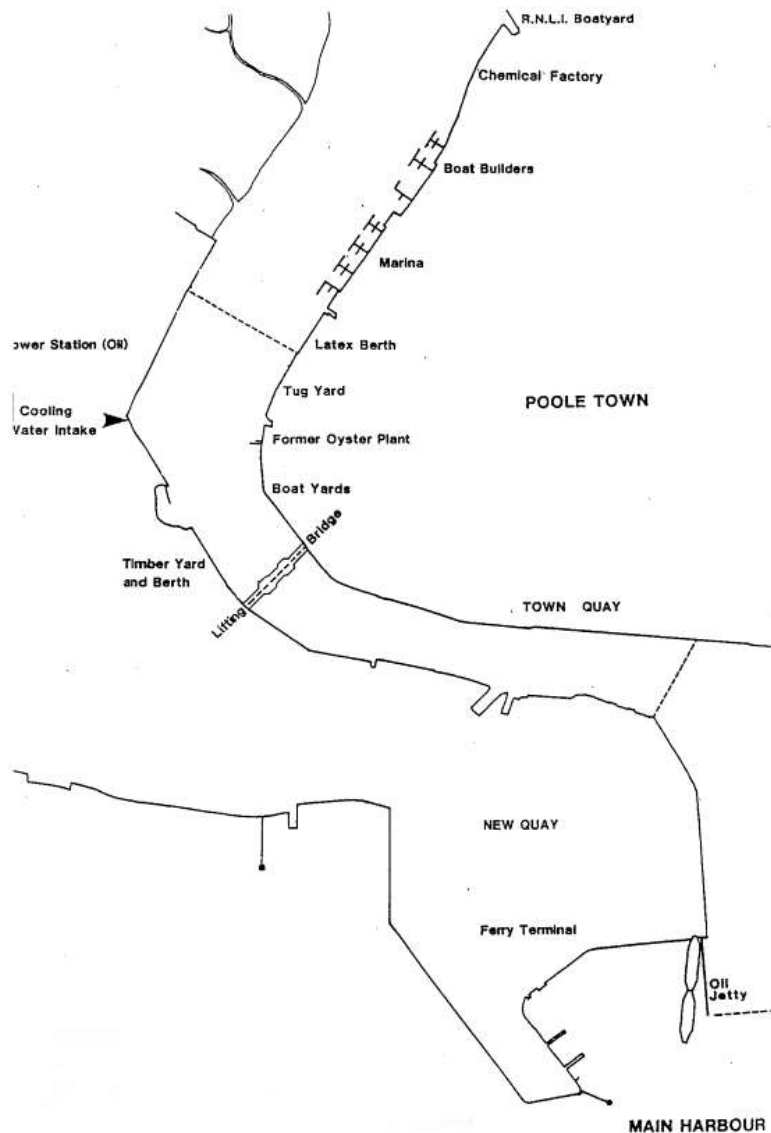


Figure 3: Lower Backwater Channel & industry, Holes Bay (Dyrynda, 1983b)

Access over Backwater Channel between Poole and Hamworthy improved with the Poole Bridge in 1934, (Buxton, 2010) and Twin Sails in 2012. Both lifting bridges ensured a regular and additional connection to Poole town and lower Hamworthy, thereby reducing the need to travel around Holes Bay (Borough of Poole, 2011).

The Backwater Channel is the most heavily used waterway in Poole Harbour and its depth has been maintained through dredging since 1950 (PHC, 2012). The RNLI berth and the marinas at Davis' Boatyard and Cobbs Quay are also dredged regularly and resulting spoil is taken out to Poole Bay. For more information on sediment dredging see *Appendix 14.15: Holes Bay Saltmarsh Re-creation Project Progress*.

Cobbs Quay Marina started off as a Nissen Hut and slipway owned by Mr Cobb (Burt, 2010). Today it is the largest of the seven Marinas in Poole Harbour, owned by Marine Developments Limited, containing 1000 berths for vessels up to 25m in length and is also home to Marinautic, Purbeck Marine and Holes Bay Marine (PHC, 2011, 2016).

Just south of Cobbs Quay Marina is Davis's Boatyard with storage for 250 vessels, a pontoon and a further 82 berths and home to PC Marine and nearby Harbour Yachts (PHC, 2016).

To the north west of Holes Bay sits a more natural estate known as Upton Country Park. Upton House, was originally built in 1816-18 and along with the 55-acre Estate was eventually bequeathed to the BOP in 1957, opening to the public in 1976 (Upton Country Park, 2016; Friends of Upton Country Park, 2016). Today, the site remains the only undeveloped area around Holes Bay. For further information, see *Section 4: Land Ownership, Access and Rights of Way*.

4 LAND OWNERSHIP, ACCESS AND RIGHTS OF WAY

Through the Great Heath project in 2014, large areas of mudflats in Holes Bay were vested in ownership of PHC working with Dorset Wildlife Trust. This can be viewed in *Appendix 14.1: Holes Bay Nature Park Land Ownership Map*. The extent and boundary of the HBNP is yet to be defined but a proposal, which will be subject to discussion, can be viewed in *Appendices 14.16: Proposed Boundary of the Holes Bay Nature Park and 14.17: Proposed Reasoning for the Holes Bay Nature Park Boundary*. The sphere of influence should also be considered, and this can be viewed in *Appendices 14.18: Proposed Sphere of Influence for the Holes Bay Nature Park and 14.19: Sphere of Influence for the Holes Bay Nature Park*.

4.1 Infrastructure

Holes Bay and its drainage basin have been considerably modified through infrastructure development as shown in *Section 3: History*. This growth will enable further pressure upon the natural site through facilitating access, and continuation of the many uses of Holes Bay.

Of the approximately 7.24 km shoreline of Holes Bay, only 24% of the shoreline (mainly north of the railway) in an arc from north to west adjoining UCP has a 'soft' lacustrine boundary (measured from Google Earth). The rest of the shoreline is a 'hard' boundary consisting of roads with their outer rock anti-erosion sea defences. The Bay is also traversed by the Poole to Weymouth rail link and on the northern and eastern sides by the A350 road, part of the county's primary road network. These transport networks largely define the hard boundaries of Holes Bay. To the south-west, Hamworthy residential development and Cobbs Quay marina surround the soft boundary south of the railway line.

Access infrastructure includes the iconic lifting bridge, a mainline train line across the bay and the shoreline shared-use cycling and walking path:

- Poole Twin Sails lifting bridge with vehicle, foot and cycle crossing over and boats crossing under at timed lifts;
- High Speed (40mph limit) Holes Bay Road dual carriageway (A350) part of the county's primary route network, one of the busiest roads in Poole and significantly one of the busiest in Dorset;
- Traffic signals incorporating signalised pedestrian and cycle crossings;
- Subways at Sterte Avenue West and Poole Train Station;
- South West Trains railway embankment crossing Holes Bay;
- Road and industrial processes;
- UCP trails;
- Holes Bay Cycle Way shared-use shoreline path and The National Cycle Route 25; links with Frome and National Route 24 at Longleat and runs south through Gillingham and Poole to Bournemouth on the Dorset coast;
- The Castleman Trailway – A 16-mile trail for cyclists and walkers linking UCP to Ringwood. (Horse riders are permitted up to the Poole section).

4.2 Who Visits the Nature Park?

Holes Bay environs host a range of recreational activities and provide access for pedestrians, different ability users, cyclists, motor vehicles and watercraft. There have been many studies by Borough of Poole (2015b), Liley & Fearnley (2012), Fearnley (2014), Panter & Liley (2015, 2016), Pearce (2015), Morrison (2015) but further research is recommended to determine and compare the numbers and demographics of the people accessing the area each year.

High use access falls within and upon very special intertidal zones for wildlife which is covered in further detail under *Section 7: Ecological Condition*. The Holes Bay side of the A350 highway, Wessex Gate Retail Park area and shared use path verges managed by BOP have significant grassland interest including the SNCI near Creekmoor inlet, with key rare species and orchids (See *Figure 4*), with pollinators and other invertebrate life. Further details can be found in *Section 6: Important Wildlife & Habitats*.



Figure 4: Bee orchid (*Ophrys apifera*), Holes Bay Road (Rance, 2015)

The impact of human activities is strongly linked to season; tourism and related recreational activities increase during summer. This is reflected in road and water-borne traffic movements and by visitors to UCP and surrounding areas.

4.3 How is the Nature Park Accessed?

Holes Bay fulfils an important role in Poole Harbour with the area to the north of the railway bridge identified as a Bird Sensitive Area. The shared walking & cycling path, local restaurants and UCP bring people close to internationally significant numbers of winter migrating birds and important species of birds. HBNP provides an ideal opportunity for engagement with nature, green travel and public health initiatives. Green travel options meet a hub in Holes Bay with links to the national cycle network, Poole Harbour trails walks, local bus and train routes.

Despite heavy infrastructure development, only a small proportion of total land-based traffic movements are likely to be focused directly on the Holes Bay natural site, consisting principally of entry to UCP and local traffic movements in Hamworthy residential areas.

4.3.1 Recreation Areas

Popular leisure areas surrounding Holes Bay include:

- Upton Woods (Purbeck District Council);
- UCP and the Woodland Play Trail (Borough of Poole);
- Cobbs Quay Marina Development Limited, Davis' Boatyard, Hamworthy Park;
- McLagan Land (ASDA section);
- Hamworthy Creeks and Symes Road greenspace.

4.3.2 Car Parks

The current mixture of small to medium car parking close to known bird areas may be a factor in preserving the current bird diversity. Limiting the size and number of car parks may reduce disturbance, visual intrusion and negative effects on bird refuge areas. This may also prevent a large unmanaged increase in visitor numbers.

Car parking sites are shown on *Appendix 14.4: Holes Bay Public Interpretation Map* and include:

- UCP – main time limited car park and enables pedestrian access to the shoreline in the north-west quadrant
- Suitable Alternative Natural Greenspaces (SANG) car park for heathland mitigation opposite Pony Drive
- ASDA – time limited car park
- Symes Road and Hamworthy Creeks – residential roads
- Lidl supermarket - time limited car park
- Poole Train Station – time limited car park
- Poole Dolphin Shopping Centre and West Quay Road – time limited car parks.

4.3.3 Public Transport

Impacts from train movement across Holes Bay may be qualitatively different from other peripheral traffic, due to its intermittent nature. Holes Bay lies within proximity of a major transport hub providing every opportunity to visit the site.

The following bus stops located within the vicinity of Holes Bay include:

- Ashmore Avenue (Hamworthy Park).
- UCP (Morebus 9). Route: Poole Bus Station – Hamworthy- Turlin Moor – Upton – UCP (entrance) – Creekmoor – Fleetsbridge – Poole Bus Station (Morebus 8 & 9).
- Southern end of Holes Bay Road opposite the train station at grid reference SZ 01210 91081. (Morebus 40, 10, X8, 3). (Poole Bus Station is approximately 430m away from Holes Bay with routes to Poole and localities).
- ASDA, Poole Bus Station (Holes Bay) – Upton (crossroads)– Holton Heath – Wareham – Corfe Castle – Swanage, return stop on Railway station side (Morebus Breezer 40).
- Poole bus station – Hamworthy – Rockley Park (Morebus 152).

Rail infrastructure is documented in *Appendix 14.4: Holes Bay Public Interpretation Map* and include:

- Poole Train Station is approximately 50m away, across the A350 at grid reference SZ 01274 91089.
- South Western Railway Services Mainline Weymouth to London Waterloo.
- Hamworthy train station is found at grid reference SY 98735 91771.

Waiting taxis can be found at Poole Train Station and Poole Quay.

Transportation data around Holes Bay (Borough of Poole, 2015b) shows the average number of daytime journeys to include:

- 900 cyclists;
- 400-500 pedestrian journeys* (approximately 70-90 were children);
- 20-29,000 car journeys.

Further breakdown of the Holes Bay traffic counts 2012-14 can be seen in *Table 1*.

	2014	2013	2012
Annual Average Daily Traffic	29487	28014	29869
Average Speed	42.5mph	42.3mph	68.1mph
Speed 85%	49.2mph	49mph	79mph
% HGV (includes Rigid, Large Van, Minibus, Artic HGV)	2.6%	2.5%	2.2%
Coverage	61.6%	67.2%	36.9%

Table 1: Holes Bay traffic counts (Borough of Poole, 2015b)

Green transport is important to reduce carbon and nitrogen emissions and is important for public health and utilitarian (necessary) work and shopping journeys, social and recreational use. HBNP provides a hub of green travel routes as shown in *Appendix 14.4: Holes Bay Public Interpretation Map*.

4.3.4 Walking and Cycling Routes

The A350 surrounding the north and eastern aspect of Holes Bay, is the most used road in Poole and the nearby shared use path along the shoreline is frequented by many walkers and cyclists. Existing monitoring by BOP Transportation (2014) indicate 400-500 walkers and 450 cyclists travelling north and south daily on the shared footpath and cycleway and 29,000 car journeys along the A350 (Borough of Poole, 2015b). UCP visitor numbers are also showing an increasing trend. The most recent data shows them peaking at 104,500 in 2011 (Dorset County Council, 2015). The Urban Heaths Partnership and Footprint Ecology monitor visitor behaviour across Dorset heathland SPA s including Holes Bay.

It is likely the strongest footfall is around ASDA and the signalised crossing area where shopping, café, recreational activity, parking and travel by rail, bus, foot and car coincide. Review and analyses of the automatic counter data gathered from the Dorset Heathlands SPA mitigation project (Fearnley (2014), suggest a trend of increases in number of people in Holes Bay and show fluctuations of approximately 6-30,000 people passing around this area in a summer month.

People from the surrounding residential communities are likely to directly access the paths for walking (commuting, recreational) including with dogs and cycling, with very little direct intrusion or access into the Bay itself.

The following routes are adjacent to HBNP:

- The National Cycle Network Route 25; links with Frome and National Route 24 at Longleat and runs south through Gillingham and Poole to Bournemouth on the Dorset coast;
- The Castleman Trailway linking UCP to Ringwood;
- The Poole Heritage Cycleway from UCP to Baiter Park is currently in development but there is a shared pavement cycling from Upton Cross Roads to Upton Country Park;
- Poole Harbour Trail Walk 6 Bus to Walk routes that circumnavigate the whole of Poole Harbour and link to the South West Coast Path at Studland Peninsular;
- Poole Harbour Trails (2016, 2016a) offer downloadable information and videos on walking around Holes Bay in their Turlin Moor to Poole Quay covering 11km (7 miles).

The Poole Harbour Trails are now a *diamond route* and are due to appear on the Ordnance Survey map. They also link to the south west coast path which ends at Studland Peninsula.

4.3.5 Marine Use

Water-based transport activity largely centres on the Cobbs Quay marina complex, the RNLI HQ, kayaking and some dispersed bait dragging, netting and recreational fishing from small boats.

There are two private boatyards, a yacht club, two slipways, two moorings belonging to PHC and personal watercraft permitted south of the railway bridge, as detailed in *Section 3: History*. The RNLI and users of Davis's Boatyard and Cobbs Quay Marina regularly access Holes Bay via the lifting bridges. Other recreational anglers, users of watercraft, kayaks, canoeists are also observed frequenting the area.

Bait digging agreements and on-site guidelines have been in place since spring 2015 through NE, Southern IFCA, BOP and local anglers. Night time angling occurs in the south-east section between the signal crossing and roundabout. More information on these activities can be found in *Section 7.5: Change in Extent of Sensitive or Priority Habitat Protected from, or Not Vulnerable to, Physical Damage*.

4.3.6 Visual Access

The prime visual access by walkers and cyclists from the shared use path includes:

- iconic man-made landscape – views of Poole town, the lifting bridge, RNLI buildings & sculptures;
- waterscape – Holes Bay, bridges, boardwalks, close shore access;
- birdwatching hubs – Upton Country Park, Pergin’s Island, Fleet Stream (see *Appendix 14.5: Holes Bay Nature Park Waterways Map*), railway/subway areas, potential areas – supermarket, hotel (currently in construction);
- landscape of Canford Heath and Beacon Hill (from Symes Road);
- Holes Bay - from RNLI café, and private training centre, waterside fish & chips, private flats, hotel;
- the A35 and A350 - (car journeys, visual access to Holes Bay despite fast roads);
- businesses along the A350 – cafés, Travelodge, McDonalds, Wessex Gate Retail Park;
- UCP - paths and routes including the play trail, semi natural woodland, reed and shoreline paths and boardwalks;
- south of Holes Bay - access from Symes Road, public rights of way & residential area.

4.4 Impacts of Human Activities Upon the Nature Park

A summary of direct and indirect use activities and their likely main impacts are shown in *Figure 5* below. These should be focused on for further research and with a priority on those likely to be affected by Holes Bay Nature Park (HBNP) promotion.

Within the intertidal area of Holes Bay: (*Change: Yes/No and + or – shown*)

Direct use activities	Key likely impacts	Affected by the HBNP?
1. Recreational (line) fishing accessed from land (e.g. A350) and via boats	Bird disturbance Sediment erosion	No
2. Bait digging and dragging	Bird disturbance Sediment erosion Damage to saltmarsh Re-colonisation of saltmarsh Sediment scars and slow weathering Prey availability	No
3. Boat use, mostly south of the railway	Bird disturbance Fuel and effluent leakage	No
4. Discharge of effluent and land drainage	Nutrient enrichment Macroalgal overgrowth Loss of saltmarsh Increased bird feeding opportunities	No
5. Wildfowling	Bird loss and disturbance (not permitted in Holes Bay)	No

Figure 5: Likely impacts of human activities upon Holes Bay

For the combination of the surrounding terrestrial and marine area of Holes Bay use activities include:

Indirect or peripheral activities	Key likely impacts	Affected by the HBNP?
6. Birdwatching	Bird disturbance (minor)	Yes +
7. Cycling along the north and east side	Bird disturbance (visual primarily)	Yes ++
8. Walking or jogging (including with dogs)	Bird disturbance (visual and physical) Faeces based pollution	Yes +++

Other activities not directly focused upon Holes Bay features but with potential for impact include:

Other activities	Key likely impacts	Affected by the HBNP?
9. Train movements	Bird disturbance visual impact Bird disturbance due to noise	No
10. Traffic movements	Noise disturbance to birds and people Airborne nitrogen deposition	Yes +
11. Low flying aircraft & helicopters	Noise disturbance to birds and people Bird strikes	No
12. Flying of drones	Noise disturbance and visual impact to birds and people	No
13. Outlets supplying fast food and take-aways	Litter deposition on land and water	Yes ++
14. Domestic waste escapes		
15. Dumping of waste	Pollution Navigation hazard	No
16. Motor vehicles parking on grass verges or driving on shared use path.	Bird disturbance visual impact Bird disturbance due to noise	Yes

Development proposals and mitigation – Poole Local Plan 2013-33 (BOP, 2018):

Other activities	Key likely impacts	Affected by the HBNP?
17. Additional parking and upgrading of footpaths and cycle ways	Noise and visual disturbance Increased visitor numbers	Yes ++
18. Development of alternative areas for recreation	Spill-over pressure on HBNP	Yes ++

5 GEOGRAPHY, GEOLOGY AND HYDROGRAPHY

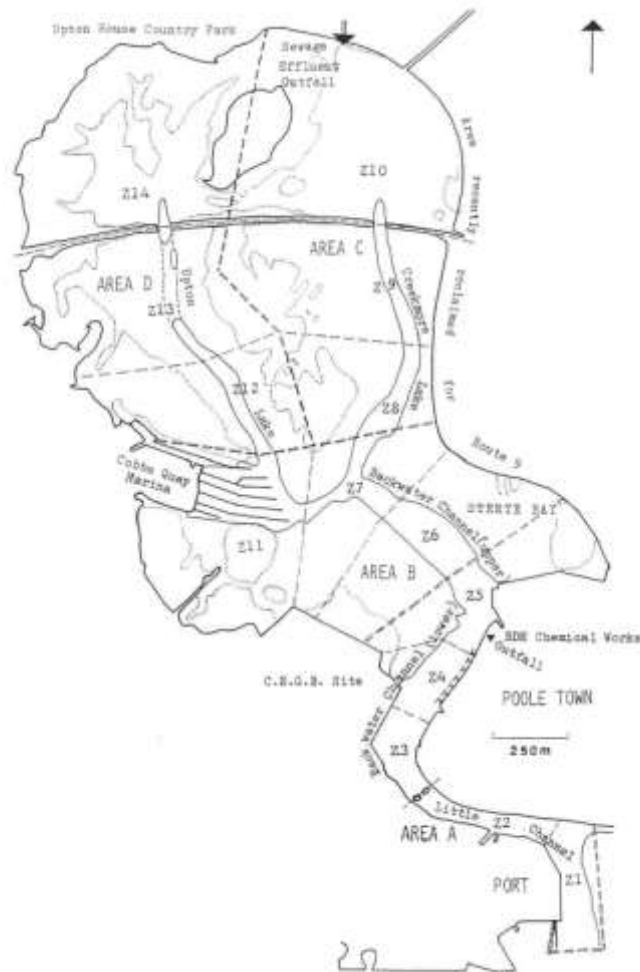


Figure 6: Holes Bay (Dyrynda, 1989)

Poole Harbour was originally formed from the submerged river valleys in the Tertiary beds of the Poole Basin (Edwards, 2004) and is underlain by sands and clays of the Poole Formation from the Middle Eocene Age (Gale, 2005; May 2005). Further detail on the channel classification can be found in Dyrynda, (1985; 1989a). Today, with its lagoon-like characteristics, Poole Harbour is one of the largest lowland estuaries in Europe (Humphreys & May, 2005) and at 3,300 ha Poole Harbour accounts for about a quarter of the saline lagoon habitat in England and Wales (Langston *et al*, 2003).

Holes Bay to the north is the second largest basin of Poole Harbour covering 286 hectares of saltmarsh and intertidal mud flats (Dorset Wildlife Trust, 2015). It is a microcosm of the Harbour, representing similar characteristic processes; self-contained and dominated by silts, mud and fine sand (Pearce, 2005). It has a tidal prism of 40% greater than the outer Harbour (Langston, 2003) and receives two double high tides and a

rapid ebb giving a small tidal range of 1.8m (springs) and 0.6m (neaps) – this creates a waterline above mean tide level for 16 out of 24 hours (Humphreys & May, 2005; Dyrynda, 2005; May, 2005; Humphreys, 2005).

From its southerly entrance, Little Channel, adjacent to the Port, forms into the lower Backwater Channel and travels north to its upper aspect and into Sterte Bay, the most wind-exposed part of Holes Bay (Dyrynda, 1989a). Upper Backwater Channel divides in the centre of Holes Bay to form the upper channels of Creekmoor Lake (east) and Upton Lake (west) (Figure 6) surrounding Pergin's Island and heading landward into Upton Heath Stream and Hatch Pond Stream respectively. Further details can be found in *Appendix 14.5: Holes Bay Nature Park Waterways Map*. At low tide, these channels drain much of the Bay, exposing the saltmarshes and mudflats. The creation of the railway embankment in 1837 had a dramatic effect upon Holes Bay, particularly on the flow of the channels. It divided Holes Bay into a northern (tertiary) basin and southern (secondary) basin; reducing the circulation in the north to two small viaducts at the top of Upton & Creekmoor Lake (Dyrynda, 1983; Pearce, 2005). See *Figure 7: Changes to Holes Bay before and after creation of the railway embankment "curve" and other development - 1849 & 1982*.

Holes Bay experiences extremely limited water movement due to its very restricted outlet channel and its position within the confines of Poole Harbour. Consequently, the various consented discharges into Holes Bay from the PSTW, land drainage and accidental discharges from boats and

land will remain longer than if exposed to open sea. The possible effects of this issue will primarily be to magnify potential impacts from other pressures considered above including pollution, litter accumulation, slow sediment healing after bait dragging and digging. Further information on these can be seen in *Section 7: Ecological Condition*.

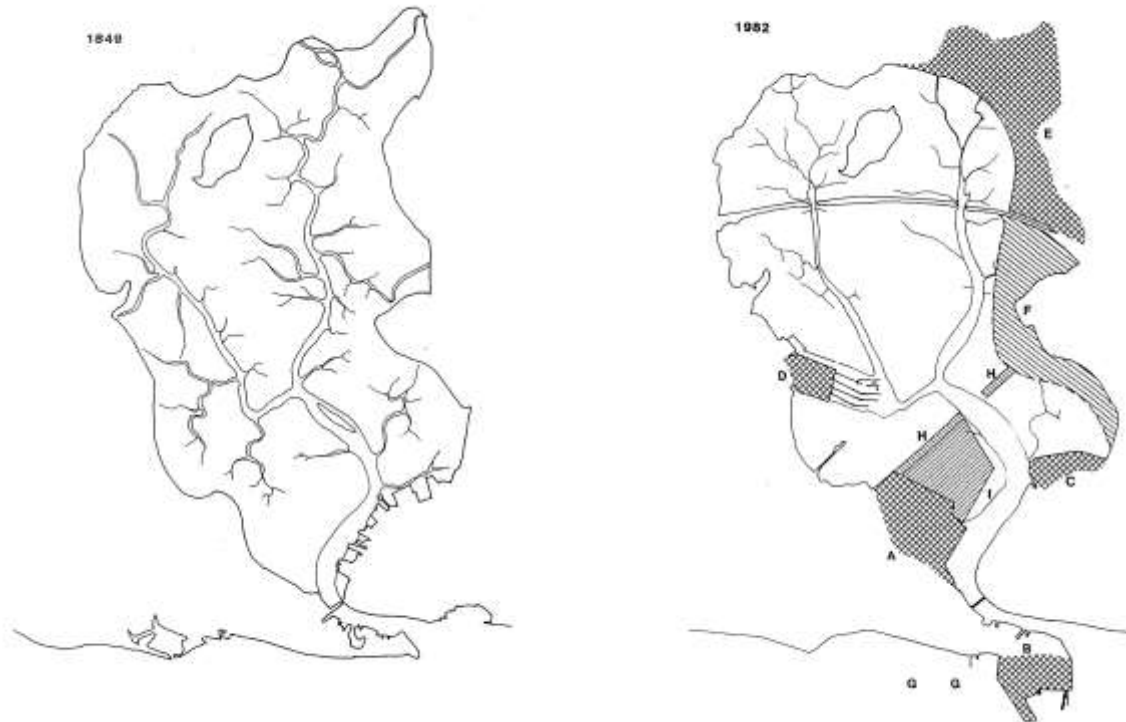


Figure 8: Changes to Holes Bay before and after creation of the railway embankment “curve” and other development - 1849 & 1982. Hatched shading depicts land reclamation/infilling. Please note: the proposed infilling of areas H and I never materialised. (Dyrynda, 1983c).

Limited water movement, slow flushing and high levels of siltation have created a turbid water column with little opportunity for light penetration. This along with the land reclamation and narrow entrance has left Holes Bay to become increasingly isolated and vulnerable to pollution (Dyrynda, 1985, 2005).

Dyrynda, (1983;1985; 1989a) undertook extensive baseline studies of Holes Bay subtidal areas, the biological information of which is further detailed under *Section 7: Ecological Condition*. The following two paragraphs detailing depth, salinity, velocity and communities are taken from his work:

The Lower Holes Bay Channel begins at the convergence of the Creekmoor and Upton Lake and heading south, includes Backwater Channel toward the mouth of Holes Bay. It is polyhaline (salinity 20-30‰), highly turbid and has a central depth range of 0-10m. It has a water velocity of approximately 2.5 knots and main habitat type of muds and muddy sand.

By comparison, the Upper Holes Bay Channel is y-shaped, branching into the Upton Lake (west) and Creekmoor Lake (east) which drains the intertidal area. Salinity varies between the three channels of Holes Bay. Upton Lake is polyhaline (salinity 23-26‰) and the Creekmoor Lake is mesohaline (salinity 15-24‰). The lower salinity is a likely cause from the sewage outfall and poor flushing (White, 1991). Both channels are highly turbid with a water velocity of approximately 1 knot. The depth range here is 0-5m but deepens to 0-15m at the point of convergence. The main habitat types are mud and gravel with finer, softer sediments occurring in Upton Lake and northern Holes Bay, above the railway embankment.

Poole Harbour Commissioners monitor the Harbour seabed using bathymetric surveillance to determine the depth, topography, maintain the navigation channels and to monitor sedimentation movements and dredging protocols (PHC, 2011, 2013; Ramsbottom 2012). Recent survey work of Holes Bay is available from Poole Harbour Commissioners.

6 IMPORTANT WILDLIFE AND HABITATS

This section will focus on the more notable species and habitats recorded in Holes Bay; qualifying features of the Poole Harbour Ramsar site, SPA and SSSI and those covered by policy; Habitats and Species of Principal Importance (formerly BAP Species), Sites of Nature Conservation Interest (SNCI), Nationally Important Marine Features, OSPAR list species or those of commercial interest. These include internationally and nationally important salt meadows, reedbeds, saltmarsh and mudflats supporting wildfowl and waders, commercially important fish, benthic invertebrates and coastal vegetation. Each of the 54-combined species and habitats recorded in Holes Bay are broken down in *Appendix 14.7: Holes Bay Important Habitats and Wildlife* with details on protective legislation or policy, location found and where known, relevant citations of records.

What makes Holes Bay a unique haven for wildlife?

The Atlantic & Mediterranean salt meadows and reedbeds in western Holes Bay and the widespread coastal saltmarsh and intertidal mudflats are all Annex I Habitat features in the Poole Harbour SPA. These underpin and sustain the invertebrate bird prey and provide a refuge for coastal, marine and avian species seeking safety in the shallows of the HBNP.

The sheltered aspect of Holes Bay provides an attractive and undisturbed place for the numerous wildfowl and waders seeking to overwinter. The large BSA is a management tool and contains important roosting and feeding sites sensitive to noise and visual disturbance. The north-west aspect of the BSA offers safe refuge for the nationally or internationally protected bird species from disturbance, providing a large visual area for birds to anticipate danger. Moreover, the perimeter access path alongside the western shores of UCP is set back and screened by tall trees and shrub, minimising bird flushing by nearby walkers (Liley & Fearnley, 2012). The railway embankment limits entry to most fishing boats and a voluntary agreement and local byelaws prohibit seasonal and spatial and temporal bait digging and fishing respectively. (See *Section 14.14: Holes Bay Nature Conservation Designations and Conservation Measures*). This minimises the human disturbance to birds, impact upon the habitats, and offers a safe nursery to many of the commercially important fish.

Locations of the 26 wildfowl and waders recorded 1998-2016 in the four separate quadrants of Holes Bay has been provided by WeBS data (Birds of Poole Harbour, 2016a,b,c,d). This is the longest dataset available for wildfowl and waders in Holes Bay and all species have been recorded north of the railway embankment (BSA). Most notable are curlew *Numenius arquata*, wimbrel *Numenius phaeopus*, black-tailed godwit *Limosa islandica* and pochard *Aythya farina* which are all on the Birds of Conservation Concern 4 red list (RSPB, 2015).

There are 13 known species of marine vertebrates recorded in Holes Bay (Dyrynda, 1983, 1985, 1989a, Green, 2016, Southern IFCA 2015, Environment Agency, 2016a, Nash, 2017). Of note are the following species of conservation importance;

- European eel *Anguilla anguilla*, critically endangered on the IUCN Red List (Jacoby & Gollock, 2014) and threatened or declining on OSPAR (2016). Both adults and silver eel have been recorded in Holes Bay.
- Spiny seahorse *Hippocampus guttulatus* and short-snouted *Hippocampus hippocampus*. Both are listed on Schedule 5 of the Wildlife and Countryside Act 1981 and Appendix II of CITES (2017) and are a Species of Principal Importance (JNCC, 2014a).
- An unidentified seal *Phocidae*. Both native species are listed on Schedule 5 of the Wildlife and Countryside Act 1981, The Conservation of Habitats and Species Regulations 2017 and are a Species of Principal Importance (JNCC, 2014a).

The following species are of commercial importance and reside within Holes Bay as juveniles and/or adult life stage;

- Dover sole *S. solea* - Species of Principal Importance (JNCC, 2014a) and Feature of Conservation Interest (FOCI) (NE & JNCC, 2010).
- Flounder *P. flesus* - on the IUCN Red List (least concern).
- Herring *C. harengus* - Species of Principal Importance (JNCC, 2014a).
- Mackerel *S. scombrus* - Species of Principal Importance (JNCC, 2014a) and Feature of Conservation Interest (NE & JNCC, 2010).
- Pollack *P. pollachius*.
- Sand smelt *A. presbyter* - IUCN Red List (least concern).
- Bass *D. labrax* - IUCN Red List (least concern).
- Sprat *S. sprattus*.
- Thick-lipped mullet *Chelon labrosus* - IUCN Red List (least concern).

Marine invertebrates of native oyster *Ostrea edulis*, peacock worm *Sabella pavonina*, sea sponge *Suberites massa* and bryzoan *Farrella repens* are all recorded in Backwater Channel (Dyrynda, 1983, 1989a, Howard & Moore, 1988, APEM 2008, 2012). Having cross-referenced the Dorset Environmental Records Centre (DERC) Marine Database (2016) against the JNCC Marine Taxon Database (2014), there are three noteworthy subtidal species found along the upper and lower Backwater Channel (Figure 6): the nationally rare sponge *S. massa* (SSSI feature and Nationally Important Marine Feature), a bryzoan *F. repens* (SSSI feature) and flat oyster *O. edulis* (Species of Principal Importance, Listed species on OSPAR and NERC).

Vegetation recorded in the Holes Bay Relief Road SNCI includes the Dorset notable species English scurvy grass *Cochlearia anglica* and the nationally rare round-headed club-rush *Scirpoides holoschoenus* (Marler, 2014, 2015). Incidentally, the UK holds more than 25% of the European population of English scurvy grass *Cochlearia anglica* (Dines *et al*, 2005).

Current known status or condition of all the important habitats and wildlife (including those listed above) in Holes Bay are detailed within Section 7: Ecological Condition and Appendix 14.6: Poole Harbour SSSI Condition Assessment of Holes Bay Units 2017 Map.

7 ECOLOGICAL CONDITION

This report focusses primarily on the marine environment. The terrestrial ecology has been reviewed elsewhere with the management being undertaken by UCP, Borough of Poole and Purbeck District Council (now Bournemouth, Christchurch & Poole Council and Dorset Council respectively).

The Holes Bay environment is heavily modified from its earlier saltmarsh-dominated status surrounded by valley mire and heath habitats. Nevertheless, it is included in the Poole Harbour SSSI, SPA and the Ramsar Site. The conservation status of Holes Bay is primarily determined by its use by birds, which are largely dependent upon the inter-tidal invertebrate food chain and grazing materials on surrounding farmland. The area north of the railway line (approximately half of the total area of Holes Bay) is considered an Overwintering BSA, a management tool for Holes Bay and the area and wildlife are vulnerable to disturbance from adjacent land uses.

Using available qualitative assessment and monitoring studies, this section will draw upon the eleven descriptors found within Annexe I of the Marine Stewardship Framework Directive (MSFD) (Council Regulations (EC) 56/2008 and 477/2010) as a suitable method to define Good Environmental Status:

1. Biological diversity
2. Non-indigenous species
3. Population of commercial fish/shellfish
4. Elements of marine food webs
5. Eutrophication
6. Sea floor integrity
7. Alteration of hydrographical conditions
8. Contaminants
9. Contaminants in fish and seafood for human consumption
10. Marine litter
11. Introduction of energy, including underwater noise

However, in the *Dorset State of the Environment Report* (Dorset Wildlife Trust, 2014), the following Marine Indicators were favoured as far more suitable criteria for measuring ecological condition locally. These were derived from the key question: “*can we tell if our biodiversity is getting better or worse?*”:

- M1. Area of surveyed and mapped seabed
- M2. Change in area of Priority Habitat (e.g. saltmarsh, mudflats)
- M3. Loss of Priority Habitat through development (e.g. marinas etc.)
- M4. Change in extent of designated sites (where designation includes SPAs etc.)
- M5. Change in extent of Sensitive or Priority Habitat protected from, or not vulnerable to, physical damage (including both designated and *de facto* MPAs and voluntarily protected areas)
- M6. Presence and distribution of non-native and invasive species
- M7. Water quality including eutrophication in Poole Harbour
- M8. Beach litter
- M9. Health of the food web, encompassing:
 - a. Population structure in commercial fisheries
 - b. Wildfowl and waders
 - c. Intertidal species
 - d. Sub-tidal species

Table 2 below, demonstrates how the Dorset Marine Indicators sit within the MSFD descriptors:

MSFD Descriptors	Dorset Marine Indicators (Dorset Wildlife Trust, 2014)
Biological diversity	M9. Health of the food web, encompassing: <ul style="list-style-type: none"> • Population structure in commercial fisheries • Wildfowl and waders • Intertidal species • Sub-tidal species
Non-indigenous species	M6. Presence and distribution of non-native and invasive species.
Population of commercial fish/shellfish	M9. Health of the food web, encompassing: <ul style="list-style-type: none"> • Population structure in commercial fisheries • Wildfowl and waders • Intertidal species • Sub-tidal species
Elements of marine food webs	M9. Health of the food web, encompassing: <ul style="list-style-type: none"> • Population structure in commercial fisheries • Wildfowl and waders • Intertidal species • Sub-tidal species
Eutrophication	M7. Water quality including eutrophication in Poole Harbour.
Sea floor integrity	M1. Area of surveyed and mapped seabed M5. Change in extent of Sensitive or Priority Habitat protected from, or not vulnerable to, physical damage (including both designated and <i>de facto</i> ¹ MPAs and voluntarily protected areas)
Alteration of hydrographical conditions	M2. Change in area of Priority Habitat (e.g. saltmarsh, mudflats etc.) M3. Loss of Priority Habitat through development (e.g. marinas etc.) M4. Change in extent of designated sites (where designation includes SPAs, etc.) M5. Change in extent of Sensitive or Priority Habitat protected from, or not vulnerable to, physical damage (including both designated and <i>de facto</i> ¹ MPAs and voluntarily protected areas)
Contaminants	M7. Water quality including eutrophication in Poole Harbour
Contaminants in fish and seafood for human consumption	M7. Water quality including eutrophication in Poole Harbour
Marine litter	M8. Beach litter
Introduction of energy, including underwater noise.	M10 Underwater noise (not covered in this report)

Table 2: Marine Stewardship Framework Directive descriptors against Dorset Marine Indicators

¹ 'De facto' protection means through the nature of the seabed or health and safety rather than statutory designation, i.e. presence of a windfarm prevents damage from trawling or unclassified shellfish waters.

7.1 M1: Area of Surveyed and Mapped Seabed

Bathymetry has been recorded by PHC since they became the Harbour Authority in 1895 but only data sets from 1970s are suitable for comparison with those recorded recently (Pearce, 2005). This type of information provides an extremely useful baseline for understanding the sediment changes in Holes Bay.

Holes Bay is a shallow embayment and therefore multi-beam survey is not feasible. PHC has performed a single beam survey providing detailed and comparative depth and sediment analysis of Holes Bay (Pearce, 2005). Recent single beam survey showing water depth data is available from Poole Harbour Commissioners (PHC, 2013).

Within the South-West Strategic Regional Coastal Monitoring Programme, the Channel Coast Observatory (CCO) (2008, 2014) surveyed Holes Bay by Light Detection and Ranging (LIDAR) and False Colour Infrared Aerial Photography (FCIR). LIDAR from height is suitable for understanding the intertidal area as shown in Figure 9 and the FCIR can detect vegetation, such as saltmarsh as shown in red in Figure 10.

Since the inception of Dorset Seasearch in 1995, there have been no dive surveys conducted in Holes Bay. The high turbidity restricts scientific diving throughout most of Holes Bay and disturbance of the contaminants in the sediment could pose a health risk. Some dive surveys were conducted in Backwater Channel by Dyrinda (1983) and biological records are shown in Sections 6: *Important Wildlife and Habitats* and 7.9.4: *Sub-tidal Species*.

Substrate type and species composition are described in Sections 5: *Geography, Geology and Hydrography* and 7.9: *Overall Health of the Food Web*.



Figure 9: LIDAR image of Holes Bay (Channel Coast Observatory, 2008)



Figure 10: False Colour Infrared Aerial Photography (FCIR) of Holes Bay (CCO, 2014)

7.2 M2: Change in Area of Priority Habitats

Holes Bay contains coastal saltmarsh, intertidal mudflats, sheltered muddy gravels and saline lagoons. These are broad scale Habitats of Principal Importance (Natural England, 2013), threatened with decline and listed under the UK Biodiversity Action Plan (UKBAP) 1994, succeeded by the UK post - 2010 Biodiversity Framework (JNCC & Defra, 2012). These priority habitats have formed the basis of Table 3: *Habitats of Principal Importance*, concerning extent, threats, and condition, adapted from DWT (2014a). NE (2010, 2010a, 2010b) has assessed and measured the extent of each of the following habitats in the Poole Harbour SSSI condition summary (Natural England, (2010a). For a summary of this see Section 7.4: *Change in Extent and Effectiveness of Designated Sites (Marine Protected Areas)*.

Broad habitat	LITTORAL SEDIMENT		
UK Habitat of Principal Importance	Coastal Saltmarsh		
Found in Holes Bay?	Yes	More Info	Description of the <i>Coastal Saltmarsh</i> (PDF)
Changes agreed in the BAP 2007 review & criteria (BRIG, 2007)		No change	
Biotope code(s) JNCC 04.05 (Connor, <i>et al</i> , 2004)	LS.LMp.Sm	Current and potential threats	Land claim Erosion and 'coastal squeeze' Sediment dynamics Cord grass Grazing Other human influences
Can we map extent?	Poole Harbour Study Group, NE, aerial photos	Can we measure condition?	NE SSSI condition assessment (Herbert <i>et al</i> , 2010, Natural England, 2017)

Broad habitat	LITTORAL SEDIMENT		
UK Habitat of Principal Importance	Intertidal Mudflats		
Found in Holes Bay?	Yes	More Info	Description of the <i>Intertidal Mudflats</i> (PDF)
Changes agreed in the BAP 2007 review & criteria (BRIG, 2007)		Revised name (previously 'Mudflats')	
Biotope code(s) JNCC 04.05 (Connor, <i>et al</i> , 2004)	LMU.Smu, LMU.Mu, LMS.MS, LS.LSa.MuSa, LS.Lmu	Current and potential threats	Sea level rise Land claim Barrage schemes Diffuse and point source discharges from agriculture, industry and urban areas Oil and gas extraction and related activities, and dredging for navigation Fishing and bait digging Human disturbance Introduction of new or non-native species Estuarine dynamics Higher sea level and increased storm frequency
Can we map extent?	Already done (NE/EA)	Can we measure condition?	NE – where part of SSSI (Herbert <i>et al</i> , 2010). See 7.4: <i>Change in Extent and Effectiveness of</i>

			Designated Sites (Marine Protected Areas)
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Broad habitat	LITTORAL SEDIMENT		
UK Habitat of Principal Importance	Sheltered Muddy Gravels		
Found in Holes Bay?	Yes	More Info	Description of the <i>Sheltered Muddy Gravels</i> (PDF)
Changes agreed in the BAP 2007 review & criteria (BRIG, 2007)		No change	
Biotope code(s) JNCC 04.05 (Connor, <i>et al</i> , 2004)	LS.LMx, LS.LMx.GvMu, LS.LMx.Mx, LS.LMx.Mx.CirCer, SS.SMx.Imx, SS.SMx.IMx.CreAsAn, SS.SMx.IMx.SpavSpAn, SS.SMx.IMx.VsenAsquAps	Current and potential threats	Physical disturbance Bait digging Fisheries Organic enrichment Persistent bio-accumulating chemicals Introduction of non-native species
Can we map extent?	Difficult	Can we measure condition?	Already done by NE. See Section 7.4: <i>Change in Extent and Effectiveness of Designated Sites (Marine Protected Areas)</i> .

Broad Habitat	SUBLITTORAL SEDIMENT		
UK Habitat of Principal Importance	Saline Lagoons		
Found in Holes Bay?	Yes	More Info:	Description of the <i>Saline Lagoons</i> PDF
Changes agreed in the BAP 2007 review & criteria (BRIG, 2007)		No change	
Biotope code(s) JNCC 04.05 (Connor, <i>et al</i> , 2004)	IR.LIR.Lag, SS.SSa.SSaLS, SS.SMu.SMuLS, SS.SMx.SMxLS, SS.SMp.Ang	Current and potential threats	Transient lagoons (changing salinity) Infilling of lagoons. Pollution - nutrient enrichment leading to eutrophication. Artificial control of water (sea and fresh)
Can we map extent?	Yes	Can we measure condition?	Already done by NE. See Section 7.4: <i>Change in Extent and Effectiveness of Designated Sites (Marine Protected Areas)</i> .

Broad Habitat	FEN, MARSH AND SWAMP		
UK Habitat of Principal Importance	Reedbeds		
Found in Holes Bay?	Yes	More info:	Description of the <i>Reedbeds</i> PDF

Changes agreed in the BAP 2007 review & criteria (BRIG, 2007)		No change	
Biotope code(s) JNCC 04.05 (Connor, et al, 2004)	SS.SMp.Ang.NVC S4	Current and potential threats	Land claim Erosion and 'coastal squeeze' Sediment dynamics Trampling Other human influences
Can we map extent?	Yes	Can we measure condition?	National Vegetation Classification surveys. Poole Harbour Reedbeds (Cook, 2005)

Table 3: Habitats of Principal Importance in Holes Bay - threats and condition (adapted from Dorset Wildlife Trust, 2014a)

In the mid nineteenth century, the coastal vegetation of Poole Harbour was very different to what we see today; acres of intertidal mudflats were dominated by seagrass *Zostera* spp. (Haigh, 1975).

By 1907, cord grass *Spartina anglica* was found in large clumps on nearly every mudflat while *Zostera* had disappeared (Hubbard, 1965, cited by Haigh, 1976).

Poole Harbour appears to have the best-documented record showing the evolution of cord grass, *S. anglica* (IECS, 2016). Further details of this species in Poole Harbour can be found in NCC, (1984).



Figure 11: Cord grass *Spartina anglica* and Sea aster *Aster tripolium* in northern Holes Bay (Humphreys, 2014)

Since the 1890s, the perennial hybrid cord grass *S. anglica* (Figure 11), has spread throughout Poole Harbour, encouraged by its enclosed nature and low tidal range (Raybould, 2005, Drake and Bennett, 2011). Some of the largest and purest swards are seen in Holes Bay (Edwards, 2004; Simpson, 2004) but the *Spartina maritima* (native) and *S. anglica* saltmarsh habitat here reduced by 70% (145Ha) between 1924-1994 and is known to be decreasing dramatically through die-back and fragmentation, particularly around the areas of infilling from the Relief Road and railway embankment (Langston et al, 2003; Underhill-Day & Dyrinda, 2005; Edwards, 2004; Raybould, 2005; Gray et al, 1991; Gray & Pearson, 1983 cited by Raybould, 2005, Pearce, 2005). Highly significant erosion of saltmarsh (>60cm) in Holes Bay was observed in 1998-2006 by Herbert, et al (2010).

The condition of the saltmarsh was not assessed by Herbert et al, (2010) but their studies did show it had declined by more than 60% saltmarsh in the southern, eastern and northern region of Holes Bay 1998-2006. LIDAR maps detailing the changes to the vertical elevation of saltmarsh can be seen in Appendix 14.8: Saltmarsh Erosion in Holes Bay. Natural England (2017) have published the most recent Condition Assessment of the Poole Harbour SSSI. See Section 7.4: Change in Extent and Effectiveness of Designated Sites (Marine Protected Areas).

UK erosion of saltmarshes occurs at a rate of 100 ha a year (JNCC, 2015b). Reasons for dieback are complex and not fully understood (Raybould, 2005) but nutrient enrichment through coastal eutrophication can reduce saltmarsh by increasing leaf biomass and decreasing the stabilising root systems resulting in creek bank collapse and un-vegetated mudflats (Deegan et al, 2012). Additional threats to the Poole Harbour saltmarsh include infection, sea-level rise, invasion from landward species, erosion or sika deer trampling and grazing (Drake and Bennett, 2011).

Holes Bay sediment changes have been monitored by PHC. A breakdown of the sediment budget can be viewed in *Table 4* below. Between 1980-1995 12,516m³ of sediment was removed mechanically from the marinas and along with the die back of *Spartina* sp. attributed to an additional 35% loss (Pearce, 2005).

Source of sediment	Volume per year m ³
Deposited in channel	+7,016
Maintenance dredging from marinas	+5,500
Total silt moved to the sub tidal	=12,516
Contribution by saltmarsh dieback	- 4,300

Table 4: Holes Bay sediment budget 1980-1995 (Pearce, 2005)

BOP is proposing a pilot study to recreate the saltmarsh in Holes Bay and recycle locally dredged spoil. For more information, see *Appendix 14.15: Holes Bay Saltmarsh Re-creation Project Progress*.

7.2.1 Climate Change

The principal impact expected from climate change is a steady rise in sea levels and coastal squeeze as hard defences or development are challenged with the rise of high water above existing soft shorelines, displacing plant species shoreward. Within Poole Harbour the expected rise (2007-2025) is reported to be at least 3.5mm per year (Drake and Bennett, 2011b). A secondary challenge is the likelihood that rising temperatures and milder over-winter temperatures will exacerbate the macroalgal growth problem that is being driven by high nutrient loadings to Holes Bay waters. See *Section 7.7: Water Quality Including Eutrophication in Poole Harbour*.

7.3 M3: Loss of Priority Habitat Through Development

Land reclamation within the Holes Bay coastal saltmarsh and intertidal mudflat has been extensive; 26% has been lost since 1900 (Pearce, 2005, *Table 5*). The earliest infilling of this habitat occurred through the creation of the railway embankment 'curve' in 1847, then the Poole Power Station in 1946 and more recently, the largest reclamation, the Holes Bay Relief Road, in 1988. In Sterte Bay alone, 6.3Ha (23%) was removed from the upper shore for this development (Dyrynda, 1989b). Further details on this development can be found in *Section 3: History*.

Location	Year	Area in m ²
East shore (new road).	1980	734,000
Power Station	1952	150,000
Cobb's Quay	1960	41,000
Total area reclaimed	1940-2000	925,000
Total area of Holes Bay prior to any major reclamation	Pre-1900	3,526,000
Intertidal area lost		26%

Table 5: Land reclaimed in Holes Bay (Pearce, 2005)

Creation of the railway embankment divided Holes Bay into two separate lagoons and dramatically changed the water movement and therefore flushing capabilities there (Dyrynda, 1983). Changes to the shape and channel structure can be seen in *Section 5: Geography, Geology and Hydrography*.

Dyrynda's studies in the 1980s were the first baseline assessment of the Holes Bay subtidal; a century after building of the embankment. Whilst it is certain this development reduced the intertidal area; it is not possible to determine the full impact upon the biota.

The Power Station was built in 1949 upon 30 acres of mudflat habitat (Hübner, 2009) in the south western area of Holes Bay. Forty years later, the Holes Bay Relief Road infilled all the intertidal area along the eastern shore of Holes Bay. Comparison of studies in 1982 and 1988 of the subtidal area (Dyrynda, 1983, Harris, 1983 cited by Dyrynda, 1989a) showed little change in the substrates. The shallow sloping intertidal shore replaced with a steep boulder bund did, however, create further wave backwash and the coarser sediment and organic matter carried by wind and waves was found to be more biologically enriched (Dyrynda (1989a). Consequently, seven years after construction, the upper shore community there was observed to be 'likely fully developed' (Dyrynda, 1989b).

The Holes Bay Relief Road also pre-dated the designation of the Poole Harbour SSSI, in 1991, after SSSIs were re-notified under the Wildlife and Countryside Act 1981. European legislation followed with the creation of the Poole Harbour SPA in 1999. This would serve to prevent any further damage to the interest features of Holes Bay, limiting development of this kind and scale already seen in the area. For more information on the history and protective legislation in Holes Bay, see *Sections 3: History* and *7.4: Change in Extent and Effectiveness of Designated Sites (Marine Protected Areas)* and *Appendix 14.14: History and Nature Conservation Designations and Conservation Management*.

7.4 M4: Change in Extent and Effectiveness of Designated Sites (Marine Protected Areas)

Changes in the extent of MPAs have already been touched upon in M2: Change in Area of Priority Habitats above. Furthermore, all conservation designations relevant to the HBNP are detailed in Nature Conservation Designations & Conservation Measures. The Marine Protected Areas (MPAs) contained here should provide a good basis to achieve Good Environmental Status (GES) under the MSFD descriptors, particularly 1: Biological Diversity and 6: Seafloor Integrity (Dorset Wildlife Trust, 2014).

7.4.1 Fishery Management in Marine Protected Areas

In 2012, Defra announced the *Revised Approach to Managing Fishing within European Marine Sites (EMS)*. These include SACs and, more specific to Holes Bay; SPAs. A risk matrix was developed detailing fishing activity as red, amber, green or blue by the level of risk presenting to the conservation features, habitats and species of EMS (Southern IFCA, 2016d, MMO, 2016). From this, red risk activities were prioritised and two local byelaws of *Bottom Towed Fishing Gear and Prohibition of Gathering (Sea Fisheries Resources) In Seagrass Beds* (Southern IFCA, 2016) were introduced. Whilst the red risk derived local byelaws are not relevant to the features of Holes Bay, the Southern IFCA assessment of amber gear interactions as shown on the EMS matrix, (MMO, 2014a) will include fixed nets used in Holes Bay.

A Poole Harbour Dredge Permit Byelaw (Southern IFCA, 2016) was created to reduce the level illegal, unreported and unregistered (IUU) fishing. This byelaw prohibits the use, storage or transportation of a shellfish dredge within Poole Harbour, unless governed by the conditions of an annual permit. Since enforcement of this byelaw in 2015, Southern IFCA has seen large decline of 75% in IUU fishing throughout Poole Harbour (Southern IFCA, 2016e).

The Poole Harbour Dredge Permit byelaw complements the Shellfish Waters Directive (Council Regulation (EC) 2006/113). Bivalve production areas are classified A, B or C according to bacteriological criteria (levels of *E.coli* found in samples from the site) (Food Standards Agency, 2016). Holes Bay is 'unclassified' for the gathering or production of bivalves (clams, cockles, oysters, mussels etc.) due to chemical contamination (Borough of Poole, 2015). This prohibition offers *de facto* protection to Holes Bay as a suitable shellfish refuge.

7.5 M5: Change in Extent of Sensitive or Priority Habitat Protected from, or Not Vulnerable to, Physical Damage.

Changes to priority habitats have already been touched upon in Section 7.2: *Change in Area of Priority Habitats*, Section 7.3: *Loss of Priority Habitat Through Development* and Section 7.4: *Change in Extent and Effectiveness of Designated Sites (Marine Protected Areas)*.



Figure 12: Trampling damage to the *Phragmites australis* reed bed in NW Holes Bay (Rance, 2016)

Significant reedbeds dominated by the common reed *Phragmites australis* are found behind saltmarsh in north and west Holes Bay and Pergin's Island (Edwards 2004; Cook 2005).

Unfortunately, damage to these priority habitats has occurred through sika deer trampling and grazing and man-made pathways to access northern Holes Bay. These are visible from UCP (Figure 12). In recent times, large numbers of bait diggers parked at Symes Road and Falconer Drive in Hamworthy, trample through the reedbeds and return to their cars and dump unwanted material (mud, seaweed and rubbish) nearby. (Martin 2016, pers. comm., 10th June).

Actions that disturb sediments in Holes Bay are likely to disrupt biota in the water column and birds feeding on the intertidal areas. These activities include illegal pump scoop dredging, bait dragging and digging.

Bait digging is a popular activity in Holes Bay and mainly focused around the southern area, although it is widespread throughout (Fearnley, et al. 2013). Collection for personal use is ancillary to the public right under Magna Carta. However, landowner permission is required for commercial removal. No commercial bait digging licences have ever been issued by PHC (PHC, 2016, pers. comm., 13th July), who own most of Holes Bay. See Section 4: *Land Ownership, Access and Rights of Way* and Appendix 14.1: *Holes Bay Land Ownership Map*.

There are concerns about the effect of bait digging upon bird disturbance and prey availability. Bait diggers flush out wildfowl and waders in the winter months in northern Holes Bay which may be detrimental to their survival (Martin 2016, pers. comm 28th June). On one such occurrence, a digger was seen flushing 62 birds (Fearnley, et al. 2013).

Research has shown that the holes left by diggers in Holes Bay can take up to 12 weeks to weather down and have the potential for contaminant release (Morrison, 2004, 2006; Fearnley, et al. 2013). In view of this and other concerns, a voluntary Memorandum of Agreement (MoA) for Bait Collection was created by the Poole Harbour bait working group in 2014 (Southern IFCA, 2016g). Stakeholders in this group included Southern IFCA, Natural England, Borough of Poole, PHC and the Angling Trust. Working with these stakeholders, DWT created two bait digging interpretation panels which were placed adjacent to the Holes Bay Relief Road and on the southern shore near Asda. The design and content of these can be viewed in Appendix 14.12: *Poole Harbour Bait Digging Interpretation Panel*.

7.5.1 Bait Dragging Fishery

Bait dragging from a boat occurs in Holes Bay mainly during autumn and winter (Birchenough, 2013); one of the main areas for this activity (Southern IFCA, 2016c). Ragworm is now classed as a fishery resource under the Marine and Coastal Access Act 2009 but this fishing method remains unregulated. Southern IFCA has assessed this fishery over a four-year period and results have shown it does not impact the Poole Harbour SPA any more than other activities already occurring (Southern IFCA, 2016b). Since the conclusion of this study, the level of bait dragging has decreased

(Birchenough 2018, pers. comm., 18th January). Furthermore, a PhD is currently underway on the impacts of bait dragging (Southern IFCA, 2016e, 2016f). The impact of bait collection in Poole is discussed further in Birchenough (2013).

The method of bait dragging is often confused with pump scoop dredging (PSD). Whilst both techniques are unique to Poole Harbour, there are differences in the gear and the way they are used. Both methods involve the use of a shallow-hulled boat to drag gear in a circular motion, leaving unmistakable sediment scars. When viewed through aerial imagery, the PSD/bait dragging scars in Holes Bay were found to persist for up to twelve weeks (Fearnley, et al. (2013). Bait dragging uses a metal hook to capture ragworm species *Alitta virens*,



Figure 13: Pump scoop dredging in Poole Harbour (Rance, 2014)

Hediste diversicolor and *Perinereis cultrifera*, whereas pump scoop dredging (Figure 13) tows a wire basket to entrap bivalves cockle *Cerastoderma edule* and clams *Tapes* sp. as seawater is continuously pumped through to sort and clean the catch.

7.6 M6: Presence and the Distribution of Non-Native and Invasive Species

From as early as the Roman era, Poole Port has been commercially important for sea cargo (Arenas et al, 2006). In the 1800s it was a major base for ships sailing to New England and Newfoundland, where the Poole Oyster Company traded and introduced non-native species through aquaculture (Dyrynda, 2005). Today Poole Port is still busy for shipping and most notably for the Cross-Channel ferry. The Port sits adjacent to the Backwater Channel of Holes Bay and is passed by the recreational boats using Cobbs Quay Marina.



Figure 14: Slipper limpet *Crepidula fornicata* inhabiting litter (Rance, 2010).

Both Poole Port and Backwater Channel have advanced in commercial development. Pontoons, marinas and submerged docks have all provided a substantial and secure base to attract benthic invertebrates, unable to inhabit the soft muddy seabed of Holes Bay.

Hill et al, 2005 performed an audit of non-native species in England. In this, no fully marine vertebrates were non-native; many were vagrants with seasonal migration. Of the 2721 species, only 64 were marine (4.6%) of which 25 are found in Dorset (Dorset Wildlife Trust, 2014).

Dyrynda's studies (1983, 1989a, 1989b) recorded five non-native sub-tidal invertebrate species alive in Holes Bay. Details are shown in Table 6. Of most interest during this time was the American slipper limpet *C. fornicata* (Figure 14). This species has demonstrated increasing populations

throughout the Harbour; in Holes Bay, it dominates the sub-tidal channels and outcompetes the native flat oyster *O. edulis* in Lower Backwater Channel (Dyrynda, 2004; Langston *et al*, 2003). Despite its invasive nature, the slipper limpet *C. fornicata* has increased biodiversity in Poole Harbour with dense species-rich beds and shell fragments proving hard substrata for benthic species to colonise (Dyrynda, 1987, Langston *et al*, 2003). Conversely, in their English audit, Hill *et al* (2005) found only two marine species demonstrating a major environmental effect – the slipper limpet *C. fornicata* and the Chinese mitten crab *Eriocheir sinensis*. Both species are known for habitat modification yet to date, the Chinese mitten crab *E. sinensis* has not been recorded in Dorset. The audit also recorded only one marine species that had strongly increased 1985-2005; the Darwin's barnacle *Austrominius modestus* (previously *Elminius modestus*) which, incidentally, was recorded in all five of Dyrynda's (1983) survey areas of Holes Bay (See Table 6: *Non-indigenous species recorded in Holes Bay*).

Arenas, *et al*, (2006) surveyed marinas along the south coast and in Poole Quay Boat Haven. They recorded 11 non-native species including Darwin's barnacle *A. modestus*, Japanese skeleton shrimp *Caprella mutica*, slipper limpet *C. fornicata*, Pacific bryozoan *Bugula neritina*, Pacific bryozoan *Tricellaria inopinata*, Korean sea squirt *Styela clava*, colonial seasquirt *Botrylloides violaceus* and sea squirt *Molgula socialis*. A further rapid assessment by Wood *et al*, (2015) found Poole Port marina to be the third highest site (joint position with Southampton) amongst 42 other south coast locations for non-native species surveyed by Wood *et al* (2015). Sixteen species were recorded on the pontoons and additional species (to those already recorded by Arenas *et al* (2006) present included orange-tipped sea squirt *Corella eumyota*, colonial sea squirt *Botrylloides diegensis*, a sea squirt *Aplidium cf. glabrum*, red ripple bryozoan *Watersipora subatra*, bay barnacle *Amphibalanus improvisus*, sea spider *Ammothea hilgendorfi*, wakame *Undaria pinnatifida*, wireweed *Sargassum muticum*, devils tongue weed *Grateloupia turuturu* and oyster thief *Colpomenia peregrina*.

With Poole Quay Boat Haven located adjacent to the Backwater Channel, it could be assumed that these species are colonising the submerged dock walls further east inside Holes Bay. To be certain, further study in Holes Bay would be necessary.

The Manila clam *Ruditapes philippinarum* was introduced for aquaculture to Poole Harbour in 1988 under assurance from the MAFF that it would not reproduce. However, the bivalve mollusc has since naturalised in Holes Bay and the wider Poole Harbour (Jensen *et al*, 2004, 2005, Humphreys *et al*, 2007, 2015) to become an exploited and recently certified sustainable fishery. See Section 7.5.1: Bait Digging Fishery. Naturalisation has also occurred with Pacific oyster *C. gigas* after it was again, introduced for aquaculture in the mid-1980s (MMO, 2014b). It is worth noting that Dyrynda's studies (1983, 1985, 1989a, 1989b) predated the introduction or known naturalisation of Manila clam *R. philippinarum* and Pacific oyster *C. gigas* for aquaculture. Again, further study on these introduced species in Holes Bay would be of interest.

Invasive, non-native species are the second biggest threat to global biodiversity after habitat loss (Williamson, 1981 cited by Hill *et al*, 2005). According to the European Marine Site Risk Review Pacific oyster *C. gigas* aquaculture in Poole Harbour has the potential to pose a high risk to the SPA bird features (Coyle & Wiggins, 2010). However, Deane *et al*, (2013) did not find Pacific oysters *C. gigas* in Holes Bay and the wider population in Poole Harbour did not represent the full potential of wild settlement.

A list of all non-indigenous species recorded in Holes Bay can be seen in Table 6: *Non-indigenous species recorded in Holes Bay*, as adapted from that by DWT (2014a).

Scientific name	Common name	Date of introduction / first UK record?	First Dorset record?	Presence Recorded in Holes Bay				
				Lower Backwater Channel	Upper Backwater Channel	Sterte Bay	Upton Lake	Creekmoor Lake
<i>Crepidula fornicata</i>	Slipper limpet	1887/1890	December 1973	(Dyrynda, 1989a) Langston, et al, (2003)	-	-	-	-
<i>Austrominius modestus</i>	Darwin's barnacle	1940/1945	January 1978	Dyrynda, (1983, 1989a)	Dyrynda, (1983, 1989a)	Dyrynda, (1989b)	Dyrynda, (1989a)	Dyrynda, (1989a)
<i>Mya arenaria</i>	Sand gaper (soft-shelled clam)	1245-1600	June 1985	Dyrynda, (1989a)	Dyrynda, (1989a)	-	Dyrynda, (1989a)	Dyrynda, (1989a)
<i>Petricola pholadiformis</i>	American piddock	1870/1890	January 1984	-	-	-	Shell only (Dyrynda, 1989a)	
<i>Sargassum muticum</i>	Wireweed (a brown seaweed)	1971	January 1960	Dyrynda, (1983, 1989a)	Dyrynda, (1983)	Dyrynda, (1989b)	Dyrynda, (1989a)	Dyrynda, (1989a)
<i>Styela clava</i>	Leathery sea squirt	1952/1953	January 1982	Dyrynda, (1983, 1989a),	Dyrynda, (1983),	Dyrynda, (1989b)	Dyrynda, (1989a)	-
<i>Spartina anglica</i>	Cord grass		1890 Poole Harbour (Hubbard, 1965 cited by Raybould, 2005)	1901 (Grey and Pearson, 1984 cited by Raybould, 2005) 2007 (Environment Agency, 2007)				
<i>Ruditapes philippinarum</i>	Manila clam	1980 (Jensen et al, 2005, Humphreys et al, 2015)	1988 (Jensen et al, 2004, 2005, Humphreys et al, 2007, 2015)	-	-	-	Jensen et al, (2005) Eley, (2015)	Jensen et al, (2005) Eley (2015)
<i>Urosalpinx cinera</i>	American oyster drill			Shell only (Dyrynda, 1983)				

Table 6: Non-indigenous species recorded in Holes Bay (adapted from Dorset Wildlife Trust, 2014a)

7.7 M7: Water Quality Including Eutrophication in Poole Harbour.

7.7.1 Effluent Historically

The building of the railway embankment effectively created tertiary (north) and secondary (south) lagoons, dramatically changing and reducing the flushing capabilities and therefore larval dispersal, oxygenation, sediment dispersal and food availability (Dyrynda, 1985). This 'lagoonization' increased the vulnerability of Holes Bay, details of which have been documented by Dyrynda's baseline studies (1983), some ten years after the effects pollution and eutrophication there became known. Langston, *et al.* (2003), Hübner, (2009, 2010), Underhill-Day *et al.*, (2010) and Kite *et al.*, (2012), provide further insight on the biological pollution in Holes Bay.

Holes Bay was once known to be the most polluted area in Poole Harbour because of historic raw sewage outfalls and municipal and industrial effluent containing heavy metals cadmium, mercury, silver, copper, zinc and selenium (Drake and Bennett, 2011, Wardlaw, 2005, Falconer, 1983 cited by Dyrynda, 1985). In the 1970s metal concentrations exceeded typical levels for the English Channel by 30-40-fold for copper, nickel and zinc and more than 100-fold for cadmium and lead with likely sources from the chemical plant, light industry and the Poole Sewage Treatment Works (PSTW). (Langston *et al.*, 2003).

It is uncertain precisely when PSTW ceased discharging untreated and undiluted raw sewage into Holes Bay, but this is likely to have been in the 1960s – PSTW has since been modified numerous times to meet the requirements of a growing local population (Jones, 2016, pers. comm., 19th July). By the 1980s, diluted raw sewage would only enter Holes Bay during storm events through 50mm screened storm overflows (later improved to 20mm in the 1990s), along with increased capacity storm tanks in 2003 to reduce the number of storm discharges to Poole Harbour (Jones, 2016, pers. comm., 19th July).

In 2002, Poole Harbour was designated both a Sensitive Area (Eutrophic) under the Urban Waste Water Treatment Directive and a Polluted Water (Eutrophic) under the Nitrates Directive in 2002. Consequently, in 2008 Wessex Water were obliged to install a nitrogen removal plant at PSTW removing an average 85% of nitrogen from its discharged water equating to 55 tonnes nitrogen/year (Wessex Water, 2014, 2017). This nitrogen stripping has resulted in an improved 'moderate' status of nitrogen concentration in Poole Harbour (Wessex Water, 2017, EA, 2018) and was the largest single reduction in nitrogen input to Poole Harbour catchment, reducing the load (excluding sea inputs) to about 10%, (Kite *et al.*, 2012).

7.7.2 Effluent today

There are several permitted sewage discharges into Holes Bay which are all reviewed for impact by the Environment Agency in accordance with regulations implementing the Habitats Directive (and Birds Directive) (Bryan *et al.*, 2013). The largest continuous treated effluent discharge to the site arises from PSTW, representing over 90% of the effluent flow from direct discharges to Poole Harbour (Acornley, 2008). In addition, there are:

- Seven Combined Storm Overflows (CSOs) at Poole Bridge, Woodlands Avenue, Hewitt Road, Kennart Road, Stanley Green Road, Creekmoor Lane and a storm overflow for Poole Sewage Treatment Works (PSTW).
- Several Emergency Overflows for Sewage Pumping Stations. These will only operate extremely infrequently.

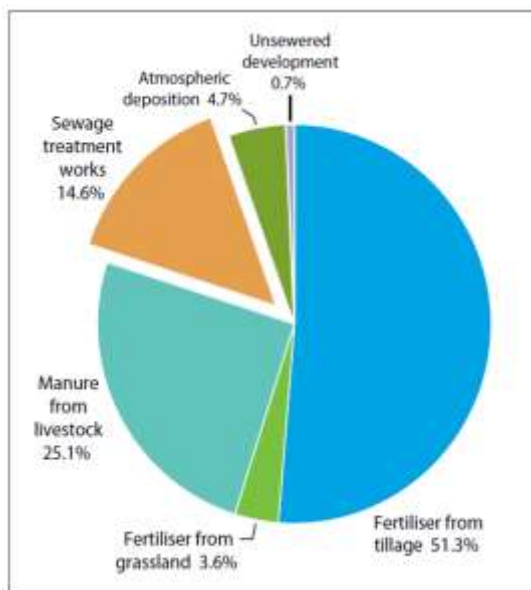


Figure 15 Estimated percentage contribution of nitrogen sources to Poole Harbour 2006-11 (excluding natural sources & English Channel) (Bryan et al, 2013 cited by PHCI, 2013)

Diluted raw sewage still discharges into Holes Bay (including several additional outfalls throughout Poole Harbour), but only during these periods of extreme heavy rainfall when storm tanks overflow. (Wessex Water, 2016a).

Nitrogen and phosphorus inputs are one of the key issues identified by the Poole Harbour Catchment Initiative (PHCI). The PHCI was one of the first pilots in England to trial the catchment-based approach (CaBA, 2014), involving stakeholder engagement to identify the key issues and solutions in their catchment (Wessex Water, 2014). Their PHCI Catchment Plan aims to protect and restore groundwater, rivers and Poole Harbour thus meeting EU obligations whilst reflecting local stakeholder opinions and actions (Wessex Water, 2014). See Section 7.7.4 Eutrophication & Algal Mats.

Nitrate leaching from agriculture is the main source of nitrogen causing eutrophication within the harbour; an estimated 80% of the nitrogen in Poole Harbour comes from agricultural sources compared to 15% from the PSTW (PHCI, 2013) as shown in Figure 15. There is also an average delay of 30-35 years, between nitrate leaving the soil zone and entering the harbour and levels are estimated to peak in 2020-2030, before stabilising (Bryan et al, 2013, PHCI, 2013).

The primary legislative drivers to address the issue of nitrates are the European Habitats Regulations and Water Framework Directive (Borough of Poole 2017).

The Water Framework Directive (WFD) 2000 is the mechanism in place to assess water quality at European wide standards and to ensure action plans are in place to ensure 'Good' status (Wessex Water, 2017). The River Basin Management Plan fulfils the requirements of the WFD and other EU Directives (Environment Agency, 2011, 2016). Under the most recent WFD, English water bodies were expected to meet 'Good' and 'Good Chemical Status' by 2015. However, Poole Harbour has consistently failed for chemical status under both cycles of WFD due to the concentration of tributyltin (TBT) (IECS, 2016, EA, 2018). See Section 7.7.3: Tributyltin and Other Contaminants (below). It is also thought that this compound alongside eutrophication in Poole Harbour may have overshadowed the effects of heavy metal contamination (Langston, et al, 2003). Both EA and NE have recognised that it would not be feasible for Poole Harbour to have met the deadline for 'Good Environmental Status' with the delay of historic leaching of nitrates flushing through groundwater into the Harbour (on average up to 30 years in the catchment) (Borough of Poole, 2017).

"Concentrations of dissolved inorganic nitrogen, measured in winter, are at less than WFD Good Status (see Table 7) across the Harbour as a whole. This elevated level of nitrogen enrichment has little effect on phytoplankton abundance (assessed at WFD Good status Harbour-wide) but encourages the growth of opportunistic macroalgae on mudflat and within saltmarsh. The extent, density and biomass of macroalgae in Holes Bay south of the railway line (units 7, 10, 11, 12) equates to WFD Moderate class based on four years data (2008, 2009, 2011 and 2015) and to WFD Poor class north of the railway (units 8, 59; the most affected part of the Harbour in this respect). Green algal mats were also widespread on mudflats in Holes Bay in 2016 and 2017." (NE, 2017, 2017a)

WFD classifications are the method for distinguishing the environmental condition or ‘status’ of water bodies and putting them into one category or another. Their range is High, Good, Moderate, Poor or Bad (EA, 2018).

Poole Harbour Cycle 2 Classification Item/Year	2016	2015	2014	2013
Dissolved Inorganic Nitrogen	Moderate	Moderate	Moderate	Moderate
Dissolved Oxygen	Moderate	High	High	High

Table 7 WFD Chemical Classification for Dissolved Inorganic Nitrogen & Dissolved Oxygen. (EA, 2018)

7.7.3 Tributyltin and Other Contaminants

Tributyltin (TBT) was used within hull antifoul paint until its toxicity in the marine environment became apparent. In the 1980s high levels of TBT were recorded in Holes Bay (Langston *et al*, 2003) and the area was the worst UK example with the highest measured concentrations occurring near to its marinas (Langston, 1987, cited by Dyrinda, 1989a).

In 1987, TBT was banned in retail sale and in mariculture or for use on boats less than 25m in length (Dyrinda, 1992, Langston *et al*, 2003). Two years after the ban, Pacific Oyster *C. gigas*, laid in Holes bay for TBT experimentation, still exhibited abnormal shell-thickening compared to other sites in Poole Harbour (Dyrinda, 1992, Langston *et al*, 2003).

During these times, Dyrinda conducted baseline studies in Holes Bay (1983, 1989a, 1989b) and aside from shell thickening in the Pacific Oyster *C. gigas*, the effects of TBT upon the species inventory remain unknown (Dyrinda 2005).

TBT in Backwater Channel Holes Bay still exceeds levels of maximum allowable concentration compared to all other sites in Poole Harbour, which fall within safe levels (Environment Agency, 2016b, 2018). TBT status in the WFD is classified as ‘Fail’ (EA, 2010, 2018). See Table 8. These high levels of TBT in the water column are likely from re-mobilisation of sediments that were historically contaminated and over time, this should subside as EA continue to monitor (Witt, 2016 pers, comm., 22nd June).

The level of contaminants in the sediments of Holes Bay has been the focus of some study throughout Poole Harbour. Hübner (2009) found the highest levels of cadmium, copper, lead phosphorus, tin and zinc in Holes Bay with cadmium, copper and zinc most elevated in the BSA. Hübner, (2009) highlighted limitations with earlier studies citing Langston *et al* (2003) and the absence of recent data to draw comparisons.

In the same paper, Hübner (2009) looked at the die-back of cord grass *S. anglica* and the subsequent release of cadmium. Results showed the highest concentrations of cadmium to be in northern Holes Bay, thought to originate from the PSTW and were found to be mobile – washing out more readily from Holes Bay compared to other metals/metalloids and being absorbed by cord grass *S. anglica* in the south. The author also found, at its current rate, the release of mobile cadmium in to the water column through cord grass *S. anglica* dieback would not put considerable strain on aquatic life but if dieback increased, the release of cadmium would be over a much shorter time scale, causing high impact upon the Estuary and mussel farming.

The most vulnerable features and/or biota to heavy metals are invertebrates, particularly molluscs and crustaceans, species composition, larval fish and birds (Langston *et al*, 2003). Some marine invertebrate species are known to be tolerant to organic and chemical pollution, such as the common ragworm *Hediste diversicolor* but, in the absence of earlier data, it was not certain whether these and other species populations had increased along with the pollution levels (Dyrinda 1989a).

In a Poole Harbour study on the sediment contaminants and indicator species of ragworm *H. diversicolor* and the peppery furrow shell *Scrobicularia plana*, Witt, (2006) found the highest

concentrations in Holes Bay in copper, silver, zinc, cadmium, mercury, lead, nickel, particularly Creekmoor Lake and sediment levels were above Probable Effect Level (PEL).

Surface water sewers should also be considered as a contaminant input. These do not require consent or permit but convey surface rain water and in doing so, transfer contaminants such as hydrocarbons, grit, salt, rubber and heavy metals to an appropriate discharge point (Water UK, 2009 cited by MCS, 2011).

Poole Harbour Water Framework Directive Cycle 2 Classification	2016	2015	2014	2013
Tributyltin (TBT)	-	-	Fail	Fail
Cadmium	Good	Good	Good	Good

Table 8: WFD Chemical Classification: Tributyltin & Cadmium (EA, 2018)

7.7.4 Eutrophication & Algal Mats

Algal mats are the result of anthropogenic nutrient enrichment from treated sewage effluent or agricultural run-off (IECS, 2016). See Section 7.7.2: *Effluent today*. Holes Bay has both historic and present-day high loadings of nutrients from consented sewage discharge points and diffuse sources arising from the wider catchment. These have resulted in significant seasonal algal blooms covering the inter-tidal mudflats and partly smothering the saltmarsh.

Over the last 50 years the amount of nitrate-nitrogen from the catchment has more than doubled, from under 1000 tonnes to well over 2000 tonnes (PHCI, 2017). One reported consequence of excessive nutrient loading has been an increase in saltmarsh loss (Deegan, *et al.* 2012), which is a current issue in Holes Bay and needs local quantification. In addition, nitrogen oxide loadings from traffic are likely to be near maximum levels permitted for saltmarsh habitats and will need to be verified (Hall, *et al.* 2011; MMO, 2015). Another consideration are the dog faeces deposited along the peripheral paths around Holes Bay. These are also likely to contribute to nutrient loads.

Excessive growth of the green alga *Ulva lactuca* and gutweed *Ulva intestinalis* in Holes Bay became noticeable in summer in the 1960s and 1970s (Dyrynda, 1989, Kite *et al.* 2012). (Further clarification on the species has confirmed identification as *Ulva rigida* (Thornton, 2016)). It is also suggested that freshwater from the nitrogen-rich discharge of PSTW and the coolant from the former Poole power station probably acted in combination to stimulate macroalgae growth, yet it was another decade or so before the issue received scientific attention (Kite *et al.* 2012). Changes to the distribution of algal mats in Holes Bay 1980-2005 is documented by Acornley, (2008).

Ulva spp. absorb nutrients 4–6 times faster than slower growing perennial species (Pederse and Borum, 1997 cited by Jones and Pinn, 2006). Consequently, these mats smother the mudflats and get blown or washed onto saltmarsh and decay. Smothering limits bird foraging and prey availability and algal mats have been known to impact fisheries.

In recent years, algal mats have become increasingly common in Poole Harbour (Jones and Pinn, 2006). In Holes Bay, the pungent smells, foam and scum of decomposition contributed to the shellfish mortalities in 1995 and 1997 and near economic collapse of the Poole Harbour fishery through Amnesiac Shellfish Poisoning and Diarrhetic Shellfish Poisoning in 2001 (Langston *et al.* 2003). However, research also acknowledges that environmental stresses in the marine environment are complex and other factors could be involved (Dyrynda, 2005 cited by Kite *et al.* 2012). As these mats decompose, they release organic matter and nutrients that can exceed that from anthropogenic input (Pihl *et al.* 1999 cited by Jones and Pinn, 2006).

In studies on Poole Harbour algal mats, Creekmoor Lake, in Holes Bay was found to contain the highest densities with algal mats recorded at 90mm thick (Jones and Pinn, 2006). In 2009, Herbert *et*

al, (2010) recorded a 70% coverage of algal mats in Holes Bay and in the same year (Kite *et al*, 2012) calculated this to be nearly 65 ha (30%) of the mudflat area in Poole Harbour. Thornton's PhD (2016) also found Holes Bay to have the highest percentage cover (75%) of intertidal algal mats, with the dominant species identified as *U. rigida* (thin sheet forming structure), but the lowest biomass compared to dense and impenetrable mats in Southern Poole Harbour. Thornton's studies (2016) accompany the extensive survey and research on algal mats compiled by Environment Agency (2011, 2015, 2015a, 2016, 2016a, 2016b, 2016c, 2016d, 2018) under both the Urban Waste Water Treatment Directive, Habitats Directive and the Water Framework Directive). These have included ground surveys, Compact Airborne Spectrographic Imager (CASI) and LIDAR aerial photography gathering data on extent and biomass. The EA's classification of macroalgae in Poole Harbour under the WFD is 'Moderate' (EA, 2010, 2018). See Table 9.

Poole Harbour does not meet 'Good Ecological Status' regarding the macroalgae and dissolved organic nitrogen, under the WFD (EA, 2010, 2018) and nitrogen load has approximately doubled in 50 years (Kite *et al*, 2012). A review conducted for the Dorset Local Nature Partnership concluded that even if the standing biomass of macroalgae was removed from Poole Harbour annually this would only account for 6% of the proposed reduction in annual nitrogen input to Poole Harbour, and it is uncertain whether macroalgal removal would itself lead to net negative conservation impacts (Taylor, 2015).

Eutrophication/toxic pollution in Poole Harbour is a risk to the SPA bird features within the European Marine Site risk review, but mitigating legislation is provided through the designation of the Nitrate Vulnerable Zones and implementation of the Water Framework Directive (Coyle & Wiggins, 2010). See Section 14.14: Holes Bay Nature Conservation Designations and Conservation Measures.

In a literature review on the impact of algal mats on benthic invertebrates and estuarine birds in Poole Harbour, Underhill-Day, (2008) found no conclusive negative impact on estuarine bird abundance, diversity or feeding activity and in some cases, it was shown to improve abundance in areas of eutrophication-induced algal growth. However, other studies found that invertebrate populations had decreased in Poole Harbour (Jones & Pinn, 2006, Underhill-Day *et al*, 2010). More recently, Holes Bay has shown a greater abundance of larger sizes of ragworm *H. diversicolor* and is therefore able to support a greater number of birds (Thornton, 2016). Further information on invertebrates in Holes Bay can be seen in Section 7.9.2: Wildfowl and Waders.

Poole Harbour Cycle 2 Classification Item/Year	2016	2015	2014	2013
Macroalgae	Moderate	Moderate	Moderate	Moderate

Table 9: WFD Chemical Classification: Macroalgae (EA, 2018)

7.7.5 Endocrine Disruptors

Further study is necessary to determine the effects of SPA bird features from ingested prey species and sediments contaminated by PCBs, PAHs, pesticides and metals (Fry, 1995, CSL, 2000 and Allan *et al*, 2000 cited by Langston *et al*, 2003).

7.7.6 Shellfish Waters

As previously stated in Section 7.4: *Change in Extent & Effectiveness of Designated Sites (Marine Protected Areas)*, Holes Bay is unclassified as shellfish waters under the Shellfish Waters Directive (Council Regulation (EC) 2006/113) based on historical chemical and biological contamination. (The mouth of Holes Bay contains the highest levels of microbial contamination in Poole Harbour (Cefas, 2009)). Species prohibited are clams *Tapes spp.*, oysters *O. edulis* and *C. gigas*, mussels *Mytilus spp.* and cockles *C. edule*. These bivalve molluscs, particularly when juvenile, (Langston *et al*, 2003) are susceptible to heavy metals. They are therefore unfit for human consumption, posing a risk to public health. Bivalves must not be harvested (gathered) from or produced in Holes Bay (Borough of Poole, 2015).

7.7.7 Bathing Waters

Holes Bay is not a popular swimming area and therefore not designated under the Bathing Water Directive (Defra, 2013). However, PSTW effluent, discharged in to the area, is subject to ultraviolet disinfection to reduce and remove micro-organism levels as required under these regulations (Wessex Water, 2017).

7.8 M8: Beach Litter

Due to low flushing rate, there remains an accumulation of debris originating from land and marine sources. It is not possible to reliably identify all sources of litter but there is some evidence of branded wrapping from nearby food and supermarket outlets. This litter may be dropped by recreational users of the HBNP, CSOs, thrown from vehicles or blown across the bypass. More research is necessary to determine the exact source of litter in the HBNP. See Section 11.5.1 Litter.

Beach cleans have been conducted in Holes Bay in 2011, 2013, 2014 and 2015 by volunteers of the Marine Conservation Society's Autumn Beachwatch campaign (MCS, 2016a). In total 111 volunteers removed 86 bags of litter of which the top five common recovered items were small plastic pieces (1060), crisp packets (788), large plastic pieces (417), caps (203) and foam sponge pieces (189). The raw data can be viewed in Appendix 14.13: *Holes Bay Beachwatch Data (2011-16)*.

The BOP has also formed links with McDonalds Restaurants and has performed occasional beach cleans in Holes Bay.

Material	Type	Number (item/piece)
Plastic	Bag	23
	Drinks	20
	Caps	203
	Lighters	18
	Food wrap	49
	Cutlery	105
	Fishing line	3
	Fishing net	11
	Crisp packets	788
	Foam sponge	189
	Pens	29
	Small plastic pieces	1060
	Large plastic pieces	417
Sanitary	Cotton buds	35
	Wipes	2
	Toilet tissue	1
	Syringe	2
Wood	Small	36
	Corks	4
	Lolly	8
Metal	Cans	23
	Caps	12
	Foil	8
Paper	Cigarette butts	11
	Cigarette packets	8
Clothing	Other	8

Table 10: A summary of the most common litter items collected in Holes Bay 2011-15 (MCS, 2016)

7.9 M9: Overall Health of the Food Web

7.9.1 Population Structure in Commercial Fisheries

Holes Bay is a nursery area for juvenile fin fish. The EA monitor small fish species throughout Poole Harbour as a requirement of the WFD and to inform the River Basin Management Plan (Environment Agency, 2011, 2016, 2018). Holes Bay was initially surveyed as a trial for the fish sampling methodology which changed when the EA commenced regular surveys in 5 other sites in the Harbour (Witt, 2016, pers. comm., 18th March). It has been surveyed on four occasions; three times in 2007 and once more recently in 2015 (Environment Agency, 2016a). The WFD classification for fish in Poole Harbour is 'Good Status' (EA, 2010, 2018). See Table 11.

Southern IFCA (2015) replicated the survey methodology of the EA and commenced an annual long-term programme of small fish surveys in October 2015. The first survey occurred in the western side of lower Holes Bay. Long-term data from the spring and autumn surveys will provide a greater understanding on the health of the fin fish in Holes Bay, the supporting habitats and that the stocks are adequately managed, and juveniles are adequately protected.

Juvenile fish species of commercial interest recorded in Holes Bay by EA (2016a), Southern IFCA (2015) and Dyrinda (1985, 1989a) include; eel *Anguilla anguilla*, bass *D.labrax*, sprat *S. sprattus*, flounder *P. flesus*, sole *S. solea*, grey mullet *C. labrosus*, sand smelt *A. presbyter* and herring *Clupea harengus*. Adult fin fish recorded in the same surveys include; flounder *P. flesus*, grey mullet *C. labrosus*, eel *A. anguilla*. Raw survey data can be viewed in Appendices 14.10 & 14.11: Holes Bay Small Fish Survey Data.

Permitted commercial fishing activity in Holes Bay includes bait dragging, angling, netting and fyke netting. Cockle raking has been observed at the mouth of Holes Bay (Liley & Fearnley, 2012). Illegal pump scoop dredging has occurred historically and is now prohibited.

Holes Bay is a popular spot for recreational anglers particularly along shores of the eastern edge of the Bay, adjacent to the Holes Bay Relief Road. Poole Harbour is a Designated Bass Nursery Area and fishing for bass, or fishing for any fish using sand-eels as bait, by any fishing boat is prohibited between 30 April and 1 November. (Southern IFCA, 2014).

Recent catches on rod and line in Holes Bay include Pollack *P. pollachius*, mackerel *S. scombrus*, eel *A. anguilla*, bass *D. labrax*, flounder *P. flesus*, sole *S. solea*, thick-lipped grey mullet *C. labrosus* (Green, 2016, pers. comm., 27th April). See Appendix 14.14: Nature Conservation Designations and Conservation Management for details on fishery management in Poole Harbour.

Southern IFCA has conducted an annual Poole Harbour bivalve assessment since 2001 to inform future management of the clam and cockle fishery. In 2015, the first ever inclusion of Holes Bay established a ranking amongst the five top sites in Poole Harbour for the highest average catch of Manila clams *R. philippinarum* per dredge (Eley, 2015). Results also showed all clam and cockles caught in Holes Bay to be above the minimum landing size of 35mm, demonstrating the positive effects of closing an area to fishing. For this reason, Holes Bay could be considered a shellfish refuge.

In 2012-13, Project Inshore provided the first ever in-depth assessment of all commercial fisheries in Dorset (Huntington, 2015). It focussed on those with commercial landings over £100,000 or those particularly important or unique to the area. From this, the Poole Harbour clam and cockle pump scoop fishery passed a pre-assessment and species of clams & cockles were listed as 'conditions likely' for full Marine Stewardship Council (MSC) certification (Southern IFCA, 2016h). In 2018, the Poole Harbour clam and cockle fishery was awarded the coveted certification of sustainability by the Marine Stewardship Council (MSC, 2018). However, as previously stated, any harvesting for bivalves such as pump scoop dredging is prohibited in Holes Bay by order of a Poole Harbour Dredge Permit Byelaw (Southern IFCA, 2016) as detailed in Section 7.4: Change in Extent and Effectiveness of

Designated Sites (Marine Protected Areas) and Appendix 14.14: Holes Bay Nature Conservation Designations and Conservation Measures.

In the European Marine Site risk review (Coyle & Wiggins, 2010), the SPA bird features were at high risk of disturbance from Illegal, Unlicensed and Unregulated (IUU) fishing and bait digging and bait dragging activities which were considered to impact prey and modify the habitat. However, since this risk review was written, Southern IFCA has introduced a Poole Harbour Dredge Permit Byelaw (Southern IFCA, 2016) and incidents of IUU have reduced significantly Harbour wide (Southern IFCA, 2016e). Furthermore, a Bait Digging MoA has been in place since 2014 (Southern IFCA, 2016g). For further details on this management, see Section 7.5: Change in Extent of Sensitive or Priority Habitat Protected from, or Not Vulnerable to, Physical Damage.

Poole Harbour Cycle 2 Classification Item/Year	2016	2015	2014	2013
Fish	Good	Good	Good	High

Table 11: WFD Ecological Classification for Fish (EA, 2018)

7.9.2 Wildfowl and Waders

Poole Harbour is home to over 20,000 wildfowl and waders totalling 60 species, with 17 being of national or international importance (PHC, 2011) for which it was designated a SPA in 1999. See Appendix 14.14: Nature Conservation Designations and Conservation Management.

The invertebrates of the intertidal saltmarshes and mudflats of Holes Bay provide a rich and attractive food source for internationally important waders and wildfowl. To the north of the railway embankment is the Overwintering BSA, which receives a longer low tide exposure and more shelter, compared to its southern counterpart (PHC, 2011). The BSA has been highlighted as a management tool for a site sensitive to noise and visual disturbance and an important roosting and feeding site for several species including avocet *Recurvirostra avosetta* and black-tailed godwit *L. islandica* (Burton, 2016. pers. comm., 7th March). By comparison, the double high tides of Poole Harbour are much benefit to roosting birds; the extra time allows for longer roosting but consequently leaving less time for feeding at low tide and more threat from disturbance. (Morrison, 2004, 2006)



Figure 16: Holes Bay WeBS quadrants (BTO, 2016)

In a Poole Harbour disturbance study, Holes Bay north (along with Brands Bay) attracted the highest number of species and Holes Bay north (along with Newton Bay and Brands Bay) held the largest number of birds (Liley and Fearnley, 2012). This survey observed 29 species of birds in Holes Bay with widgeon, teal and black tailed godwit being the most dominant species recorded.

The British Trust for Ornithology (BTO) run annual Wetland Bird Surveys (WeBS) on non-breeding water birds in the UK to identify population sizes, determine trends in numbers and distribution, and identify important sites for water birds. (BTO, 2016). These have been coordinated by Birds of Poole Harbour since 1998 in the four quadrants of Holes Bay (north-west, north-east, south-east and south-west) as shown in Figure 16. Apart from years 2000-02, volunteers have recorded various waders and wildfowl species in Holes Bay every year; September to March. Of most interest is the bird features of the Poole Harbour SPA, SSSI, Ramsar and Birds of Conservation Concern 4 (BoCC4) Red or Amber List (RSPB, 2015). The most concerning species, currently on the BoCC4 Red List are the pochard *Aythya farina* and black-tailed godwit *L. islandica*, curlew *Numenius arquata*, lapwing *Vanellus vanellus* and whimbrel *N. phaeopus*. A breakdown of when each bird feature was present in Holes Bay 1998-2016 can be seen in Section 14.7: Holes Bay Important Wildlife and Habitats. (Please note: the full dataset of the Holes Bay WeBS data is too large to include in the Appendix. It is,

therefore, available upon request from Birds of Poole Harbour). This is the longest continued dataset for birds in Holes Bay which demonstrates the changes in bird numbers. It does not, however, show reasons for this decline.

The BTO manage the WeBS Alert Report whereby species showing a change in numbers are flagged and an advisory alert is issued (BTO, 2016). Seven years previously, dunlin *Calidris alpina* and shelduck *Tadorna tadorna* were listed as declining in Poole Harbour through the WeBS Alert System (Liley & Underhill-Day, 2009). According the BTO, Poole Harbour WeBS Alerts will not be assessed until 2018 but has stated the following:

“The most recent analysis available approximating to Alerts for Poole Harbour but with a slightly modified methodology that compares the five year 1992/93 to 1996/97 baseline period upon which notification is based with the comparison period of 2009/10 to 2013/14 would flag brent goose *Branta bernicla*, red-breasted merganser *Mergus serrator*, and redshank *Tringa tetanus* as having declined by more than 25% and shelduck *Tadorna tadorna*, pochard *Aythya farina*, goldeneye *Bucephala clangula*, lapwing *Vanellus vanellus* and curlew *N. arquata* as having declined by more than 50%”. (Austin, 2017, pers. comm., 12th July).

Curlew *N. arquata*, whimbrel *N. phaeopus*, black tailed godwit *L. islandica* and pochard *A. farina* are also currently red listed as Birds of Conservation Concern 4.

Whilst these declines in bird species are of concern, it would be of benefit to look at trends for qualifying species in Holes Bay and compare these to birds from other areas.

Cord grass *S. anglica* die back was observed by Morrison (2004, 2006) and Hopper (2008) in Holes Bay central causing a direct threat to the number of bird roost sites. A repeat survey by Morrison (2015) showed a direct affect to the species of oystercatcher *Haematopus ostralegus*, dunlin *Calidris alpina*, curlew *N. arquata* and redshank *Tringa totanus* in this area and an increase wader roost disturbance. However, Morrison (2015) also noticed an increase in avocet *Recurvirostra avosetta* (Figure 16) roost sites in Holes Bay compared to his earlier studies in (Morrison, 2004, 2006).

Dog walking is a major source of disturbance to birds in Holes Bay. The shared foot & cycle path is directly adjacent to the intertidal zone. On a shared path route in Holes Bay, a lower flush rate of birds was observed in response to commuting cyclists and walkers compared to those that stopped or paused (Liley & Underhill-Day, 2009, Liley & Fearnley, 2012).



Figure 17: Avocet *Recurvirostra avosetta* in Holes Bay (Steve Davis, 2014)

Reed screening for dogs and birds has been discussed and guided walks and site interpretation and web-based information have been developed through The Great Heath project, Dorset Dogs and local agencies such as NE, PHC, BOP and Southern IFCA.

Bird disturbance from heavy boat traffic and the RNLI in south-eastern Holes Bay has been observed by Pickess & Underhill-Day (2002) Morrison (2004) and Caldow *et al*, (2005). More recently, Morrison (2015) documented bird disturbance in Holes Bay (in descending order) by dog walking, walking, general recreation, clam/cockle dredging, motorised boat launching and the RNLI hovercraft. The specific survey points used in this research are shown in Table 12.

ACTIVITY	SURVEY POINT
Dog walking	Holes Bay north west, Holes Bay north east, Sterte
Walking	Holes Bay north west, Holes Bay north east, Sterte
General recreation	Holes Bay north east,
Clam/cockle fishing	Creekmoor Lake
Motorised boat launching	Creekmoor Lake
RNLI Hovercraft	Creekmoor Lake

Table 12: Bird disturbance in Holes Bay (in descending order) adapted from Morrison (2015)

There are concerns that feeding behaviour of wildfowl and waders in Holes Bay may be affected by the algal mats. In studies on these algal mats and feeding relationships between invertebrates and overwintering birds, Thornton (2016) selected five species; Eurasian curlew *N. arquata*, black-tailed godwit *L. limosa*, oystercatcher *Haematopus ostralegus*, redshank *Tringa totanus* and dunlin *Calidris alpina* as representatives of the overall assemblage of features within the Poole Harbour SPA. Results showed an increase in algal biomass caused higher abundance of less-energy dense prey with Holes Bay providing the highest available energy and highest benthic invertebrate menu (BIM) for these birds compared to Ower Bay and Brands Bay.

The Holes Bay saltmarsh and mudflats have been studied as part of the Poole Harbour SSSI Condition Assessment. The current condition is 'Unfavourable – declining' - the erosion of saltmarsh and spread of reed and numbers of wintering shelduck in the Harbour have declined significantly in recent years (NE, 2017). Shelduck decline may be linked to reduced food availability as a result of an increase in algal mat cover and current measures to address these matters are not adequate to achieve favourable condition (NE, 2017). A full breakdown on each of the Holes Bay units, can be seen in Table 15 & 16 and viewed in Appendix 14.6: Poole Harbour SSSI Condition Assessment of Holes Bay Units 2017 Map.

7.9.3 Intertidal Species

The invertebrate communities found within the mudflats of Holes Bay are a rich and important food source for avian and marine predation at low and high tide respectively. The double high tides create longer periods of submersion and therefore benefit suspension-feeding invertebrates and their marine predators (Humphreys, 2005). Although the saltmarsh habitat is reducing, the mudflats and their food availability are increasing, making it particularly good food source for several bird species such as shelduck *Tadorna tadorna* and teal *Anas crecca*, (Pickess & Underhill-Day, 2002)

In a survey of the bed and waters of Holes Bay, Dyrinda (1989a) found the most common faunal group to be Annelida (segmented worms) particularly the species threadworm *Audouinia tentaculata*, ragworm *Hediste deversicolour*, *Clitellio arenarius* and *Tubificoides benedeni*. High numbers and high biomass of invertebrate species particularly at the entrance of Holes Bay were documented by Thomas *et al*, (2004). Holes Bay also contained a higher biomass of annelid worms (with all size classes of polychaete worms) and molluscs compared to Ower Bay and Brands Bay in studies by Thornton (2016).

Herbert *et al*, (2010), also commissioned by NE, focused on the intertidal invertebrates and biotopes of Poole Harbour SSSI following on from the methodology of Thomas *et al*, (2004). Using WeBS data from 2004/5 and invertebrate records, Herbert *et al*, (2010) calculated the biomass availability by each of the four quadrants in Holes Bay. (The BTO WeBS Survey quadrant map for Holes Bay, is shown in Figure 16). In Holes Bay, the areas of greatest biomass density occurred in the north-west

quadrant but by comparison, the north-east area showed the lowest (Herbert, *et al*, 2010). The biotopes recorded by Herbert *et al*, (2010), can be viewed in *Appendix 14.9: Holes Bay Biotopes*.

Additional infaunal estuarine communities including the phyla Annelida, Arthropoda and Mollusca recorded in Creekmoor Lake can be viewed in Jones and Pinn (2006). Their studies on the intertidal area found the species richness to be low, notably declining as the algal mats increased. See *Section 7.7.4: Eutrophication & Algal Mats*.

Incidentally, the current WFD Classification for benthic invertebrates and phytoplankton in Poole Harbour is 'Good' (Environment Agency, 2016, 2018). See *Table 13*.

Poole Harbour Cycle 2 Classification Item/Year	2016	2015	2014	2013
Invertebrates	Good	Good	Good	Good
Phytoplankton	Good	Good	Good	Good

Table 13 WFD Ecological Classification for Invertebrates and Phytoplankton (EA, 2018)

7.9.4 Sub-tidal Species

The subtidal channels (Upton and Creekmoor Lake and Backwater Channel) of Holes Bay were first surveyed extensively by Dyrinda (1983, 1985, 1989a) using divers, dredge and grab samples. In 1983, these detailed findings recorded 121 species of alga, invertebrates and fish. In a later survey of Holes Bay, Dyrinda (1985) recorded 120 species; 27 of sediment infauna, 74 hard substrate colonisers and 17 mobile species.

Additional studies in Holes Bay have shown low biodiversity, attributed to the poor flushing and eutrophication but a higher abundance of individual, opportunistic and short-lived species (Dyrinda 1983, Howard & Moore, 1988 & Langston *et al*, 2001, 2003). After thirty-four years, this baseline data still forms the most detailed subtidal collection available to Holes Bay, demonstrating substantial and ecologically significant communities of marine species (Dyrinda, 1989a).

Dyrinda's studies (1983, 1989a), found the richest communities in Holes Bay were on the submerged walls and sediments of Backwater Channel subjected to higher flushing, oxygenation and coarser sediments.



Figure 19: Rare sea sponge Suberites massa (Tinsley, 2009)



Figure 18: Flat oyster Ostrea edulis (Tinsley, 2009a)

Noteworthy species were the rare sea sponge *Suberites massa*, flat oyster *O. edulis* and juvenile individuals of the peacock worm *S. pavonina*.

S. massa (Figure 18) was recorded in large numbers, as the most common sponge species and was also recorded by Howard & Moore (1988) and APEM (2008, 2012). At the time of research, this location of *S. massa* was probably the most substantial UK population (Dyrynda, 1989a, 2005). More recently, APEM (2008, 2012) undertook targeted surveys of this species following proposals for development of the former power station site. Although there were no comparisons made to earlier survey work by Dyrynda (1989a or Howard and Moore (1988), APEM (2008, 2012) recorded *S. massa* all along the former site wall in Upper Backwater Channel, noting a decrease in density upstream. The EA (2011, 2015a, 2016) also conduct benthic surveys within three locations of the Holes Bay Channels (Witt, 2018, pers. comm., 3rd August), as part of their responsibility under the WFD and River Basin Management (EA, 2016, 2018). *S. massa* is not recorded and furthermore, Backwater Channel is not part of this survey for benthic species. Further comparable studies would be necessary to determine the current locations and densities of *S. massa* in Backwater Channel.

Flat oyster *O. edulis* (Figure 19) was recorded in both the upper- and lower-Holes Bay channel (Dyrynda, 1983). Later surveys revealed dense beds in the Lower Holes Bay Channel adjacent to the BDH factory along with clams *Tapes* spp. and mussels *Mytilus edulis* (Dyrynda, 1989a). Smothering and siltation in low energy environments can have a significant effect on Flat oyster *O. edulis* and associated communities (Haelters and Kerckhof, 2009).

Juvenile and small aggregations of *S. pavonina* peacock worm (Figure 20) were recorded colonising sublittoral concrete in the Lower Backwater Channel (Dyrynda, 1983; 1989a). Since this time, there have been no focused surveys for this species in Holes Bay. Further survey work is necessary to clarify whether this species has disappeared from Backwater Channel.

Peacock worm *S. pavonina* only becomes a notable community of the Poole Harbour SSSI when it forms dense beds and the subtidal environment of Holes Bay is assumed unlikely to be a suitable habitat for this. The subtidal channels of wider Poole Harbour are known hotspots for this species as shown in Baldock (2017).



Figure 20: Peacock worm *Sabella pavonina* (Tinsley, 2009b)

Further details on the status and associated policy or conservation legislation of *S. pavonina* peacock worm can be viewed in Section 14.7: *Holes Bay Important Wildlife and Habitats*. In wider Poole Harbour, biodiversity hotspots of 'exceptional, dense and extensive forests' of peacock worm *S. pavonina* are found in shallow sheltered areas, downstream of tidal currents which deliver a good food supply (Dyrynda, 2005). These areas in the South Deep and Wych Channel were revisited by Southern IFCA (2015a) and the SSSI notable communities mapped by Dyrynda (1985) were found to have increased in the South Deep of Poole Harbour. Peacock worm *S. pavonina* form long-lived dense beds which create a refuge for sponges, sea squirts and seaweeds. Research by Dyrynda (1985, 2005) shows that high density beds can take years or even decades to form and can work as a seabed stabilizer encouraging over 0.5m settlement of fine sediment.

In 1988, the Upper Backwater Channel, Sterte and Upton Lake showed signs of health with large numbers of marine species and individuals both mobile and infaunal, whereas Lower Backwater Channel and Creekmoor Lake showed the opposite; stress and depletion (Dyrynda, 1989b).

Upper Backwater Channel, Sterte and Upton Lake provide an ideal food source for the commercially important fish species as recorded by Dyrynda (1989b) of flounder *P. flesus*, bass *D.labrax*, mullet *Mugilidae spp.*, eel *A. anguilla* and sole *S. solea*. The site is also a documented nursery ground for many of these species after small fish survey data from Dyrynda, (1983, 1989a) Southern IFCA (2015) and EA (2015). For detailed information and records of these species in Holes Bay, see Section 7.9.1: *Population Structure in Commercial Fisheries*.

Under the WFD fish in Poole Harbour are in ‘Good Status’ (EA, 2010, 2018). See Table 14 below.

Table 14: Table 14: WFD Ecological Classification for Fish (EA, 2018)

Poole Harbour Cycle 2 Classification Item/Year	2016	2015	2014	2013
Fish	Good	Good	Good	High

7.10 Poole Harbour SSSI Condition Assessment 2017

Monitoring and reporting on the condition of SSSIs is a vital part of Natural England’s statutory responsibility to conserve and protect them. (Natural England, 2013a). Under the WFD, Poole Harbour is also required to meet any standards and objectives of the European Protected Area designations (principally in respect of the SPA and as a Shellfish Water) (Kite *et al*, 2012). However, Poole Harbour is not achieving favourable condition as set by the Conservation Objectives of the Special Protection Area. The current condition of the Holes Bay littoral sediment (units 007, 008, 009, 010, 059 and 067 as shown in Table 15, 16 & Appendix 14.6, to include saltmarsh, reedbed and mudflat habitats and wintering birds) are listed as ‘Unfavourable-declining’ (Natural England, 2017, 2017a) or *Unfavourable-Recovering*. This overall assessment is based on where a unit exceeds 10% of unfavourable condition or the whole estuary exceeds 5% as shown in Table 16 (Kite *et al*, 2012). The assessment considers the condition of the saltmarsh, reedbed and mudflat habitats and wintering birds in addition to the water quality and biological indicators of eutrophication, such as the algal mats. It also brings together other assessments from WeBs Alerts on concerns over wildfowl and waders and the EA (2011, 2016, 2016d) under the Water Framework Directive. For a full breakdown on the assessment for each unit within Holes bay see Natural England, (2017). This result has shown Holes Bay to have declined since NE’s earlier assessment in 2010.

The Holes Bay Units of the Poole Harbour Condition Assessment (NE, 2017) can be seen in Table 15 along with the Condition Summary for Poole Harbour in Table 16. the overall. A map showing all the Condition Assessment units for Holes Bay can be viewed in Appendix 14.6: *Poole Harbour SSSI Condition Assessment of Holes Bay*.

Unit	Unit name	Condition	Condition Threat Risk	Habitat	Area (ha)	Grid Ref
007	Holes Bay East and Sterte Bay	Unfavourable - Declining	High	LITTORAL SEDIMENT	26.3458	SZ 007 914
008	HOLES BAY NORTH	Unfavourable - Declining	Medium	LITTORAL SEDIMENT	33.9371	SY 997 925
009	PERGINS ISLAND	Unfavourable - Recovering	No identified Condition Threat	BROADLEAVED, MIXED AND YEW WOODLAND - Lowland	6.2061	SY 999 925
010	HOLES BAY CENTRAL	Unfavourable - Declining	High	LITTORAL SEDIMENT	43.4552	SZ 001 918
059	Holes Bay North mudflat	Unfavourable - Declining	High	LITTORAL SEDIMENT	37.2477	SZ 001 924
067	Holes Bay, Upton Lake mud and saltmarsh	Unfavourable - Declining	No assessment of Condition Threat undertaken	LITTORAL SEDIMENT	66.4052	SY 999 913

Table 15: Poole Harbour SSSI Condition Assessment 2017 summary table for Holes Bay Units 7, 8, 9, 10, 59 & 67 (Natural England, 2017)

Site: Poole Harbour SSSI

	Sites	Units	Units Assessed
Total number	1	55	55
Total area (ha)	4,112.35	4,112.35	4,112.35

	% meeting area of favourable or unfavourable recovering	Favourable	Unfavourable - Recovering	Unfavourable - No change	Unfavourable - Declining	Partially destroyed	Destroyed	Not Recorded
Area (ha)	3,597.61	3,065.65	531.96	9.21	505.53			
Percentage	87.48%	74.55%	12.94%	0.22%	12.29%	0.00%	0.00%	0.00%

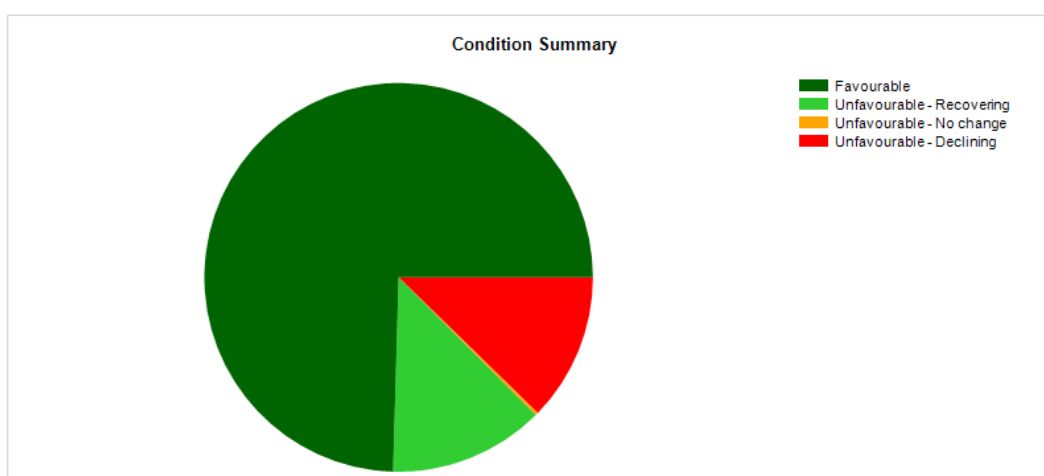


Table 16: Poole Harbour SSSI/SPA/Ramsar site Condition Assessment 2017 summary table (Natural England, 2017)

8 NATURE CONSERVATION DESIGNATIONS & CONSERVATION MEASURES

Poole Harbour receives national and international protection through the Wildlife and Countryside Act 1981, Habitats & Birds Directive 1992, The Conservation of Habitats and Species Regulations 2010 and Ramsar Convention 1971 in the form of a SSSI, SPA and Ramsar site respectively.

In 2016 the Poole Harbour SPA boundaries were extended to include below MLW and add spoonbill *Platalea leucorodia*, little egret *Egretta garzetta* and sandwich tern *Sternula sandvicensis* as qualifying features (Natural England 2018). In Holes Bay, this extension now encompasses the intertidal and sublittoral areas of Upton Lake, Creekmoor Lake and Backwater Channel. This protective legislation now includes a small Site of Nature Conservation Interest, previously known as Hawkwood Saltmarsh SNCI. The Poole Harbour SSSI which underpins the SPA, was also extended and notified in 2018 (Natural England, 2018b).

Holes Bay is home to Annexe I habitats of Atlantic salt meadows, coastal saltmarsh, intertidal mudflats and reedbeds as recorded in detail in *Appendix 14.6: Holes Bay Important Wildlife and Habitats*. These are all features of the Poole Harbour SPA and provide shelter and roosting for the wildfowl and waders.

Holes Bay also contains non-statutory habitat protection through Sites of Nature Conservation Interest (SNCI); Hawkwood Saltmarsh SNCI and Holes Bay Relief Road SNCI; small areas omitted from the neighbouring SSSI. (Dorset Wildlife Trust, 2016). After acknowledgement that this area was omitted from the original designation, Hawkwood SNCI has now been included in the revised Poole Harbour SPA (Burton, 2016).

Further details on all designations and conservation measures, citations and their qualifying features or important wildlife and habitats see *Appendix 14.14: Holes Bay Nature Conservation Designations and Conservation Measures*.

9 HOLES BAY PROPOSED SALTMARSH RE-CREATION STUDY

Several thousand cubic metres of sediment are naturally eroded away from Poole Harbour each year, as highlighted under *Section 7: Ecological Condition*, and a similar amount is lost to maintenance dredging (Drake and Bennett, 2011). In Holes Bay, Cobbs Quay Marina dredge 9,000m³ of sediment annually (PHC, 2010, Royal Haskoning 2005, Ramsbottom, 2012) and the RNLi also dredge less than 1,000m³ from their berths in Backwater Channel every 3-4 years (PHC, 2012). Both sites are vulnerable to siltation and are dredged to maintain the depth necessary for berthing and for access for seafaring vessels. The resulting spoil is transhipped from Holes Bay and deposited in nearby Swanage Bay (PHC, 2012). It is believed that this sediment does not return to the bay. All dredging is monitored under the PHC Maintenance Dredging Policy and Harbour Control and subject to their Harbour Works Licence and a Food and Environmental Protection Act licence from the Marine Management Organisation (MMO) (Drake and Bennett, 2011).

There is no strong evidence to show dredging affects the sediment budget or regime of Poole Harbour - the effects are thought to be more localised (PHC, 2010). The saltmarsh in Holes Bay is continuing to exhibit dieback; evident from aerial photographs as far back as circa 1914. The dieback rate has decreased over recent decades (See *Figure 21* & *Figure 22*) however, it is recognised that the loss of saltmarsh is still a concern. The exact reason for the dieback is not conclusive but factors such as: historic pollution, excessive root growth causing anaerobic soil conditions, boat activity causing erosion to the habitat and a natural cyclic process have been put forward (BCP, 2019. pers comm 11th April).

Network Rail owns a major asset in the railway embankment which runs through the bay. In recent years the armour layer of the structure has deteriorated requiring greater maintenance. It is believed that the primary cause of the degradation beyond normal deterioration is due to greater impact of wave energy caused by the considerable erosion of the mudflats and die-back of saltmarsh (BCP, 2019. pers comm 11th April).

Borough of Poole (BOP) previously carried out a feasibility study to determine the viability of a 5-year pilot project to regenerate the saltmarsh through beneficial reuse of this dredged material (Hawkes, 2015). The feasibility study was stopped due to unpredicted difficulty in trying to obtain the required consents. Following local levy funding in July 2018, the feasibility study has continued through BOP (Now Bournemouth, Christchurch and Poole) council (BCP, 2019). It is hoped that the pilot project could halt, and even reverse the current trend



Figure 21: Aerial view of Holes Bay showing sediment in 2000 (Getmapping, 2015)



Figure 22: Aerial view of Holes Bay showing a reduction in the sediment in 2012 (Getmapping, 2015a)

of die back within the saltmarsh community and mitigate against coastal squeeze resulting from sea level rise. See *Appendix 14.15: Holes Bay Saltmarsh Re-creation Project Progress for more information.*

10 MANAGEMENT AND RECOMMENDATIONS

The proposed area defining HBNP is subject to existing management policies and regulations from several statutory bodies which include Dorset County Council (now Dorset Council), PHC (2014), NE, EA, BOP (now Bournemouth, Christchurch & Poole Council), Southern IFCA, Marine Management Organisation with WW making up the membership of the Poole Harbour Steering Group. The aquatic management issues have been outlined in the voluntary (non-statutory) Poole Harbour Aquatic Management Plan drawn up by the Poole Harbour Steering Group (Drake and Bennett, 2011), while land-based issues are dealt with by supporting documents for Local Development Frameworks and Local Plans, particularly the Poole Local Plan 2012-33 (BOP, 2018).

There will be obvious overlaps between the voluntary plan and statutory plans, but both sets of sources are referred to given that future Holes Bay management will be on a voluntary partnership arrangement basis.

What difference will it make managing Holes Bay as a Nature Park?

Current management of Holes Bay represents the baseline situation, and for the purposes of this paper it is assumed that by focusing on likely changes in activities and related threats driven by change in the status of Holes Bay, relevant management responses can be suggested.

The Management Matrix contained in Section 2 of the Poole Harbour Aquatic Management Plan (Drake and Bennett, 2011) is a comprehensive framework covering the entire Poole Harbour complex, of which Holes Bay represents a subset of issues. As mentioned above, this matrix represents the baseline situation and the table listing activities with reference number is reproduced below. The right-hand column contains the suggested additional focus on the activity beyond what is described in the Aquatic Management Plan and reflects change in pressure due to Nature Park promotion noted under *Section 4.4: Impacts of Human Activities Upon the Nature Park*.

It is also assumed that where additional management measures are required that they would act only to supplement, (e.g. through voluntary measures or exceptionally proposed as byelaws), existing management measures contained in the referenced documents.

Figure 23 below, has been adapted from the Management Matrix in the Poole Harbour Aquatic Management Plan (Drake and Bennett, 2011) and Poole Harbour Site Improvement Plan (Natural England, 2014).

No.	Activity	Proposed Management Variation specific to HBNP management needs
1	Grazing of sika deer	Targeted monitoring for Pergin's Island and saltmarsh. Monitoring, management and restoration of damaged areas. Working with NE, RSPB and The Deer Initiative.
2	Nutrient enrichment, (diffuse agricultural run-off)	Partnership in the Poole Harbour Catchment Initiative. Improving the evidence base on algal mats.
3	Use of pesticides & herbicides	Partnership in the Poole Harbour Catchment Initiative
4	Soil erosion	Implementation of appropriate coastal management. Working with PHC, BOP, NE and EA.
5	Discharges from industry	WW & EA
6	Airborne emissions from traffic, industry & vessels	Research likely local impact on saltmarsh in Holes Bay. (See Section: 11.1)
7	Discharge of treated effluent from PSTW	WW

No.	Activity	Proposed Management Variation specific to HBNP management needs
8	Overflow of sewage from sewerage network	WW
9	Use of antifouling paints	Work with marinas locally to ensure compliance. Recommendation on subtidal survey of bio-indicator species.
10	Use of sacrificial anodes	Work with marinas locally to ensure compliance
11	Ballast water transfer	N/A
12	Discharge of waste from commercial & recreational vessels	Work with marinas locally to ensure compliance
13	Marine & terrestrial littering	Holes Bay Partnership baseline study on litter sources and work with Litter Free Coast & Sea and Marine Conservation Society. Work with BOP as main coordinator of litter picks in the area.
14	Managing the shoreline	Liaison with residents' groups on Hamworthy shoreline. Shoreline Management Plan for Poole Harbour (Halcrow, 2004). Extend the workings of 'Harbour Watch' with Poole Harbour Commissioners.
15	Shellfish dredging	Promote Southern IFCA byelaws and maintain awareness on the prohibition and health risks of bivalve removal for consumption. Support the assessment of the fisheries against the MSC standards.
16	Drift and set net fishing	Promote Southern IFCA seasonal fixed net byelaw closure.
17	Eel fishing	Work with the EA to promote their management and regulation of the eel fishery.
18	Bait digging	Review existing agreements considering published research and work with Southern IFCA and NE in their promotion. To erect additional bait digging interpretation panels at Symes Road and Falconer Crescent (North West access to Holes bay). Extend the workings of 'Harbour Watch' with PHC & promote bait digging MoA. Review the need for a possible byelaw to manage bait digging
19	Bait dragging	Maintain surveillance – fishery is unregulated.
20	Use of Hovercraft	Only applicable to RNLI.
21	Illegal fishing	Promote the prohibition of pump scoop dredging for cockles and clams, as per No. 15 & other Southern IFCA byelaws.
22	Pilotage & marine traffic management	Promote the PHC guidance on 6 knot speed limits.
23	Maintenance dredging	See <i>Holes Bay Proposed Saltmarsh Re-creation Study</i> .
24	Capital dredging	Review all subtidal survey work, interest features and protective legislation.
25	Anchoring	There are no 'anchorage sensitive zones' (containing seagrass beds), in Holes Bay.

No.	Activity	Proposed Management Variation specific to HBNP management needs
26	All recreational activity	Prepare recreational management plan informed by survey of use amongst residents and visitors and movement counts. Creation of bird disturbance guidance – safe distances for observers, kayakers and boat users, with a focus on reducing crossover at bird flight paths.
27	Yacht racing	N/A
28	Other non-motorised watercraft	Improved signage to educate and instruct. Creation of a recreational ‘safe bird distance’ Code of Conduct.
29	Windsurfing and Kitesurfing	N/A
30	Wildfowling	Areas in Poole Harbour covered by permit (excluding Holes Bay) are only accessible by boat and not by foot (Dorset Wildfowling Association, 2010)
31	Dog walking and uncontrolled dogs	Upgrade educational material, signage, review of dog waste bins; sponsor partnership working with Dorset Dogs. Reed screening, scrub and path layout at UCP to reduce the impact of human trampling and dogs on bird disturbance across mudflats and through reedbeds. Educate, relate and inform the public through guided walks with Dorset Dogs, Bird, Marine interest guided walks and events.
32	Potential for illegal egg collecting	Educate, relate and inform the public through guided walks with Dorset Dogs, Bird, Marine interest guided walks and events.
33	Unauthorised landing on shorelines	Improved signage to educate and instruct
34	Shoreline & intertidal based development	Liaise with partners and ensure responses are written to any such enquiries/consultations.
35	Yachting	Work with marinas locally
36	Motor boating	Work with marinas locally
37	Moorings	All moorings are managed and regulated by Poole Harbour Commissioners
38	Water-skiing / Wakeboarding and Personal Watercraft	Work with marinas locally Creation of a recreational ‘safe bird distance’ Code of Conduct.
39	Low flying aircraft, helicopters & drones	Review need for no-fly zone for Holes Bay to reduce disturbance to birds.
40	Chemical transportation by ship & storage on land	N/A
41	Archaeological excavations	Permissions through NE, BOP or PHC.

Figure 23: Holes Bay Management Matrix (as adapted from Drake and Bennett, 2011)

As part of the Improvement Programme for England’s Natura 2000 Sites (IPENS), a Site Improvement Plan for Poole Harbour has been written (Natural England, 2014). This plan has regard to the bird interest features for which Poole Harbour was designated SPA and provides an overview of the current and predicted issues faced, their measure and the delivery bodies involved (Natural England, 2014). Further management policies, agreements and legislation can be viewed under *Appendix 14.14: Nature Conservation Designations and Conservation Management*.

This Report, informed by the above-mentioned statutory and non-statutory plans, will serve to facilitate biannual meetings of the consortium of stakeholders involved in the HBNP and launch as a

precursor to a proposed Management Plan and Memorandum of Understanding. By sharing information, this will offer a more co-ordinated approach for further study, surveys, research and analysis:

- Within these documents to agree:
 - To define the terrestrial boundary of the HBNP. A proposed area and justifications has been detailed in *Proposed Boundary Map of the Holes Bay Nature Park* and *Proposed Reasoning for Holes Bay Nature Park Boundary*.
 - Hamworthy Creeks (south of Cobbs Quay Marina) to be recognised as a potential Nature Reserve
 - To prioritise management of disturbance toward birds and other wildlife. To agree a minimum safe boat distance from birds to reduce flush rates and distress through RNLI, Cobbs Quay and Davis's Boatyard and other users. To produce a Code of Conduct for recreational bird watching from boats, watercraft and the shoreline.
 - To raise the profile of Holes Bay as a single site and not just a subsidiary site of Poole Harbour and to understand its ecological sensitivity.
 - To promote the subtidal waters of the HBNP as a varied marine environment through visually appealing marine maps to highlight species and habitats with conservation importance.
 - To work with user groups and manage volunteer watches, surveys and wardens to promote the HBNP.
- Acknowledge HBNP as shellfish refuge in providing the opportunity for further study as a control site for cockles and clams.
- Utilise opportunities to reach wide ranging recreational audiences through innovative interpretation.
- To design and deliver a variety of guided walks and informative web pages to contribute to sensitive access opportunities, increased awareness of HBNP and potential human impacts.

11 SURVEYING AND MONITORING RECOMMENDATIONS

11.1 Subtidal Surveys

Holes Bay has received limited subtidal study since Dyrinda's baseline studies in the 1980s and it would be beneficial to have a more recent understanding of the biological communities there, particularly of the rare sea sponge *S. massa* and flat oyster *O. edulis*. These species that are rare, scarce or sensitive to pressure should receive regular monitoring, particularly considering the saltmarsh re-creation study. The native oyster *O. edulis*, Species of Principal Importance (JNCC, 2014a) is highly sensitive to siltation and in the 1980s was previously abundant in Backwater Channel.

Despite records from Dyrinda (1983, 1985), It is not known whether peacock worm *S. pavonina* still resides in Backwater Channel. Some targeted survey work in this area would be necessary to clarify.

It is recommended that further subtidal study is conducted repeating that of Dyrinda's work from 1983, 1985 & 1989. Particularly since his work predated the introduction or known naturalisation of Manila clam *R. philippinarum* and Pacific oyster *C. gigas* for aquaculture. Liley & Underhill-Day (2009) suggest repeating such a survey of interest features in Backwater Channel every ten years, to highlight changes and to guide works.

Herbert *et al* (2010) conducted a detailed survey of the Holes Bay intertidal biotopes to assess the condition of the Poole Harbour SSSI. Using drop down cameras, dredge sampling and diver surveys, a subtidal biotope map could also be created using Dyrinda's baseline studies. Results would inform all future management of the HBNP and provide a comprehensive and detailed understanding of the subtidal environment.

Further research on chemical contamination should be included in studies of HBNP, particularly about activities that disturb sediment and saltmarsh.

The agricultural run-off, managed sewage and airborne emissions input falls within a complex channel system and is known to attribute to loss of transition saltmarsh habitats. Their relation to the problem of die back and loss of diversity could be an area for future research in understanding potential trigger points and key moments for die back.

11.2 Non-native Species

Dyrinda's studies (1983, 1985) pre-dated the introduction of Manila clam *R. philippinarum* and Pacific oyster *C. gigas*. It would be of interest to understand what effect these non-native species, and particularly the invasive slipper limpet *C. fornicata*, may have had upon native communities.

11.3 Wildfowl and Waders

Effective access management to mitigate human pressure within the HBNP could include a review of the influence of proximity of public access to birds, based on work already undertaken by Morrison (2015). This could include an understanding of boating routes upon bird flight channel use, bird refuge areas and creating a suitable code of conduct for watching birds from land or by boat. Dog screens would minimise flushing and would complement possible screened hides or boardwalks.

It would be beneficial to further understand the factors affecting northern Holes Bay and how the BSA forms part of a complex of bird sites throughout the rest of the Poole Harbour SPA.

Further research could enable an understanding into the bioaccumulation risk in bird populations and at what sediment depth the uptake pathway of contaminants may occur. It may not be feasible to test live birds, but it would be worthwhile to analyse recovered bird corpses from Holes Bay.

11.4 Visitor Access

There is some understanding of the types of access and locations thanks to the research by Liley & Fearnley (2012), Fearnley (2014), Borough of Poole (2015b), Pearce (2015), Morrison (2015), Panter & Liley (2015). More recently, Footprint Ecology submitted a Habitats Regulations Assessment (HRA) to BOP in support of the new Poole Local Plan. As part of the process to inform this HRA work, the BOP commissioned targeted visitor surveys at a selection of locations around the Poole Harbour shoreline. This visitor survey (undertaken in the winter 2016), collected home postcode data and other information on access patterns through face-face interviews with a random sample of visitors. The full results of the survey are in a separate report (Panter & Liley, 2016).

It would still be of great interest to determine and compare the numbers and demographics of the people accessing the HBNP on an annual basis.

11.4.1 Trampling damage

Reedbed and saltmarsh trampling is known to occur in Pergin's Island and the north and west aspect of Holes Bay. Some of this occurs through access to Holes Bay from UCP and these pathways are plainly visible. Increased signage and public engagement on reducing such impacts may help but perhaps funding could be sought to erect further screens or natural barriers to discourage the act.

11.5 Pollution

11.5.1 Litter

Beach cleans have been conducted occasionally at Holes Bay but coordination between the HBNP landowners along with local businesses could enable further awareness and understanding on the source of the litter. This is only possible where items are painstakingly recorded as part of a wider survey. For the last 25 years, the Marine Conservation Society has been coordinating *Beachwatch* – the national beach cleaning and litter surveying programme (MCS, 2016a).

The main concern over events of this kind are to minimise any such impact to the interest features of the Poole Harbour SPA. See *Section 14.14: Holes Bay Nature Conservation Designations and Conservation Measures*. Providing Natural England are consulted and in agreement, the HBNP could 'adopt' the area for annual beach cleans. This would most likely occur within the area south of the railway line, during the summer season to avoid the overwintering wildfowl and waders.

12 CONCLUSIONS

Holes Bay is a longstanding important area for the maritime sector in its southern area but at the same time is a secluded wildlife haven to its north. Despite the opposing conflicts these might present, the HBNP creates a beneficial relationship whereby both the commercial use and natural environment are valuable to the conurbation. Engaging with landscape and wildlife is highly beneficial for public health with the wide range of species and large numbers of rare significant species. HBNP offers many opportunities for those pursuing access, physical fitness, or recreation and with adequate awareness, users will understand the sensitivity of the site and continue to minimise their impact. Balancing the desire for public access with the needs of an internationally important wetland habitat, does though pose a challenge.

The ecological profile of HBNP has undergone dramatic changes over the last century – infilling and disturbance has reduced the size and dynamics of the area; loss of sedimentation, the die-back of cord grass and the disappearance of seagrass. The ecological condition of the HBNP is in some instances of concern due to the historical industrial input of heavy metals and metalloids locked away in the sheltered sediments north of the railway embankment, the elevated levels of TBT in the water column of Backwater Channel and the increasing level of nitrogen and phosphorus from historical agricultural input and to a lesser extent, the PSTW. These have both fuelled the excessive algal mat coverage throughout most of Holes Bay.

The annelid species nevertheless appear to show a tolerance of the sediment contaminants and along with the overwintering BSA, these and other prey species, attract 26 species of wildfowl and waders. Beneath the waves, the nursery area provides safe refuge for 11 species of fin fish, protected through local netting and dredging byelaws. Both native seahorse species have been recorded yet it is questionable as to whether they reside in Holes Bay. Further understanding of the subtidal invertebrates is much needed and a comparable survey repeating Dyrinda's baseline research, documenting 120 different species and 30 years ago, is long overdue. Since this time, 54 important species and habitats of international important wildfowl and waders, coastal habitats and commercially important fin fish have been recorded in Holes Bay.

HBNP is without doubt, of high commercial and recreational value. Throughout the last century commercial growth has reduced the intertidal area dramatically but HBNP continues to boast internationally important habitats and interest features.

Given the informal status of HBNP, the primary challenge is to achieve management coordination and clear designation of focal points within responsible partner agencies. It will build upon the management framework completed for the Poole Harbour Aquatic Management Plan and respond to the identified changes in pressure due to HBNP promotion.

It is anticipated, this report will continue to inform all relevant planning applications, the forthcoming Management Plan and Memorandum of Understanding in seeking to promote Holes Bay as a commercially important, highly prized and ecologically sensitive Nature Park.

13 REFERENCES

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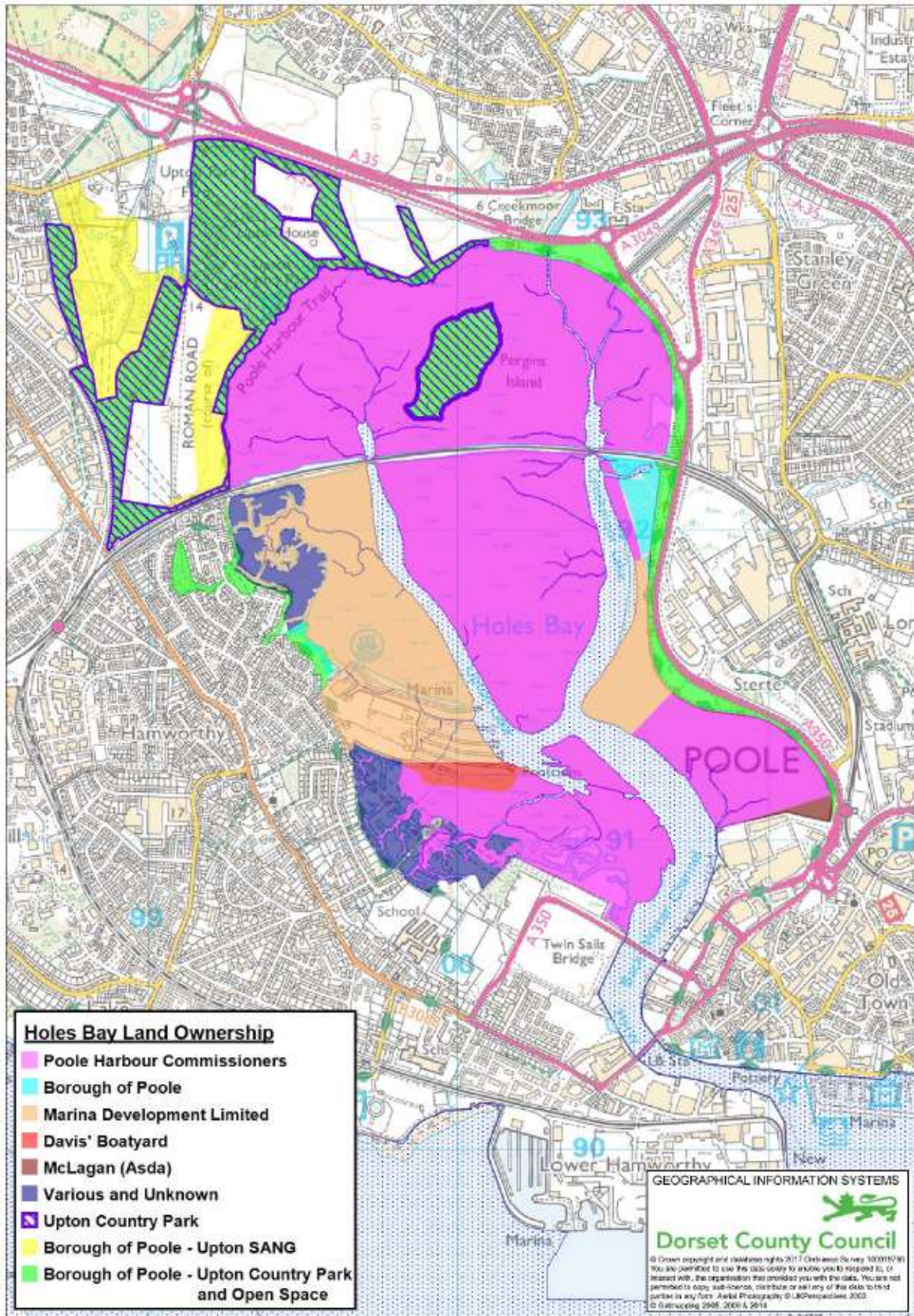
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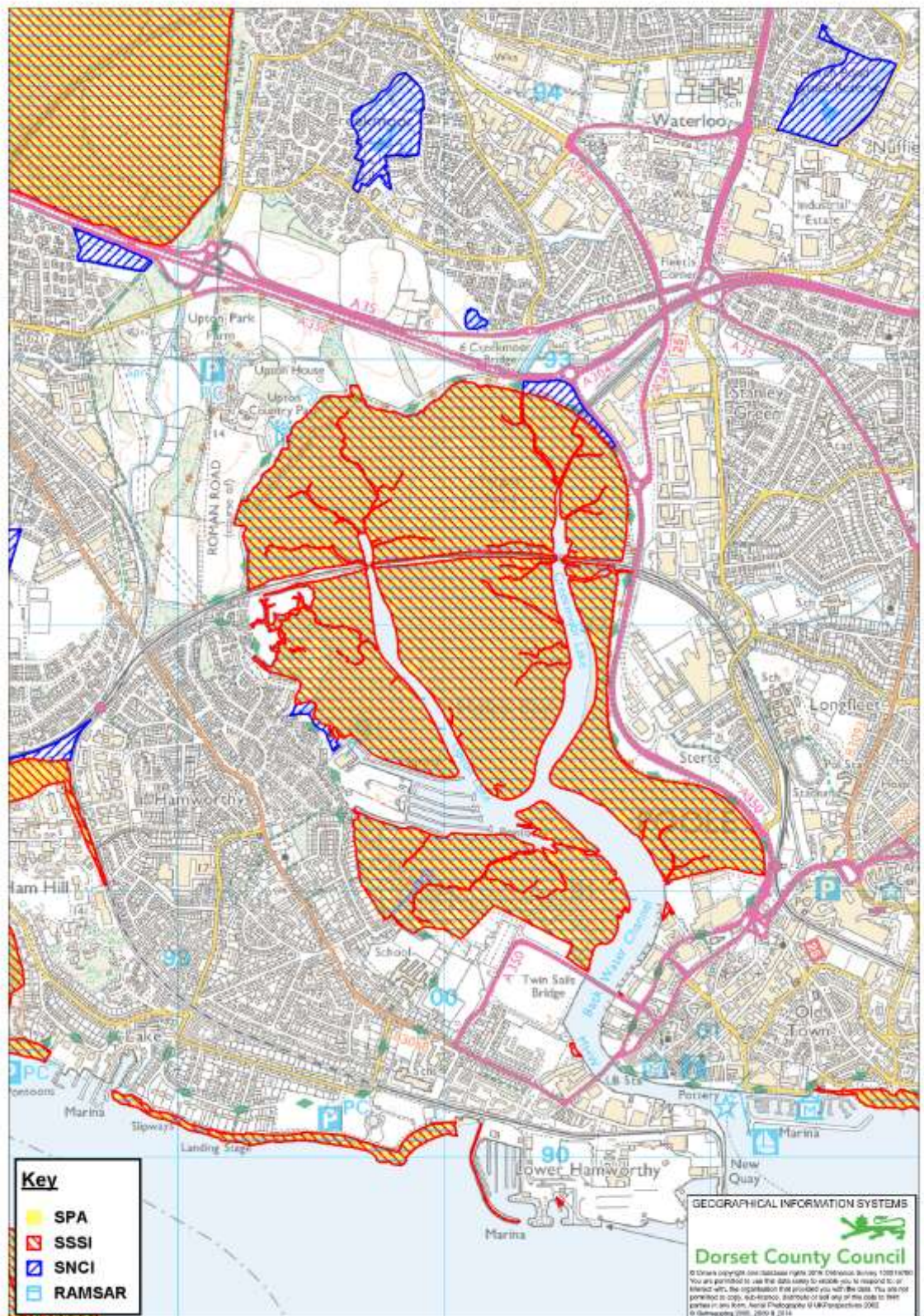
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14 APPENDICES

14.1 Holes Bay Nature Park Land Ownership Map



14.2 Holes Bay Designations Map



14.3 Holes Bay Nature Park Interpretation Panels

THE GREAT HEATH LIVING LANDSCAPE HOLES BAY NATURE PARK



Holes Bay Nature Park is located in the heart of Poole and makes a huge contribution to the high quality natural environment enjoyed by residents, visitors and local businesses. The area also provides important space for wildlife and for people to enjoy nature and outdoor activities. From this spot you have the chance to get as close to rare and beautiful nature as it gets.
Welcome to Holes Bay!



Poole Harbour is the largest natural harbour in Britain, an internationally important protected area for wildlife. It is a Special Protection Area for birds, Ramsar wetland and Site of Special Scientific Interest.
It has been a govt owned Roman site, played a part in preparations for D-Day and is now a popular place for leisure boat users, fishing and angling as well as commercial fishing.



Help us look after this special place
• Bag it & bin it - take all litter away with you
• Can we help?
• Fishing is allowed but to protect the sea nursery we fishing from June 20th April to 1st November so head out to start in late September. Please follow minimum size - head first directions.
• Commercial harvesting of shellfish is not allowed in Holes Bay due to historic contamination. Permits are required for any commercial fishing.
• Boat Navigation Area Nov - March
• Please don't drink or let your dog drink the water. Please bag dog poo in bin or keep it up!
• Take care - the water, mudflats and wet rocks are dangerous

The part of the shore is a **Site of Nature Conservation Interest**, providing protected sites and swampy areas for all sorts of wildlife. In spring and summer look out for the pale green flowered wild corydalis and the rare round-headed blue fly, and for insects from grasshoppers to bees & butterflies.



A special place for birds
Up to 20,000 waders and migrating birds, at a time can be found in the Harbour in winter! Why? One reason is the incredible mud which is very rich in nutrients, perfect food for wading birds when the mud is exposed, look out for them in autumn, winter and spring.

Mud of life
Poole Harbour's mud is teeming with life. It is home to more than 80 species of worms, crustaceans, molluscs, insect larvae and even fish, providing much needed food for birds, especially during migration and in winter when the sheltered corner of Poole Harbour is an important refuge.

Did you know?
Holes Bay is home to a variety of fish and shellfish, from bass, mackerel and flounder to swimming crabs, gobies, gulls and oysters.



Beach Digging Code
• Dig only where you need for your own use
• Don't dig any further than you go
• Don't disturb birds and wildlife
• Avoid digging in mudflats
• Digging is in any time
• Beach Digging - please bag litter from 1st November to 31st February
• Head first - minimum size must be between 1st November & 31st March
• This digging is subject to local authority planning permission
• Please report any concerns about the site on 01202 341780 or www.phc.gov.uk/report



THE GREAT HEATH LIVING LANDSCAPE HOLES BAY NATURE PARK



Holes Bay Nature Park is located in the heart of Poole and makes a huge contribution to the high quality natural environment enjoyed by residents, visitors and local businesses. The area also provides important space for wildlife and for people to enjoy nature and outdoor activities. From this spot you have the chance to get as close to rare and beautiful nature as it gets.
Welcome to Holes Bay!



Poole Harbour is the largest natural harbour in Britain, an internationally important protected area for wildlife. It is a Special Protection Area for birds, Ramsar wetland and Site of Special Scientific Interest.
There is a dazzling variety of hidden wildlife here, from at least 12 species of fish overwintering the shallow waters to over 80 species of worms, crustaceans, molluscs and insect larvae in the incredibly rich mud.



Help us look after this special place
• Bag it & bin it - take all litter away with you
• Can we help?
• Fishing is allowed but to protect the sea nursery we fishing from June 20th April to 1st November so head out to start in late September. Please follow minimum size - head first directions.
• Commercial harvesting of shellfish is not allowed in Holes Bay due to historic contamination. Permits are required for any commercial fishing.
• Boat Navigation Area Nov - March
• Please don't drink or let your dog drink the water. Please bag dog poo in bin or keep it up!
• Take care - the water, mudflats and wet rocks are dangerous

A special place for birds
In winter birds need all their energy to find enough food to survive, so it is vital that they are not disturbed while feeding or resting. The area north of the railway line is a bird sensitive area, a refuge for internationally significant numbers of birds. Please avoid any activities that could cause disturbance between November and March. Watchers at birds@pooleharbour.co.uk

Mud of life
Poole Harbour's mud is teeming with life. It is home to more than 80 species of worms, crustaceans, molluscs, insect larvae and even fish, providing much needed food for birds, especially during migration and in winter when the sheltered corner of Poole Harbour is an important refuge.

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14.4 Holes Bay Public Interpretation Map



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- | | | |
|--------------------|---------------------|-----------------------------|
| Castleman Trailway | Public Footpath | Poole Harbour Trails Walk 6 |
| Cycleway/footpath | Permissive Footpath | Poole Heritage Cycle Route |
| National Cycleway | Public bridleway | |

14.5 Holes Bay Nature Park Waterways Map

Dorset Explorer (2016)



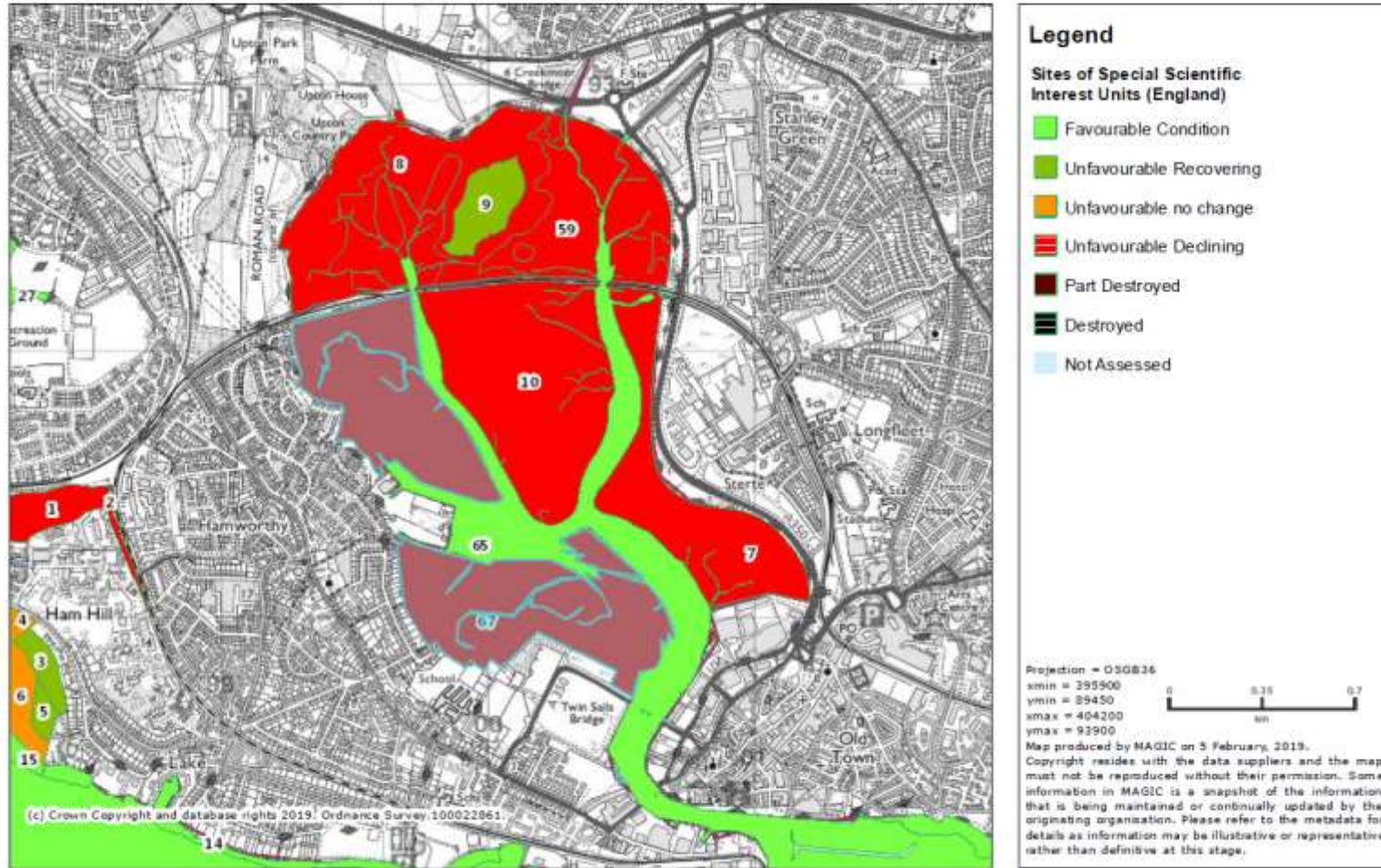
KEY:

1=Symes Road Ditch 2=Dead Man's Ditch 3=Creekmoor Stream 4=Fleet 5=Sterte Stream.

14.6 Poole Harbour SSSI Condition Assessment of Holes Bay Units 2017 Map (Magic, 2018)

MAGiC

Magic Map



14.7 Holes Bay Important Wildlife and Habitats

Latin Name	Common Name/Description	Designation/Conservation Measure	Location (present)	Recorder
	<p>Atlantic Salt Meadows</p> <p>Wide habitat type including all lower, middle and upper marsh vegetation dominated by one of more of <i>Agrostis stolonifera</i>, <i>Aster tripolium</i>, <i>Atriplex portulacoides</i>, <i>Eleocharis uniglumis</i>, <i>Festuca rubra</i>, <i>Juncus gerardii</i>, <i>Plantago maritima</i>, <i>Puccinellia maritima</i> and <i>Triglochin maritimum</i>.</p>	<ul style="list-style-type: none"> Annexe I Habitat SPA (Natural England, 2016) 	Western Holes Bay	Edwards, (2004)
	<p>Mediterranean Salt Meadows</p> <p><i>Juncus maritimus</i> dominated NVC communities</p>	<ul style="list-style-type: none"> Annexe I Habitat SPA (Natural England, 2016) 	Western Holes Bay	Edwards, (2004)
	<p>Coastal saltmarsh</p> <p>Estuaries, <i>Salicornia</i> and other annuals colonising mud and sand, <i>Spartina</i> salt meadows and Mediterranean and thermo-Atlantic halophilous scrubs</p>	<ul style="list-style-type: none"> Habitats Directive – Annex I Sub-feature of the Poole Harbour SPA (Natural England, 2016) Habitat of Principal Importance (JNCC, 2015a) 	Holes Bay – low water mark to 1 metre above the EHW Springs	Herbert, <i>et al</i> (2010)
	<p>Intertidal mudflats</p> <p>In areas of lowered salinity, characteristic species are: common cockle <i>Cerastoderma edule</i>, sand-hopper <i>Corophium volutator</i>, laver spire shell <i>Hydrobia</i></p>	<ul style="list-style-type: none"> Habitat of Principal Importance (JNCC, 2015b) OSPAR habitat Sub-feature of the Poole Harbour SPA (Natural England, 2016) 	Holes Bay	Herbert, <i>et al</i> (2010)

Latin Name	Common Name/Description	Designation/Conservation Measure	Location (present)	Recorder
	<i>ulvae</i> , ragworm <i>Hediste diversicolor</i> and large numbers of oligochaete annelids (principally <i>Tubificoides spp</i>). With a slight increase in the proportion of sand, the polychaetes catworm <i>Nephtys hombergii</i> and lugworm <i>Arenicola marina</i> occur.			
	Shallow inland waters including lagoons	Sub-feature of the Poole Harbour SPA	Holes Bay	
<i>Anas acuta</i>	Pintail	<ul style="list-style-type: none"> • Feature of the Poole Harbour SSSI (NE, 2016b) • BoCC4 Amber List (RSPB, 2015) 	<p>North west Holes Bay 2004, 2007 & 2012-16</p> <p>North east Holes Bay 2003-14, 2016</p> <p>South east Holes Bay 2007, 2011, 2015</p> <p>South west Holes Bay 2003; 2005; 2011</p>	<p>Birds of Poole Harbour, (2016a)</p> <p>Birds of Poole Harbour, (2016b)</p> <p>Birds of Poole Harbour, (2016c)</p> <p>Birds of Poole Harbour, (2016d)</p>
<i>Anas crecca</i>	Teal	<ul style="list-style-type: none"> • Feature of the Poole Harbour SSSI (NE, 2016b) • BoCC4 Amber List (RSPB, 2015) 	<p>North west Holes Bay 2004, 1998-99, 2003 & 2006-16</p> <p>North east Holes Bay 1998-99, 2003-16</p> <p>South east Holes Bay 1998-99, 2003-16</p> <p>South west Holes Bay 1998-99, 2003; 2005-2007; 2011-16</p>	<p>Birds of Poole Harbour, (2016a)</p> <p>Birds of Poole Harbour, (2016b)</p> <p>Birds of Poole Harbour, (2016c)</p> <p>Birds of Poole Harbour, (2016d)</p>

Latin Name	Common Name/Description	Designation/Conservation Measure	Location (present)	Recorder
<i>Anguilla anguilla</i>	European eel (adult & silver eel)	<ul style="list-style-type: none"> IUCN Red List (critically endangered) (Jacoby & Gollock, 2014) Species of Principal Importance (JNCC, 2014a) OSPAR list of threatened and/or declining species and habitats. (OSPAR, 2016) 	<p>Holes Bay (mid-spring – autumn)</p> <p>Cobbs Quay October- December</p>	<p>Dyrynda (1983, 1989a)</p> <p>Green, 2016, pers. comm., 27 April</p>
<i>Ardea cinerea</i>	Grey heron	<ul style="list-style-type: none"> Feature of the Poole Harbour SSSI (NE, 2016b) (aggregations during breeding season) 	<p>North west Holes Bay 2004, 1998-99, 2003-15</p> <p>North east Holes Bay 1998-99, 2003-16</p> <p>South east Holes Bay 1998, 2003-15</p> <p>South west Holes Bay 1998, 2003, 2005, 2007, 2011-16</p>	<p>Birds of Poole Harbour, (2016a)</p> <p>Birds of Poole Harbour, (2016b)</p> <p>Birds of Poole Harbour, (2016c)</p> <p>Birds of Poole Harbour, (2016d)</p>
<i>Atherina presbyter</i>	Sand smelt (juvenile)	<ul style="list-style-type: none"> IUCN Red List (least concern) (Gon, 2015) Commercially important. 	Holes Bay west	Southern IFCA (2015)
<i>Aythya farina</i>	Pochard	<ul style="list-style-type: none"> Feature of the Poole Harbour SSSI (NE, 2016b) BoCC4 Red List (RSPB, 2015) 	<p>North west Holes Bay 2004, 2003, 2005, 2007</p> <p>North east Holes Bay 1999, 2004-07, 2010</p> <p>South east Holes Bay 2010</p>	<p>Birds of Poole Harbour, (2016a)</p> <p>Birds of Poole Harbour, (2016b)</p> <p>Birds of Poole Harbour, (2016c)</p>

Latin Name	Common Name/Description	Designation/Conservation Measure	Location (present)	Recorder
<i>Branta bernicla</i>	Brent goose (dark-bellied)	<ul style="list-style-type: none"> • Feature of the Poole Harbour SSSI (NE, 2016b) • BoCC4 Amber List (RSPB, 2015) 	<p>North west Holes Bay 2004, 2004</p> <p>South east Holes Bay 2010, 2013.</p> <p>South west Holes Bay 1998, 2005, 2014</p>	<p>Birds of Poole Harbour, (2016a)</p> <p>Birds of Poole Harbour, (2016c)</p> <p>Birds of Poole Harbour, (2016d)</p>
<i>Bucephala clangula</i>	Goldeneye	<ul style="list-style-type: none"> • Feature of the Poole Harbour SSSI (NE, 2016b) • BoCC4 Amber List (RSPB, 2015) 	<p>North west Holes Bay 2004, 2003-04, 2010</p> <p>North east Holes Bay 1998-99, 2003-10, 2013</p> <p>South east Holes Bay 1998-99, 2004-12, 2014-16</p> <p>South west Holes Bay 1998-99, 2003, 2005, 2012.</p>	<p>Birds of Poole Harbour, (2016a)</p> <p>Birds of Poole Harbour, (2016b)</p> <p>Birds of Poole Harbour, (2016c)</p> <p>Birds of Poole Harbour, (2016d)</p>
<i>Calidris alpina</i>	Dunlin	<ul style="list-style-type: none"> • Feature of the Poole Harbour SSSI (NE, 2016b) • BoCC4 Amber List (RSPB, 2015) 	<p>North west Holes Bay 1998, 2003-04, 2007-08, 2011-16</p> <p>North east Holes Bay 1998-99, 2003-07, 2009-16</p> <p>South east Holes Bay 1998-99, 2003-07, 2009-16</p> <p>South west Holes Bay 1998-99, 2003, 2005, 2007, 2011-12, 2015.</p>	<p>Birds of Poole Harbour, (2016a)</p> <p>Birds of Poole Harbour, (2016b)</p> <p>Birds of Poole Harbour, (2016c)</p> <p>Birds of Poole Harbour, (2016d)</p>

Latin Name	Common Name/Description	Designation/Conservation Measure	Location (present)	Recorder
<i>Chelon labrosus</i>	Thick-lipped grey mullet	<ul style="list-style-type: none"> IUCN Red List (least concern) Freyhof & Kottelat (2008a) Commercial and recreational importance. 	North east Holes Bay & Creekmoor Lake	Dyrynda, 1983, 1985, 1989a)
<i>Cochlearia anglica</i>	English scurvy grass	<ul style="list-style-type: none"> Dorset notable species International responsibility – the UK holds more than 25% of the European population (Dines <i>et al</i>, 2005). 	Holes Bay Relief Road Site of Nature Conservation Interest (SNCI) (Dorset Wildlife Trust, 2016)	Marler, (2014)
<i>Cladium mariscus</i>	Greater Fen-sedge	<ul style="list-style-type: none"> Poole Harbour Ramsar site qualifying species (English Nature, 1999; JNCC, 1999, 2008) 	Holes Bay saltmarsh	No records found in Holes Bay
<i>Clupea harengus</i>	Herring (juvenile)	<ul style="list-style-type: none"> Species of Principal Importance (JNCC, 2014a) IUCN Red List (Least concern) (Herdson & Priede, 2010) Commercially important. 	Holes Bay	Environment Agency (2016a)
<i>Dicentrarchus labrax</i>	Sea Bass (Adult & juvenile)	<ul style="list-style-type: none"> The Bass (Specified Areas) (Prohibition of Fishing) Order 1990: Bass Nursery Area Poole Harbour (30th April-1st November). IUCN Red List (Least concern) Freyoff & Kottelat (2008a) 	<p>Holes Bay</p> <p>Holes Bay (west)</p> <p>Holes Bay</p> <p>Backwater Channel</p>	<p>Environment Agency (2016a)</p> <p>Southern IFCA (2015)</p> <p>Green, 2016, pers. comm., 27 April</p> <p>Dyrynda, (1989a)</p>
<i>Egretta garzetta</i>	Little Egret (Non-breeding)	<ul style="list-style-type: none"> Feature of the Poole Harbour SSSI (NE, 2016b) Feature of the extended Poole Harbour SPA (Natural England, 2016, 2018). 	<p>North west Holes Bay 1998, 2003-16</p> <p>North east Holes Bay 1998-99, 2003-16</p>	<p>Birds of Poole Harbour, (2016a)</p> <p>Birds of Poole Harbour, (2016b)</p>

Latin Name	Common Name/Description	Designation/Conservation Measure	Location (present)	Recorder
			South east Holes Bay 1998-99, 2003-16	Birds of Poole Harbour, (2016c)
			South west Holes Bay 1998-99, 2003, 2005-07, 2011-16.	Birds of Poole Harbour, (2016d)
<i>Farrella repens</i>	A bryozoan	<ul style="list-style-type: none"> Feature of the Poole Harbour SSSI (Natural England, 2016ba) 	Upper Holes Bay Channel	Dyrynda (1983; 1989a) Source: DERC (2016)
<i>Hippocampus spp.</i>	A seahorse	<ul style="list-style-type: none"> Wildlife and Countryside Act 1981 (as amended) and improved by the Countryside and Rights of Way Act 2000 (JNCC, 2014b) 	South-west Holes Bay Fisherman's Dock (2016)	Unconfirmed species sighting, Natural England (2017) The Seahorse Trust, (2017)
<i>Hippocampus guttulatus</i>	Spiny seahorse	<ul style="list-style-type: none"> Wildlife and Countryside Act 1981 (as amended) and improved by the Countryside and Rights of Way Act 2000 (JNCC, 2014b) IUCN Red List (data deficient) (Pollom, 2017) 	South of Cobbs Quay Marina 2010 Fisherman's Dock (2006, 2010, 2017)	Garrick-Maidment, (2010) & The Seahorse Trust, (2017) Dorset Wildlife Trust (2017)
<i>Hippocampus hippocampus</i>	Short-snouted seahorse	<ul style="list-style-type: none"> Wildlife and Countryside Act 1981 (as amended) and improved by the Countryside and Rights of Way Act 2000 (JNCC, 2014b) IUCN Red List (data deficient) (Woodall, 2017) 	Northern Holes Bay (south of the railway line) South of Cobbs Quay Marina 2008 Backwater Channel 2005.	Garrick-Maidment, (2010) & Seahorse Trust, (2017)
<i>Larus melanocephalus</i>	Mediterranean gull (Breeding)	<ul style="list-style-type: none"> BoCC4 Amber List (RSPB, 2015) Qualifying species of the Poole Harbour Ramsar site (English Nature, 1999; JNCC, 1999; 2008) 	North east Holes Bay 2012 South east Holes Bay 2012 & 2016	Birds of Poole Harbour, (2016b) Birds of Poole Harbour, (2016c)

Latin Name	Common Name/Description	Designation/Conservation Measure	Location (present)	Recorder
		<ul style="list-style-type: none"> Annexe I Feature of the Poole Harbour SPA (Natural England, 2016) 		
<i>Larus michahellis</i>	Yellow-legged gull (Non-breeding)	<ul style="list-style-type: none"> Feature of the Poole Harbour SSSI (NE, 2016b) BoCC4 Amber List (RSPB, 2015) 	<p>North west Holes Bay 1998, 2003, 2012, 2014</p> <p>North east Holes Bay 1998-99, 2004-14</p> <p>South east Holes Bay 1998, 2003-09, 2012-14, 2016</p> <p>South west Holes Bay 1998, 2003, 2007.</p>	<p>Birds of Poole Harbour, (2016a)</p> <p>Birds of Poole Harbour, (2016b)</p> <p>Birds of Poole Harbour, (2016c)</p> <p>Birds of Poole Harbour, (2016d)</p>
<i>Larus ridibundus</i>	Black headed gull	<ul style="list-style-type: none"> Feature of the Poole Harbour SSSI (NE, 2016b) BoCC4 Amber List (RSPB, 2015) 	<p>North west Holes Bay 1998-99, 2003, 2005, 2007-10, 2012, 2014, 2016</p> <p>North east Holes Bay 1998-99, 2003-16</p> <p>South east Holes Bay 1998-99, 2003-16</p> <p>South west Holes Bay 1998-99, 2003, 2007, 2012, 2013</p>	<p>Birds of Poole Harbour, (2016a)</p> <p>Birds of Poole Harbour, (2016b)</p> <p>Birds of Poole Harbour, (2016c)</p> <p>Birds of Poole Harbour, (2016d)</p>
<i>Limosa islandica</i>	Black-tailed godwit	<ul style="list-style-type: none"> Species of Principal Importance (JNCC, 2014a) BoCC4 Red List (RSPB, 2015) 	<p>North west Holes Bay 1998-99; 2003-04 & 2006-16</p> <p>North east Holes Bay 1998-99 & 2003-16</p>	<p>Birds of Poole Harbour, (2016a)</p> <p>Birds of Poole Harbour, (2016b)</p>

Latin Name	Common Name/Description	Designation/Conservation Measure	Location (present)	Recorder
		<ul style="list-style-type: none"> Qualifying species of the Poole Harbour Ramsar site (English Nature, 1999; JNCC, 1999; 2008) Feature of the Poole Harbour SPA (Natural England, 2016) Feature of the Poole Harbour SSSI (NE, 2016b) 	<p>South east Holes Bay 1998-99 & 2003-16</p> <p>South west Holes Bay 1998-99; 2003; 2006-07; 2011-12; 2014-16</p>	<p>Birds of Poole Harbour, (2016c)</p> <p>Birds of Poole Harbour, (2016d)</p>
<i>Mergus serrator</i>	Red-breasted Merganser	<ul style="list-style-type: none"> Feature of the Poole Harbour SSSI (NE, 2016b) 	<p>North west Holes Bay 1998, 2003-04, 2010.</p> <p>North east Holes Bay 1998-99, 2005, 2008, 2010, 2016</p> <p>South east Holes Bay 1998-99, 2004-16</p> <p>South west Holes Bay 1998-99, 2003, 2005, 2012-14, 2016.</p>	<p>Birds of Poole Harbour, (2016a)</p> <p>Birds of Poole Harbour, (2016b)</p> <p>Birds of Poole Harbour, (2016c)</p> <p>Birds of Poole Harbour, (2016d)</p>
<i>Mugilidae</i>	Grey mullet species	<ul style="list-style-type: none"> Commercial and recreational importance. 	<p>Holes Bay</p> <p>Creekmoor Lake</p>	<p>Environment Agency (2015a)</p> <p>Dyrynda, (1989a)</p>
<i>Numenius arquata</i>	Curlew	<ul style="list-style-type: none"> Feature of the Poole Harbour SSSI (NE, 2016b) BoCC4 Red List (RSPB, 2015) 	<p>North west Holes Bay 1998-99, 2003-16</p> <p>North east Holes Bay 1998-99, 2003-16</p> <p>South east Holes Bay 1998-99, 2003-16</p>	<p>Birds of Poole Harbour, (2016a)</p> <p>Birds of Poole Harbour, (2016b)</p> <p>Birds of Poole Harbour, (2016c)</p>

Latin Name	Common Name/Description	Designation/Conservation Measure	Location (present)	Recorder
			South west Holes Bay 1998-99, 2003, 2005-2007, 2011-16.	Birds of Poole Harbour, (2016d)
<i>Numenius phaeopus</i>	Whimbrel	<ul style="list-style-type: none"> • Feature of the Poole Harbour SSSI (NE, 2016b) • BoCC4 Red List (RSPB, 2015) 	North west Holes Bay 2014 North east Holes Bay 1998 South west Holes Bay 1998, 2005, 2014.	Birds of Poole Harbour, (2016a) Birds of Poole Harbour, (2016b) Birds of Poole Harbour, (2016d)
<i>Ostrea edulis</i>	Native oyster	<ul style="list-style-type: none"> • Species of Principal Importance (JNCC, 2014a) • England NERC List • Ospar list of threatened and/or declining species (Ospar, 2016) 	Upper Holes Bay Channel	Dyrynda (1983) Source: DERC (2016)
<i>Phalacrocorax carbo</i>	Cormorant	<ul style="list-style-type: none"> • Feature of the Poole Harbour SSSI (NE, 2016b) 	North west Holes Bay 2003; 1998, 2003-04, 2008-15 North east Holes Bay 1998-99, 2003-16 South east Holes Bay 1998-99, 2003-16 South west Holes Bay 1998-99, 2003; 2007-12; 2011-16	Birds of Poole Harbour, (2016a) Birds of Poole Harbour, (2016b) Birds of Poole Harbour, (2016c) Birds of Poole Harbour, (2016d)
<i>Phragmites australis</i>	Reedbeds	<ul style="list-style-type: none"> • Feature of the Poole Harbour SSSI (NE, 2016b) 	North & west Holes Bay & Pergins Island	Edwards (2004)

Latin Name	Common Name/Description	Designation/Conservation Measure	Location (present)	Recorder
		<ul style="list-style-type: none"> • Feature of the Poole Harbour SPA (Natural England, 2016) • Habitat of Principal Importance (JNCC, 2015b) 		
<i>Phocidae</i>	Seal spp. (unidentified)	<ul style="list-style-type: none"> • Conservation of Seals Act (1970) 	Near to Marina, Upton Lake, Holes Bay	Nash, (2017)
<i>Platalea leucorodia</i>	Eurasian spoonbill (Non-breeding)	<ul style="list-style-type: none"> • Feature of the Poole Harbour SSSI (NE, 2016b) • BoCC4 Amber List (RSPB, 2015) • Feature of the extended Poole Harbour SPA (Natural England, 2016, 2018). 	<p>North west Holes Bay 2003; 2003, 2010, 2012-15</p> <p>North east Holes Bay 2010-15</p> <p>South east Holes Bay 2012</p> <p>South west Holes Bay 2003; 2014-15</p>	<p>Birds of Poole Harbour, (2016a)</p> <p>Birds of Poole Harbour, (2016b)</p> <p>Birds of Poole Harbour, (2016c)</p> <p>Birds of Poole Harbour, (2016d)</p>
<i>Platichthys flesus</i>	Flounder (adult & juvenile)	<ul style="list-style-type: none"> • Commercially & recreationally important • IUCN Red List (least concern) Munroe (2010). 	<p>Upper Backwater Channel & Creekmoor Lake</p> <p>Holes Bay west</p> <p>Holes Bay</p>	<p>Dyrynda, (1985, 1989a)</p> <p>Southern IFCA (2015) Environment Agency, (2016a)</p>
<i>Pluvialis squatarola</i>	Grey Plover	<ul style="list-style-type: none"> • Feature of the Poole Harbour SSSI (NE, 2016b) • BoCC4 Amber List (RSPB, 2015) 	<p>North west Holes Bay 2004</p> <p>South east Holes Bay 2012</p> <p>South west Holes Bay 2003, 2005</p>	<p>Birds of Poole Harbour, (2016a)</p> <p>Birds of Poole Harbour, (2016c)</p> <p>Birds of Poole Harbour, (2016d)</p>

Latin Name	Common Name/Description	Designation/Conservation Measure	Location (present)	Recorder
<i>Pollachius pollachius</i>	Pollack (juvenile)	<ul style="list-style-type: none"> Commercially important 	Holes Bay Relief Road (Nov 2015)	Green, 2016, pers. comm., 27 April
<i>Recurvirostra avosetta</i>	Avocet (Non-breeding)	<ul style="list-style-type: none"> BoCC4 Amber List (RSPB, 2015) Feature of the Poole Harbour Ramsar site (JNCC, 1999; 2008) Feature of the Poole Harbour SPA – Annex I species (Natural England, 2016) Feature of the Poole Harbour SSSI (NE, 2016b) 	<p>North west Holes Bay 2003; 2007-16</p> <p>North east Holes Bay 2003-16</p> <p>South east Holes Bay 1999; 2005-07; 2009-12; 2015-16</p> <p>South west Holes Bay 2003; 2011-12; 2014-16</p>	<p>Birds of Poole Harbour, (2016a)</p> <p>Birds of Poole Harbour, (2016b)</p> <p>Birds of Poole Harbour, (2016c)</p> <p>Birds of Poole Harbour, (2016d)</p>
<i>Sabella pavonina</i>	Peacock worm (juvenile & small aggregations)	<ul style="list-style-type: none"> Notable community under the Poole Harbour SSSI (Natural England, 2015a) 	Backwater Channel, Holes Bay	Dyrunda (1983, 1989a)
<i>Scirpoides holoschoenus</i>	Round-headed club-rush	<ul style="list-style-type: none"> Species of Principal Importance in England (JNCC, 2014a) Nationally Rare. Excludes Red Listed Taxa IUCN – Endangered (2001); Least Concern, 2013 (Lansdown, 2013) 	Holes Bay Relief Road SNCI: North east Holes Bay	Marler (2015)
<i>Scomber scombrus</i>	Mackerel (Adult)	<ul style="list-style-type: none"> IUCN Red List (least concern). (Collette et al, 2011) Commercially important. 	RNLI power cable markers, Lower Holes Bay Channel (2014)	Green, 2016, pers. comm., 27 April
<i>Solea solea</i>	Dover sole (Adult & juvenile)	<ul style="list-style-type: none"> IUCN Red List (data deficient) (Tous et al, 2015) Commercially important 	Holes Bay south west & Upper Backwater Channel	Dyrunda (1983, 1989a)

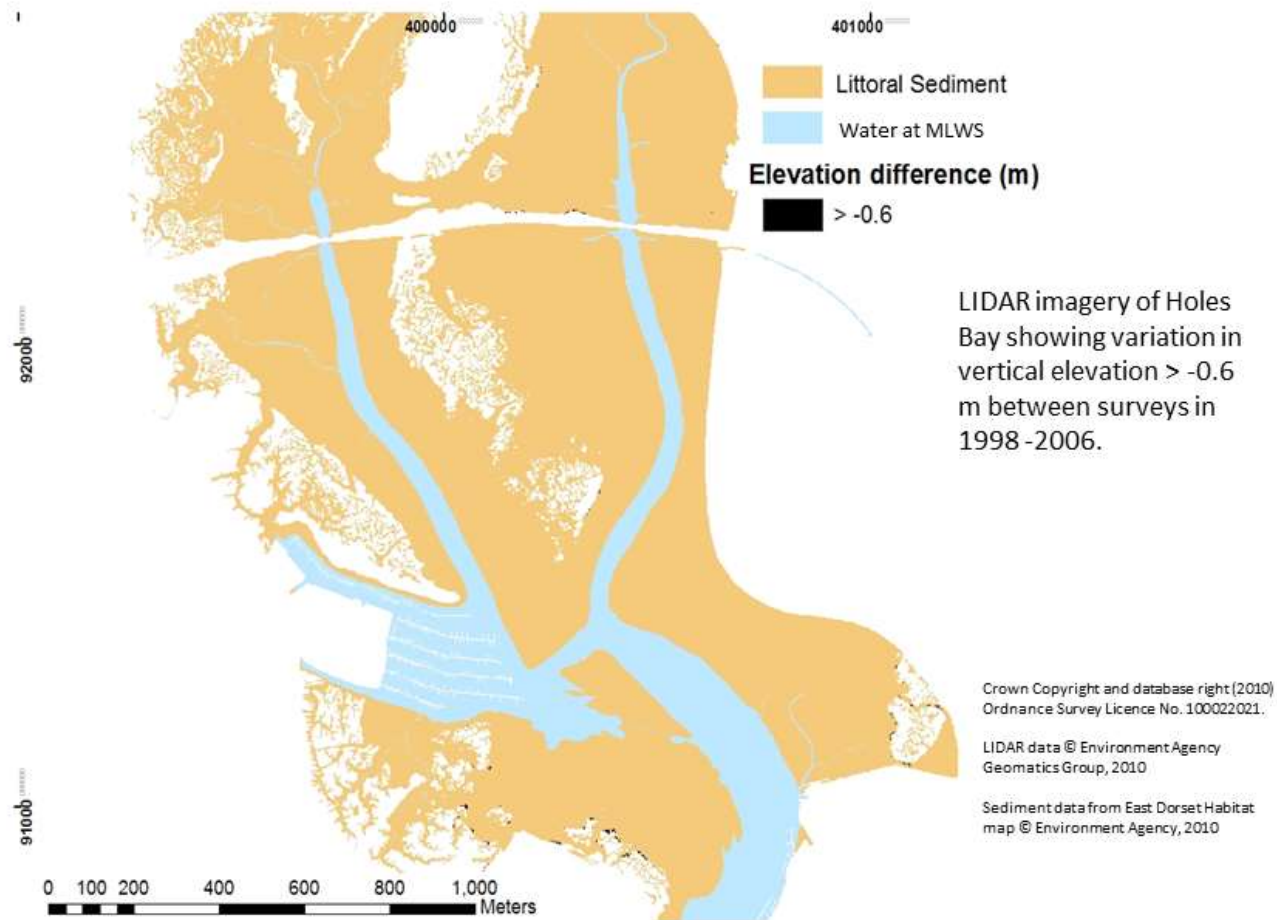
Latin Name	Common Name/Description	Designation/Conservation Measure	Location (present)	Recorder
			RNLI power cable table markers (2015)	Green, 2016, pers. comm., 27 April
<i>Sprattus sprattus</i>	Sprat (juvenile)	<ul style="list-style-type: none"> Commercially important 	Holes Bay	Environment Agency (2015a)
<i>Sterna hirundo</i>	Common tern (Breeding)	<ul style="list-style-type: none"> Feature of the Poole Harbour SSSI (NE, 2016b) Feature of the Poole Harbour SPA – Annex I species (Natural England, 2016) Feature of the Poole Harbour SPA (Natural England, 2016). Feature of the Poole Harbour Ramsar site (English Nature, 1999; JNCC, 1999; 2008) BoCC4 Amber List (RSPB, 2015) 	<p>North west Holes Bay 2006</p> <p>South east Holes Bay 2005</p> <p>South west Holes Bay 1998</p>	<p>Birds of Poole Harbour, (2016a)</p> <p>Birds of Poole Harbour, (2016c)</p> <p>Birds of Poole Harbour, (2016d)</p>
<i>Sternula sandvicensis</i>	Sandwich tern (Breeding) (aggregations during breeding season)	<ul style="list-style-type: none"> BoCC4 Amber List (RSPB, 2015) Feature of the Poole Harbour SSSI (NE (2016b) Feature of the extended Poole Harbour SPA (Natural England, 2016, 2018). 	<p>North east Holes Bay 2012</p> <p>South east Holes Bay 1998, 2006</p>	<p>Birds of Poole Harbour (2016b)</p> <p>Birds of Poole Harbour, (2016c)</p>
<i>Suberites massa</i>	Sponge	<ul style="list-style-type: none"> National Important Marine Feature (JNCC, 2014) Nationally rare or scarce (not based on IUCN criteria) Poole Harbour SSSI feature (Natural England, 2016b) Qualifying species of the Poole Harbour Ramsar site (JNCC, 1999; 2008) 	<p>Lower Holes Bay Channel</p> <p>Upper Holes Bay Channel (former power station site)</p>	<p>Dyrynda (1983) Source: DERC (2016) Howard & Moore (1988). Ramboll, (2014a)</p> <p>APEM (2012)</p>

Latin Name	Common Name/Description	Designation/Conservation Measure	Location (present)	Recorder
<i>Tadorna tadorna</i>	Shelduck	<ul style="list-style-type: none"> Qualifying species of the Poole Harbour Ramsar site (English Nature, 1999; JNCC, 1999; 2008) Feature of the Poole Harbour SPA (Natural England, 2016) Feature of the Poole Harbour SSSI (NE (2016b)) BoCC4 Amber List (RSPB, 2015) 	<p>North west Holes Bay 1998-99; 2003-04; 2006-16</p> <p>North east Holes Bay 1998-99; 2003-16</p> <p>South east Holes Bay 1998-99; 2003-16</p> <p>South west Holes Bay 1998-99; 2003; 2005-07; 2011-16</p>	<p>Birds of Poole Harbour, (2016a)</p> <p>Birds of Poole Harbour, (2016b)</p> <p>Birds of Poole Harbour, (2016c)</p> <p>Birds of Poole Harbour, (2016d)</p>
<i>Tringa erythropus</i>	Spotted redshank	<ul style="list-style-type: none"> BoCC4 Amber List (RSPB, 2015) 	<p>North west Holes Bay 2003, 2010, 2012, 2014</p> <p>North east Holes Bay 1998, 2004-10; 20012-14</p> <p>South east Holes Bay 1999; 2003-4, 2006-10</p> <p>South west Holes Bay 2007</p>	<p>Birds of Poole Harbour, (2016a)</p> <p>Birds of Poole Harbour, (2016b)</p> <p>Birds of Poole Harbour, (2016c)</p> <p>Birds of Poole Harbour, (2016d)</p>
<i>Tringa nebularia</i>	Greenshank	<ul style="list-style-type: none"> Feature of the Poole Harbour SSSI (NE (2016b)) BoCC4 Amber List (RSPB, 2015) 	<p>North west Holes Bay 2003, 2013.</p> <p>North east Holes Bay 1999, 2010, 2013</p> <p>South east Holes Bay 1999, 2010-13</p> <p>South west Holes Bay 1999, 2005</p>	<p>Birds of Poole Harbour, (2016a)</p> <p>Birds of Poole Harbour, (2016b)</p> <p>Birds of Poole Harbour, (2016c)</p> <p>Birds of Poole Harbour, (2016d)</p>

Latin Name	Common Name/Description	Designation/Conservation Measure	Location (present)	Recorder
<i>Tringa totanus</i>	Redshank	<ul style="list-style-type: none"> • Feature of the Poole Harbour SSSI (NE (2016b)) • BoCC4 Amber List (RSPB, 2015) 	North west Holes Bay 1998-99, 2003-04, 2006-16	Birds of Poole Harbour, (2016a)
			North east Holes Bay 1998-99, 2003-16	Birds of Poole Harbour, (2016b)
			South east Holes Bay 1998-99, 2003-16	Birds of Poole Harbour, (2016c)
			South west Holes Bay 1998-99, 2003, 2005-07, 2011-16	Birds of Poole Harbour, (2016d)
<i>Vanellus vanellus</i>	Lapwing	<ul style="list-style-type: none"> • BoCC4 Red List (RSPB, 2015) • Feature of the Poole Harbour SPA (Natural England, 2016) 	North west Holes Bay 1998-99, 2003, 2006-7, 2009, 2011-14	Birds of Poole Harbour, (2016a)
			South west Holes Bay 2005	Birds of Poole Harbour, (2016d)

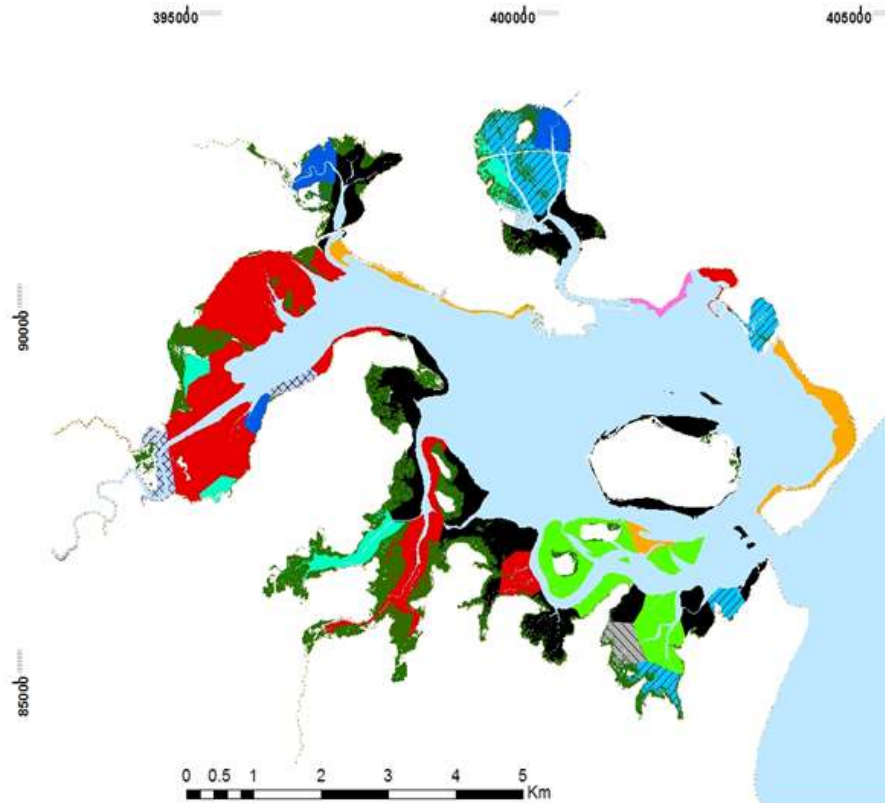
14.8 Saltmarsh Erosion in Holes Bay

(Herbert *et al*, 2010)



14.9 Holes Bay Biotopes

(Herbert *et al.*, 2010)



Intertidal biotopes of Poole Harbour. Biotopes classified according to *The Marine Habitat Classification for Britain & Ireland. v04 05* (Connor *et al.* 2004).

Biotopes

-  Polychaete/oligochate dominated upper estuarine muds (LS.LMu.UEst)
-  Hediste diversicolor in littoral mud (LS.LMu.UEst.Hed)
-  Hediste and oligochaetes in littoral mud (LS.LMu.UEst.Hed.OI)
-  Hediste and Corophium in littoral mud (LS.LMu.UEst.Hed.Cvol)
-  Nephtys hombergii and Streblospio shrubsolii in littoral mud (LS.LMu.UEst.NhomStr)
-  Tubificoides benedii and other oligochaetes in littoral muds (LS.LMu.UEst.Tben)
-  Polychaete/bivalve dominated mid estuarine muds (LS.LMu.MEst)
-  Hediste, Macoma in littoral sandy mud (LS.LMu.MEst.HedMac)
-  Polychaete/bivalve dominated muddy sand shores (LS.LSa.MuSa)
-  Littoral Mixed Sediment (LS.LMx.Mx)
-  Saltmarsh (LS.LMp.Sm)

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14.10 Holes Bay Small Fish Survey Data (Environment Agency)

Contains Environment Agency information © Environment Agency and database right (Environment Agency, 2016a)

Environment Agency (2016a) Fish Counts Holes Bay 2007-15

Site Id	Site Name	Event Date	Survey Method	Survey Strategy	No Of Runs	Species Name	Latin Name	Fish Count
62904	Holes Hole Seine Net	2/11/2015 0:00	SEINE NETTING	SINGLE CATCH SAMPLE	1	Sea bass	<i>Dicentrarchus labrax</i>	1
62904	Holes Hole Seine Net	2/11/2015 0:00	SEINE NETTING	SINGLE CATCH SAMPLE	1	Sprat	<i>Sprattus sprattus</i>	5
62904	Holes Hole Seine Net	2/11/2015 0:00	SEINE NETTING	SINGLE CATCH SAMPLE	1	Grey mullet sp.	<i>Mugilidae</i>	2
26771	Holes - Seine	5/22/2007 0:00	SEINE NETTING	SINGLE CATCH SAMPLE	1	Sea bass	<i>Dicentrarchus labrax</i>	1
26771	Holes - Seine	5/22/2007 0:00	SEINE NETTING	SINGLE CATCH SAMPLE	1	Sprat	<i>Sprattus sprattus</i>	9
26771	Holes - Seine	5/22/2007 0:00	SEINE NETTING	SINGLE CATCH SAMPLE	1	Flounder	<i>Platichthys flesus</i>	9
26771	Holes - Seine		SEINE NETTING	SINGLE CATCH SAMPLE	1	Goby sp.	<i>Gobiidae</i>	133
26771	Holes - Seine	9/19/2007 0:00	SEINE NETTING	SINGLE CATCH SAMPLE	1	Herring	<i>Clupea harengus</i>	309
26771	Holes - Seine	9/19/2007 0:00	SEINE NETTING	SINGLE CATCH SAMPLE	1	Sand goby	<i>Pomatoschistus minutus</i>	55
26771	Holes - Seine	9/19/2007 0:00	SEINE NETTING	SINGLE CATCH SAMPLE	1	Sand smelt	<i>Atherina presbyter</i>	3
26771	Holes - Seine	9/19/2007 0:00	SEINE NETTING	SINGLE CATCH SAMPLE	1	Herring	<i>Clupea harengus</i>	60
26771	Holes - Seine	9/19/2007 0:00	SEINE NETTING	SINGLE CATCH SAMPLE	1	Sand goby	<i>Pomatoschistus minutus</i>	2
26771	Holes - Seine	9/19/2007 0:00	SEINE NETTING	SINGLE CATCH SAMPLE	1	Sand smelt	<i>Atherina presbyter</i>	6
28976	Holes Bay trawl	10/5/2007 0:00	Beam Trawl Netting 1.5m	SINGLE CATCH SAMPLE	1	Common goby	<i>Pomatoschistus microps</i>	10
28976	Holes Bay trawl	10/5/2007 0:00	Beam Trawl Netting 1.5m	SINGLE CATCH SAMPLE	1	Black goby	<i>Gobius niger</i>	1

14.11 Holes Bay Small Fish Survey Data (Southern IFCA)

(Southern IFCA, 2015)

Site:	Holes Bay
Date:	12.10.15
Time:	11:32
Latitude:	50 43.447 N
Longitude:	002 00.414 W
Weather:	Bright and Clear
Windspeed:	2-3 Knots
Sea State:	Slight
Survey Personnel:	Sarah Birchanough (Southern IFCA) Simon Pengelly (Southern IFCA) Vicki Gravestock (Southern IFCA) Neil Richardson (Southern IFCA) Nigel Back (Angler) Peter Tinsley (DWT) Emma Rance (DWT)
Haul Number:	1
Catch Method:	Seine Net
Additional Species:	Crangon Shrimp, Prawn

No.	Species Name			
	Sand Smelt	Sand Goby	Bass	Flounder
1	60	39	84	94
2	64	39	73	
3	65	36	81	
4	68	40	71	
5	56	32	69	
6	72	32	90	
7	63	36	70	
8	70	36	71	
9	67	35	67	
10	62	34	74	
11	61	35	79	
12	67	37	74	
13	60	40	59	
14	59	36	70	
15	52	36	102	
16	71	37	73	
17	62	34	72	
18	55	31	86	
19	55	31	63	
20	59	34	70	
21	62	34	77	
22	54	32	81	
23	55	45	70	
24	66	34	75	
25	57	29	71	
26	60	28	72	
27	64	58		
28	65	41		
29	59	37		
30	52	38		
31	60	40		
32	66	37		
33	59	40		
34	57	37		
35	60	40		
36	65	42		
37	66	37		
38	55	35		
39	63	41		
40	53	29		
41	54	44		
42	67	37		
43	58	37		
44	66	30		
45	57	35		
46	60	36		
47	57	38		
48	52	34		
49	50	33		
50	52	34		
Additional Count (beyond 50):	8	580		
Total Count:	58	630	26	1

14.12 Poole Harbour Bait Digging Interpretation Panel

Poole Harbour Bait Agreement



The Memorandum of Agreement for bait digging in Poole Harbour was produced in partnership with bait diggers and anglers. It allows for the protection and improvement of the marine environment of the inshore waters of Poole Harbour whilst allowing for sustainable bait collection.

Poole Harbour is a European Marine Site (EMS), designated as a Special Protection Area (SPA), Site of Special Scientific Interest (SSSI) and Ramsar site.

The harbour comprises of a mosaic of intertidal habitats which, each year, support thousands of over-wintering and passage birds that are of national and international significance.

Please help us to look after our Harbour and support the sustainable collection of bait.



Backfilling

All diggers should ensure that they backfill any holes which are dug.

Bird Sensitive Areas

In some areas of the Harbour visual and noise disturbance are likely to be more significant to the bird interest. Sediment recovery from baitdigging in these areas is also likely to be slower.

Bait diggers should avoid conducting activity in defined bird sensitive areas between **1st November and 30th March inclusive**.

For a full list of co-ordinates defining these sensitive areas please see the full Agreement at www.southern-ifca.gov.uk

Holes Bay

Holes Bay is a site of particular importance for bird species within Poole Harbour. The enclosed nature of the bay and its sheltered position create a refuge for bird species when other areas of the Harbour are affected by adverse weather.

In order to preserve this area during particularly vulnerable periods, please do not dig for bait:

- Within the area north of the railway bridge **at any time of the year**
- And in the remainder of Holes Bay, during the months of **January and February**



Seagrass

Seagrass beds are an important habitat, supporting a wide range of species. Seagrass is considered to be highly sensitive to physical disturbance including that caused by trampling, digging and other hand gathering activities.

- Bait diggers must abide by the Southern IFA's byelaw Prohibition on gathering (sea fishing) resources in seagrass beds byelaw
- Bait diggers are asked to not walk across seagrass beds

General Provisions

- Collect bait sustainably and only gather what is needed to ensure future stocks
- Avoid taking green spawning worms
- Keep to access paths and avoid trampling saltmarsh, reedbeds and other similar habitats
- Avoid bait digging around moorings, slipways and sea walls
- Be aware of use of torch lights at night which can disturb roosting birds
- Keep to all local byelaws and regulations

Commercial diggers are required to obtain landowner permission before digging activity is carried out



14.13 Holes Bay Beachwatch Data (2011-2016)

(Marine Conservation Society, 2016)

Holes Bay Beachwatch Data 2011-2015 (Marine Conservation Society, 2016)

Year	SurveyID	BeachID	Beach Name	Beach County	Beach Region	Beach Latitude	Beach Longitude	Date of Survey	Survey With	Time Survey	Time Survey	Total time	Total volunteers	Volunteers
2011	33558	2836	Holes Bay	Dorset	South West	50.73408	-1.99274	18/09/2011	GBBC	14:00	16:00	2	36	18
2013	34465	2836	Holes Bay	Dorset	South West	50.73408	-1.99274	21/09/2013	GBBC	10:30	12:00	1.5	60	40
2014	35318	2836	Holes Bay	Dorset	South West	50.73408	-1.99274	21/09/2014	GBBC	12:00	14:00	2	6	3
2015	35921	2836	Holes Bay	Dorset	South West	50.73408	-1.99274	20/09/2015	GBBC	10:30	12:30	2	100	50

Survey: Beach	Survey: Beach	Survey: Latitude	Survey: Beach	Survey: Beach	Survey: Extent	Survey: Width	Survey: Width	Survey: Sea	Survey: Sea	Survey: Info	Survey: Time	Survey: Un	Survey: Oil	Survey: Pellets
100	11		14.95	7	0		Strong	Moderate	N/A	Much rain during week	Contact lost	Absent	Absent	
20	60	21/09/2013		2	500	Onshore	Light	Calm	N/A			Absent	Absent	
10	1.25			5	1000	Offshore	Light	Calm	N/A	3 volunteers	No	Not in the	Absent	
10	5	26/12/2014		10	500		Light	Moderate	N/A			Absent	Absent	

Survey: An	Survey: An	Survey: An	Survey: An	Survey: An	Survey: An	Plastic: Yo	Plastic: Ba	Plastic: Sm	Plastic: Me	Plastic: Cle	Plastic: Dri	Plastic: Toi	Plastic: Car	Plastic: Caps
						0	23		1	0	16	2		132
No							3		2		3	1		27
No							5		1					19
No						0	2		0	0	1	0		25

Plastic: Cig	Plastic: Co	Plastic: For	Plastic: Cu	Plastic: Cur	Plastic: Fis	Plastic: Fis	Plastic: Fis	Plastic: Flo	Plastic: For	Plastic: Glc	Plastic: Glc	Plastic: Oil	Plastic: Ind	Plastic: Crisp
9	0	41		71	1	8	3	1	153	1	2	0	31	503
		5		22	2			1	6				2	151
9		2							15	1			14	79
0	0	1		12	0	1	0	0	15	0	0	0	3	55

Plastic: Per	Plastic: Pla	Plastic: Pla	Plastic: Pla	Plastic: She	Plastic: She	Plastic: Str	Plastic: Str	Plastic: Ro	Plastic: Tar	Plastic: To	Plastic: Ba	Plastic: Ott	Plastic: Bu	Plastic: Crates
22	652	41		0	1	19	13	10		5		0		
2	180	114					5			2				
3	104	187				1	19	4		2				
2	124	75		0	0	0	3	4		2		0		

Holes Bay Beachwatch Data 2011-2015 (Marine Conservation Society, 2016)

Plastic: Fer	Plastic: Fib	Plastic: Fis	Plastic: Ha	Plastic: Inj	Plastic: Jer	Plastic: Lig	Plastic: Fis	Plastic: Lok	Plastic: Oct	Plastic: Oil	Plastic: Oy	Plastic: Oy	Plastic: Mu	Plastic: Other_d
	0	1						0						1x shipment labe
														toothbrush
														sellotape Polysty
	0	0						0						Lighter

Plastic: Oth	Rubber: Ba	Rubber: Bc	Rubber: Ty	Rubber: Ty	Rubber: Ot	Rubber: Ot	Cloth: Clot	Cloth: Sack	Cloth: Furr	Cloth: Sho	Cloth: Oth	Cloth: Oth	Paper: Bag	Paper: Cardboar
1	4	0	0	0	20x elastic	29	2	0	1			4	2	8
5												1		1
9						1						1	1	
1	0	0	0	0		0	0	0	0		Running ba	1	0	0

Paper: Pur	Paper: Tet	Paper: Cig	Paper: Cig	Paper: Cup	Paper: Nev	Paper: Oth	Paper: Oth	Wood: Cor	Wood: Loll	Wood: Lob	Wood: Cra	Wood: Fish	Wood: Bru	Wood: Pallets
1	0	2	7	2	0	1x leaflet	1	3	8	0			0	0
		6												
			3			sorry - "oth	2	1						
0	0	0	1	0	2		0	0	0	0			0	0

Wood: Oth	Wood: Oth	Wood: Oth	Wood: Oth	Metal: Aer	Metal: Bbc	Metal: Drir	Metal: Foo	Metal: Cap	Metal: Fish	Metal: Foil	Metal: Scr	Metal: Wir	Metal: Elec	Metal: Lobsterp
1x large pla	17			1	0	14	1	12		6	1	3		0
Pencils	12					4								
	2					2				2				
	5			0	0	3	0	0	0	0	0	0		0

Metal: Oil	Metal: Pair	Metal: Oth	Metal: Oth	Metal: Oth	Metal: Oth	Glass: Bott	Glass: Bulb	Glass: Oth	Glass: Oth	Pottery: Cd	Pottery: O	Pottery: O	Pottery: O	San: Buds
0		1x shell cas	1			2	0		4				0	12
														23
0			0		0	0	1		1				0	0

Holes Bay Beachwatch Data 2011-2015 (Marine Conservation Society, 2016)

San: Tamp	San: Towe	San: Wipes	San: Condo	San: Toilet	San: Other	San: Other	Med: Cont	Med: Syrin	Med: Othe	Med: Othe	Faeces: In_bags		
0	0	2	0	1		0		2		0	0		
0	0	1	0	0		0		0		0	0		

14.14 Holes Bay Nature Conservation Designations and Conservation Measures.

Habitats or Species Designation/ Conservation Measure	Legislation	Area	Qualifying Features/criterion
Poole Harbour Special Protection Area (SPA) 1999 (Natural England, 2016)	<p>Conservation of Wild Birds (Birds Directive) 1979 as amended.</p> <p>The Conservation of Habitats and Species Regulations 2010.</p>	Terrestrial and inter-tidal areas down to mean low water	<p>Annexe I and/or qualifying species:</p> <ul style="list-style-type: none"> • Avocet <i>Recurvirostra avosetta</i> • Black-tailed godwit <i>Limosa limosa islandica</i> • Common tern <i>Sterna hirundo</i> • Mediterranean gull <i>Larus melanocephalus</i> • Shelduck <i>Tadorna tadorna</i> • Water bird assemblage <p>Annexe I Habitat and/or qualifying feature:</p> <ul style="list-style-type: none"> • Atlantic salt meadow • Coastal saltmarsh • Shallow inshore waters including coastal lagoons • Intertidal mudflats • Mediterranean salt meadows • Reedbeds
<p>Poole Harbour proposed Special Protection Area (SPA)</p> <p>(Natural England, 2016a, 2018)</p>	<p>Conservation of Wild Birds (Birds Directive) 1979 as amended.</p> <p>The Conservation of Habitats and Species Regulations 2010.</p>	Additional intertidal and sublittoral areas not previously included in the original SPA; in Holes Bay these are as are Upton Lake, Creekmoor Lake and Backwater Channel.	<p>Annexe I and/or qualifying species:</p> <ul style="list-style-type: none"> • Spoonbill <i>Platalea leucorodia</i> • Little egret <i>Egretta garzetta</i> • Sandwich tern <i>Sterna sandvicensis</i>
<p>Part of the Poole Harbour Ramsar Site. (JNCC, 1999; 2008) Map (English Nature, 1999)</p>	Convention on Wetlands of International Importance 1971.	Holes Bay excluding the Creekmoor Lake, Upton Lake and Backwater Channel & Marina Development Ltd.	<p>Best and largest example of a bar-built estuary with lagoonal characteristics (a natural harbour) in Britain. Qualifying features:</p> <ul style="list-style-type: none"> • Avocet <i>Recurvirostra avosetta</i> • Black-tailed godwit <i>Limosa islandica</i> • Common tern <i>Sterna hirundo</i> • Great Fen-sedge <i>Cladium mariscus</i>. • Hydroid <i>Hartlaubella gelatinosa</i> (nationally scarce)

Habitats or Species Designation/ Conservation Measure	Legislation	Area	Qualifying Features/criterion
			<ul style="list-style-type: none"> • Internationally important waterfowl assemblage (over 20000 birds) • Mediterranean gull <i>Larus melanocephalus</i> • Shelduck <i>Tadorna tadorna</i> • Shrubby sea-blite <i>Suaeda vera</i> • Sponge <i>Suberites massa</i> (nationally rare)
South East Dorset Green Belt		Northern Holes Bay.	Prevention of unrestricted urban sprawl.
HBNP	Part of The Great Heath Living Landscapes Project	Not yet defined	286 hectares of saltmarsh and intertidal mud flats providing a rich food source for 80 species and a haven for the internationally significant waders and waterfowl species listed under Annexe I of the Birds Directive (Dorset Wildlife Trust, 2015).
Hawkwood Saltmarsh Site of Nature Conservation Interest (SNCI) (Edwards, 1993)	Non-statutory: valuable wildlife areas outside of Nature Reserves or SSSIs (Dorset Wildlife Trust, 2016)	Western Holes Bay	An area of <i>Spartina</i> dominated saltmarsh measuring 0.85 ha located between the SSSI and Cobbs Quay Marina. (Edwards, 1993). This area was left out of the SSSI designation. N.B. This area is now protected under the Poole Harbour SPA (Natural England, 2018)
Holes Bay Reserve for Scientific Study	Dyrynda, (1985, 1989a)	Upper- and Lower-Holes Bay	In 1983, it was proposed that Holes Bay should become a reserve for scientific or experimental study (Southern Sea Fisheries Committee, 1983). However, it is not clear whether this came to fruition.
Holes Bay Relief Road Site of Nature Conservation Interest (SNCI) (Marler, 2014)	Non-statutory: valuable wildlife areas outside of Nature Reserves or SSSIs (Dorset Wildlife Trust, 2016)	Area in north-eastern Holes Bay adjacent to the A350.	A small area with species of dry acid grassland and sand dunes along the worn edges of the paths. These include the Red Data Book species Round-headed Club-rush (<i>Scirpus holoschoenus</i>) and English scurvy grass <i>Cochlearia anglica</i> – both are Dorset notable species. (Marler, 2014 P.4)
Poole Harbour SSSI 1991 (NE (2016b, 2018a)	Originally created in 1954, revised in 1977, re-notified in 1990 (Underhill-Day <i>et al</i> , 2010) and extended in 2018 (Natural England, 2018a).	Holes Bay sublittoral extending to the MHW (Natural England, 2018b).	Designated under section 28 of the WCA, in 1990. Intertidal saltmarshes and mud flats that support large numbers of internationally significant overwintering waterfowl and waders (Natural England, no date). <ul style="list-style-type: none"> • Avocet <i>Recurvirostra avosetta</i> • Black-tailed Godwit <i>Limosa islandica</i>

Habitats or Species Designation/ Conservation Measure	Legislation	Area	Qualifying Features/criterion
	Wildlife and Countryside Act 1981 (as amended) and improved by the Countryside and Rights of Way Act 2000 (JNCC, 2014b)		<ul style="list-style-type: none"> • Brent Goose (Dark-bellied) <i>Branta bernicla</i> • Cormorant <i>Phalacrocorax carbo</i>; • Curlew <i>Numenius arquata</i>; • Dunlin <i>Calidris alpina</i>; • Goldeneye <i>Bucephala clangula</i>; • Greenshank <i>Tringa nebularia</i> • Grey Plover <i>Pluvialis squatarola</i>; • Little Egret <i>Egretta garzetta</i> • Peacock worm <i>Sabella pavonina</i> • Pintail <i>Anas acuta</i> • Pochard <i>Aythya farina</i> • Red-breasted Merganser <i>Mergus serrator</i> • Redshank <i>Tringa totanus</i> • Shelduck <i>Tadorna tadorna</i> • Sponge <i>Suberites massa</i> (nationally rare) • Spoonbill <i>Platalea leucorodia</i> • Teal <i>Anas crecca</i> • Whimbrel <i>Numenius phaeopus</i> • Yellow-legged gull <i>Larus michahellis</i> <p>Aggregations of each of the following species of seabird and waterbird during the breeding season:</p> <ul style="list-style-type: none"> • Common Tern <i>Sterna hirundo</i> • Sandwich Tern <i>Sterna sandvicensis</i> • Grey Heron <i>Ardea cinerea</i> <p>Assemblages of breeding birds – Lowland open waters and their margins combined with sand dunes and salt marsh.</p>

Habitats or Species Designation/ Conservation Measure	Legislation	Area	Qualifying Features/criterion
			For the full list of 54 'notified features' including the Schedule 5 sea anemone - N, Starlet Sea Anemone <i>Nematostella vectensis</i> , peacock worm <i>Sabella pavonina</i> and seagrass <i>Zostera maritima</i> see Natural England (2018b)
Bird Sensitive Area	Poole Harbour Steering Group	Important roosting and feeding sites sensitive to noise and visual disturbance	North of the railway embankment – overwintering Bird Sensitive Area. Noted for avocet & black-tailed godwit (Drake and Bennett, 2011)
Bait Working Group MoA for Bait Digging in Poole Harbour 2015	Voluntary agreement between statutory and non-statutory bodies.	Intertidal mud flats	Bait digging in northern Holes Bay is prohibited at all times. In the area south of the railway line it is prohibited during the months of January and February; at all other times, personal digging is allowed, subject to the agreement. Commercial digging is only permitted under the permission of the landowner. Southern IFCA, (2015)
Bass Nursery Area	The Bass (Specified Areas) (Prohibition of Fishing) Order 1990		Fishing for bass, or any fish using sandeels as bait, by any commercial or recreational fishing boat is prohibited between 30th April and 1st November. (Southern IFCA, 2014)
Bass Fishing Regulations	Council Regulation (EU) 2016/72	Recreational Angling Shore fishing Poole Harbour	Bass regulations 2015-16 (MMO, 2016): 1 st January - 30 th June: Catch and release only. 1 st July-31 st December: 1 bass per fisherman per day. Minimum Conservation Reference Size increased from 36 to 42cm.
Periwinkles	Southern IFCA (2016) byelaw	Intertidal areas	Seasonal fishery closure to protect the breeding stock of <i>Littorina littorea</i> 15th May-15th September. Removal of periwinkles is only permitted by hand picking.
Prohibition for fishing for bivalves for human consumption	Shellfish Waters Directive (Council Regulation (EC) 2006/113)	Holes Bay	Holes Bay is unclassified shellfish waters due to concerns over chemical contamination and risks to public health. Bivalve molluscs (clams, cockles, oysters, mussels etc.) must not be harvested (gathered) from or produced in Holes Bay 1st Sept 2015 to 31 st Aug 2016 (Borough of Poole, 2015).

Habitats or Species Designation/ Conservation Measure	Legislation	Area	Qualifying Features/criterion
Poole Harbour Shellfish Hand Gathering	Southern IFCA (2016) byelaw	Below the Mean High-Water Spring tide line	The hand gathering of shellfish by hand or using a rake or similar equipment (or transport of such) is prohibited in Holes Bay 1 st November- 31 st March.
Poole Harbour Dredge Permit.	Southern IFCA (2016) byelaw.	Poole Harbour	The prohibition to store, carry, tranship or use a shellfish dredge anywhere within Poole Harbour unless permitted by Southern IFCA. Carrying or using the listed fishing gear is prohibited in the Bird Sensitive Areas of Poole Harbour (includes Holes Bay) 1 st November – 31 st March.
European eel fishing	The Eels (England and Wales) Regulations 2009 (SI 2009/3344) Council Regulation (EC) 1100/2007/EEC of 18 September 2007 on establishing measures for the recovery of the stock of European eel	Poole Harbour	Fyke nets are set in Holes Bay (IFCO Dell, 2016. pers comm 14 th March). European eel stocks are managed by the Environment Agency. The UK Eel Management Plan covers authorised eel fishing instruments, a guide to the national eel fishing byelaws and any regional byelaws relating to eel fishing. It includes the following: <ul style="list-style-type: none"> • Eel fishing is only permitted using fixed traps (fyke nets), small wingless traps, winged traps, elver dip nets or rod and line. • Fishing for eels over 12cm in length, by net or trap is not permitted above the tidal limit and there is a closed season 1st March - 31st October. • All eels less than 30 cm in length must be returned (apart from elvers caught in a dip net). (Source: Dorset Wildlife Trust, 2014)
Fixed Engines	Southern IFCA (2016) Byelaw	Poole Harbour	The placement and use of fixed nets (excluding fyke nets) is prohibited in Poole Harbour 1 st April-30 th September
Poole Harbour prawns closed season	Southern IFCA (2016) Byelaw	Poole Harbour	Fishing for or removal of prawns is prohibited 1 st January - 31 st July.
Nitrate Vulnerable Zone	Nitrate Pollution Prevention (Amendment) and Water Resources (Control of Pollution) (Silage, Slurry and	North western Holes Bay terrestrial area (Upton Country Park)	Areas at risk of agricultural pollution are regulated with guidelines for farmers on using and storing nitrogen containing fertilizers and manure. (Environment Agency, 2016c)

Habitats or Species Designation/ Conservation Measure	Legislation	Area	Qualifying Features/criterion
	Agricultural Fuel Oil) (England) Regulations 2013		
Sensitive Area (Eutrophic)	EU Urban Wastewater Treatment Directive 2002	Poole Harbour	Set limits for nitrogen in waste water discharges depending on the population served (Wessex Water, 2017)
Polluted Waters (Eutrophic)	Nitrate Directives 2002	Poole Harbour	High nutrient levels in Poole Harbour (Langston et al, 2003)
6 knot Speed limit	Poole Marine Safety Management Plan - Poole Harbour Commissioners	All craft within Holes Bay	(Poole Harbour Study Group, 2011)
Minimum Landing Size of commercial fish and shellfish	Southern IFCA (2016a) Wheelhouse Card	Poole Harbour	Listing various fish and shellfish protected through minimum landing size byelaws and other legislation.
Designated Sites View: Poole Harbour [online map]			

14.15 Holes Bay Saltmarsh Re-creation Project Progress (BCP, 2019)

Summary of progress – Holes Bay

The original Holes Bay project stalled in 2015, due to the unpredicted difficulty in trying to obtain the required consents. The Borough of Poole could not facilitate carrying out further work as the costs and resources required increased, and it was not known how much this would amount to. A lot of work had been completed prior to this, including stakeholder consultation and steering group formation, liaison with statutory environmental bodies such as NE and EA, and nursery studies to determine the feasibility of saltmarsh regeneration. The original feasibility did look at indicative methods for the proposal, but a more detailed analysis including cost comparison was not achieved. A picture of the site is as Appendix A.

The Holes Bay feasibility study was reignited in July 2018, following local levy funding of £60k to complete the study, aiming to identify a preferred option/method for undertaking the works and identifying funding sources to do so.

Stakeholders were consulted to determine whether there were any changes to their situation, if there were any future limitations which were unknown two years ago, and if their support for the project had altered. In particular, it was key to obtain this information from the owners of Cobbs Quay/Davis Boatyard, and the RNLI. In addition, it was also of critical importance to determine Network Rail's stance on the project, as they own a major asset through the railway, which would likely be affected should the saltmarsh continue to erode.

All commercial operators are keen for the project to progress and showed their enthusiasm for assisting where required. The communication with Network Rail is being managed by an external consultant WSP, as they are managing the asset plan for the railway, but also providing support to the Holes Bay feasibility study. This link has therefore proved very useful

Borough of Poole have also conducted research looking at case studies, and site visits, including to Lymington boiler marsh; our nearest geographical case study in order to get a better understanding of lessons learned and their evolution of delivery methods. We have also been speaking to various experts in the field including Colin Scott (ABPMer).

The Environment agency has been consulted and discussions held around whether there would be a positive financial credit to completing this work through Outcome Measures (OMs), as part of the Flood Defence Grant in Aid Partnership Funding methodology. The measures that could be applicable are OM4a or OM 4b, as shown in Appendix B. The type of habitat to be formed will not be known until the pilot scheme is underway/completed, and possibly even following completion, during the monitoring phase. Currently, the project would not achieve financial credit for sustaining the saltmarsh; however, this has been raised as a query, as if the erosion rates are proven to be consistently declining, then the argument stands that sustaining the current saltmarsh is equally as important as creating additional saltmarsh/mudflats.

Natural England are supportive but have advised that we may need to look at contaminant testing of the receptor sites – the argument being that this sediment will be kept trapped in the bay, rather than deposited outside of an already highly contaminated body of water with lack of tidal flow. They have advised that an updated HRA assessment will need to be completed. Borough of Poole have previously drafted a HRA, but the decision at the time was to submit this following the MMO application. Due to the complications and subsequent withdrawal of the MMO application, the HRA was not submitted and reviewed by NE.

There have been initial conversations with MMO, but the response indicated that the application process was to be completely restarted, without any acknowledgement of advice provided in the previous application, and case officer knowledge. Conversations were then halted, as the Borough of Poole decided it would be more viable and cost effective to determine the preferred methods, and liaise with the relevant contacts in the field, before consulting with MMO and accruing costs, where they may not be necessary.

Sediment and water sampling and analysis is also currently underway, which should help to inform the likelihood of saltmarsh growth. The results are due shortly.

Presently, the data is being formatted into such a way that, along with indicative costs from contractors for dredging and retaining methods, this can be used to determine the preferred method for the pilot study. Currently the view is that there may be a combined method, of possibly bottom dumping some sediment to the deeper eastern side of the saltmarsh (as is being done in Lymington Harbour) and using cutter suction or backhoe to then pipe sediment onto areas of the shallower western saltmarsh. The methods of retention could be as simple as creating islands using straw wrapped in hessian (such as for Lymington Harbour), but there may be a requirement for silt curtains to retain deposited material if sediment suspension is an issue. We are currently reviewing the various methods possible in order to narrow down to a preferred option. Once this has been completed, and if proposals are agreeable with the various funding partners, discussions will need to be had with the consenting bodies to determine the steps needed to obtain permissions / MMO licence.

Appendix A

Site map (dredge and receptor areas)



Appendix B

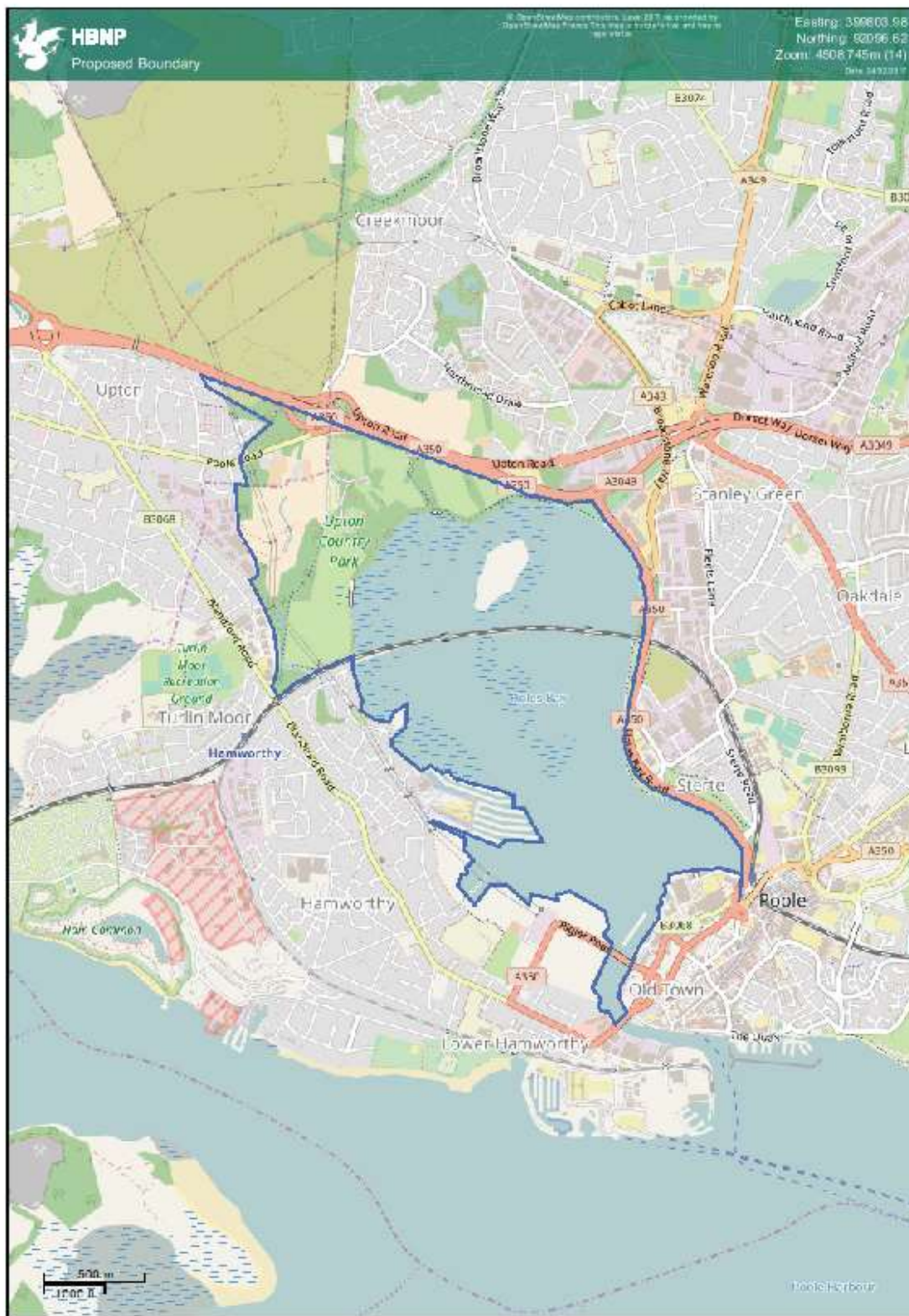
Environment Agency – Outcome Measures

Table 6: Summary of outcome measures

OM no.	Outcome Measure definition	Benefits and outcomes qualifying for national funding	Payment rate	Examples of funding levels from Government
OM 1	Average benefit to cost ratio of schemes delivering OMs	Under OM1, present value of whole-life benefits of the current investment, less benefits paid for or payments made under the other outcome measures.	5.56p per £1 of qualifying benefit (i.e. seeking an 18 to 1 return from national investment)	These include avoidance of damages to e.g. business, agriculture, local government, communications, infrastructure, utilities and public health
OM 1a	Present value of whole-life benefits per £1 of FDGIA			
OM 2	Households moved from one category of flood risk to a lower category Households must be at direct risk of flood damage and have been built or converted into housing before January 2012 to be counted.	Under OM2, present value of direct damages to residential properties and their contents avoided, in the: – 20% most deprived areas – 21-40% most deprived areas – 60% least deprived areas.	45p per £1 30p per £1 20p per £1	Based on moving a single household from very significant risk to low risk for a duration of 50 years £15,399 per household protected £10,266 £6,844
OM 3	Households better protected against coastal erosion. Households must be at direct risk of damage from coastal erosion and have been built or converted into housing before January 2012 to qualify.	Under OM3, present value of the reduction in direct damages to residential properties, in the: – 20% most deprived areas – 21-40% most deprived areas – 60% least deprived areas	45p per £1 30p per £1 20p per £1	Based on protecting a single household at risk of loss within 20 years, for a period of 50 years £35,601 per household protected £23,734 £15,822
OM 4	Statutory environmental obligations fully met through flood and coastal erosion risk management	Outcomes specifically funded under OM4:		
OM 4a	Hectares of water-dependent habitat created or improved to help meet the objectives of the Water Framework Directive	Water-dependent habitat created or improved	£15,000 per hectare	
OM 4b	Hectares of inter-tidal habitat created to help meet the objectives of the Water Framework Directive for areas protected under the EU Habitats or Birds Directive	Inter-tidal habitat created	£50,000 per hectare	
OM 4c	Kilometres of river protected under the EU Habitats or Birds Directive improved to help meet the objectives of the Water Framework Directive	Protected rivers improved	£80,000 per km of river bed	

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/221094/pb13896-flood-coastal-resilience-policy.pdf

14.16 Proposed Boundary Map of the Holes Bay Nature Park (not definitive and subject to consultation). (Dorset Explorer, 2017)

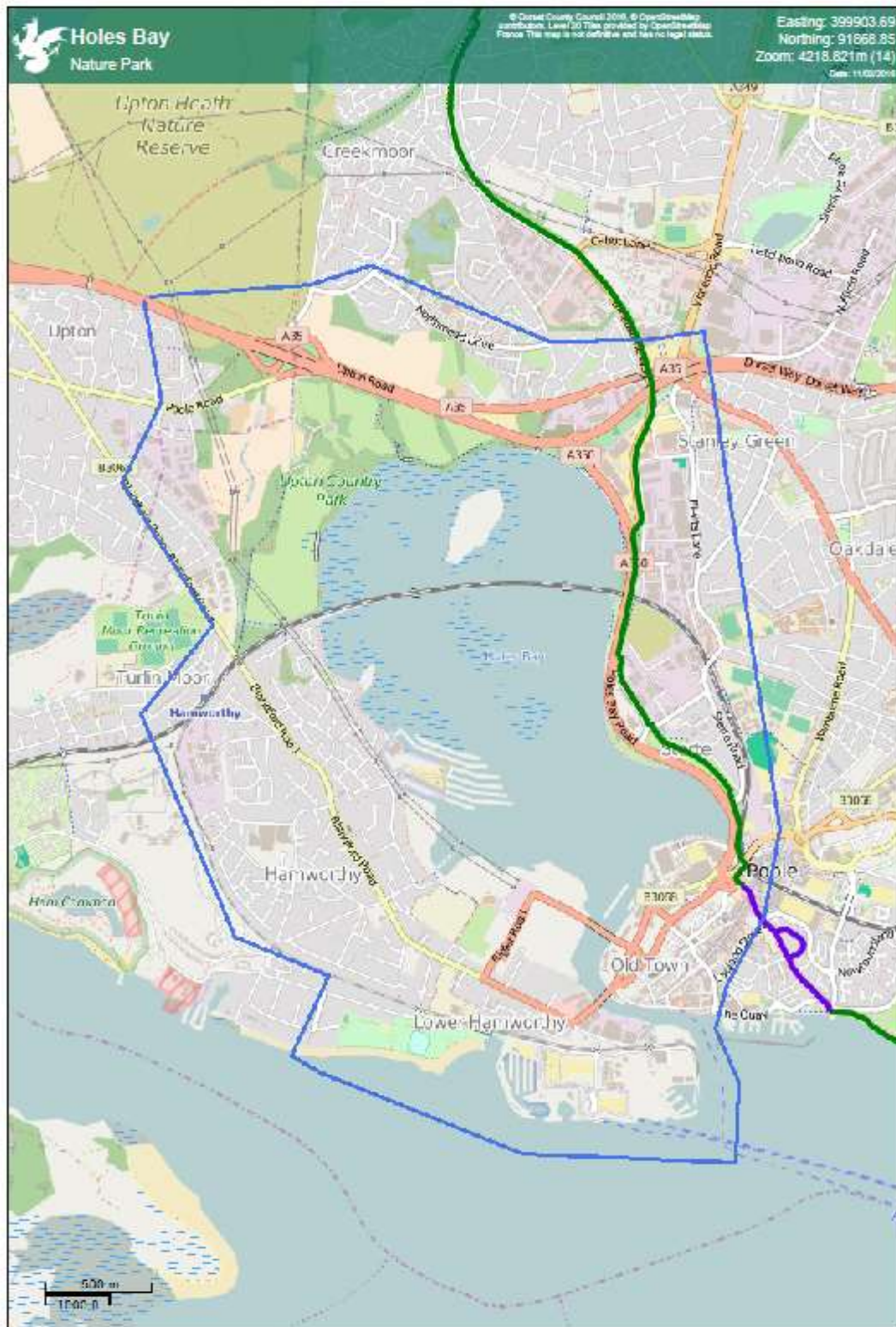


14.17 Proposed Reasoning for Holes Bay Nature Park Boundary

To be viewed alongside Proposed Boundary Map of the Holes Bay Nature Park

Location	Reasoning
<ul style="list-style-type: none"> Marine 	<ul style="list-style-type: none"> Incorporating all the marine area to include; water, channels, mud flats and saltmarsh up to the Extreme High-Water Mark.
<ul style="list-style-type: none"> Seascape grass verges and pathways 	<ul style="list-style-type: none"> Visual access, roadside verges provide diverse plants and inverts, road generates air pollution and water run off/drains
<ul style="list-style-type: none"> Upton Wood (PDC) 	<ul style="list-style-type: none"> Mitigation, recreational access, links to Upton Country Park, drainage/water link.
<ul style="list-style-type: none"> Upton Country Park (BoP) 	<ul style="list-style-type: none"> Mitigation, access, bus to walk routes, Castleman Trail and Heritage Cycle trail, screening, dog use.
<ul style="list-style-type: none"> McLagan Land (ASDA) 	<ul style="list-style-type: none"> Adjoins Holes Bay, close visual access, potential bird info, sponsors or public binoculars and interpretation.
<ul style="list-style-type: none"> Hamworthy Creeks 	<ul style="list-style-type: none"> Salt marsh, Poole Harbour trails and road access.
<ul style="list-style-type: none"> Holes Bay SNCI & Hawkwood Saltmarsh SNCI. 	<ul style="list-style-type: none"> Recognition of this adjoining conservation area that adjoins the marine with the terrestrial area.
<ul style="list-style-type: none"> The sewage outlet/inlets 	<ul style="list-style-type: none"> Run off and nitrification
<ul style="list-style-type: none"> Twin Sails & Poole Bridge 	<ul style="list-style-type: none"> Access, visual access, iconic structures, boat and watercraft access, the delimit of Holes Bay?
<ul style="list-style-type: none"> The National Cycle Route 25; the start of Castleman, Poole Harbour Trail 6 and Poole Heritage Cycleway 	<ul style="list-style-type: none"> Shared cycle path visual and physical access, mitigation, screening, opportunities for interpretation and guided walks
<ul style="list-style-type: none"> The railway and embankment 	<ul style="list-style-type: none"> Crosses Holes Bay, national route and structure, green access

14.18 Proposed Sphere of Influence Map for the Holes Bay Nature Park
(not definitive and subject to consultation). (Dorset Explorer (2017a))



14.19 Sphere of influence of the Holes Bay Nature Park.

The following are to be considered as influences and used in conjunction with *Proposed Sphere of Influence Map for the Holes Bay Nature Park*:

- Improvement Programme for England's Natura 2000 Sites (IPENS) - Poole Harbour (Natural England 2016) priorities (agricultural and industrial run off, fluvial links, nitrogen from roads, bird disturbance from access).
- Green travel hubs and links (catchment of walkers, commuters, local journeys).
- Land ownership.
- Potential commercial/recreational impacts – RNLI, Cobbs Quay Marina, boating channels, Sunseeker, adjoining industrial use.
- Sedimentation and estuarine links to the wider Poole Harbour.
- Bird refuge areas as waders and wildfowl flush to Lytchett Bay, Arne and other locations.
- Lytchett Bay Nature Park – possible overlap at Hamworthy Train Station and Upton Play Trail, with parts of HBNP.