Marine recreation evidence briefing: hovercraft

This briefing note provides evidence of the impacts and potential management options for marine and coastal recreational activities in Marine Protected Areas (MPAs). This note is an output from a study commissioned by Natural England and the Marine Management Organisation to collate and update the evidence base on the significance of impacts from recreational activities. The significance of any impact on the Conservation Objectives for an MPA will depend on a range of site specific factors. This note is intended to provide an overview of the evidence base and is complementary to Natural England's *Conservation Advice* and *Advice on Operations* which should be referred to when assessing potential impacts. This note relates to recreational use of hovercraft in coastal water (cruising). Hovercraft racing has not been included in this note as this is mainly conducted in inland waterways. Other notes are available for other recreational activities, for details see *further information* below.

Hovercraft

Definition

A hovercraft, also known as an Air-Cushion Vehicle (ACV), is a craft capable of travelling over land, water, mud or ice and other surfaces.

Distribution of activity

Hovercraft are restricted to coastal environments and are used on foreshore sediment (ie mud, sand and gravel) and on the surface of adjacent areas of shallow subtidal. Hovercraft are primarily used in sheltered environments, typically with large expanses of flat,

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intertidal areas such as mudflats or sandflats. Popular spots include the Wash, the Humber Estuary, natural harbours in Hampshire (Langstone, Chichester and Portsmouth), Blackwater Estuary, Severn Estuary and Morecambe Bay with a 'hotspot' of activity around the Isle of Sheppey and Swale Estuary (Simon Oakley, Hovercraft Club of Great Britain (HCGB), pers. comm. 8 February 2017).

Levels of activity

The Hovercraft Club of Great Britain estimated that it has approximately 800 members, although only about 100 of those members were active 'cruising' (recreational) hovercrafters (Simon Oakley, HCGB, pers. comm. 8 February, 2017).

Pressures

This note includes evidence on the pressures and impacts of the activity related to the launch/recovery of hovercraft and the use of hovercraft in intertidal areas and at sea.

The direct pressures considered to arise from each functional aspect of the activity are shown in Table 1 and the potential biological receptor groups affected by the pressures are shown in Table 2. The information presented on pressures associated with the activity builds upon, and is complementary to, Natural England's Conservation Advice and Advice on Operations which should be referred to for MPA specific information and sensitivities of specific MPA features to those pressures[1].

The main pressure-receptor impact pathways arising from this activity are considered to be:

- Abrasion/ penetration/ disturbance of intertidal substratum surface during launch/recovery of hovercraft using a vehicle/trailer or during operation of hovercraft (due to hovercraft movements, skirt pressure or lift air escape); this potentially may include displacement of surface material or compaction (Brooks, 2014). Abrasion disturbance during launch/recovery of hovercraft is considered unlikely to be a frequent pressure as established slipways are used which in general are accessible at high and low tides which minimises disturbance to sediment (UK CEED. 2000).
- Underwater noise disturbance of fish, related to engine operation, during the activity (this pressure is considered negligible for seals, cetaceans and diving birds based on the anticipated lack of overlap between recreational hovercraft in shallow coastal waters and these receptors in the marine environment).
- Above water noise and visual disturbance, of hauled out seals and birds, related to the operational noise (from engine and people) and the presence of the hovercraft and participants. The HCGB limits cruising craft noise to 87 decibels at 25m, but encourages new craft to be quieter than this[2]. Manufacturing developments can reduce the above water noise level from a two seater recreational hovercraft into

[1] https://www.gov.uk/government/collections/conservation-advice-packages-for-marine-protected-areas
[2] http://www.hovercraft.org.uk/showthread.php?6-buyers-guide

the range of 74-78 decibels at 25m[3], which the HCGB stated was similar to the noise from powerboats (Simon Oakley, HCGB, pers. comm. 8 February 2017).

Impacts to sub-surface substratum of intertidal habitats are not expected due to the operational clearance above ground during operation, the minimal ground pressure exerted by the hovercraft and the lack of surface piercing projections (Brooks, 2014).

Impacts to subtidal habitats are not expected as hovercraft do not use in-water propellers (which may cause scour in shallow subtidal environments). Furthermore, during operation a hovercraft rides on top of the water surface rather than in the water. The result is that there is no significant wash which could impact on shallow subtidal features (Brooks, 2014).

The potential for visual disturbance of fish receptors during operation of recreational hovercraft has been considered negligible (expert judgement) due to the low likelihood of overlap between the activity/pressure and sensitive receptors such as basking sharks (expert judgement).

For Tables 1 & 2 see page 12.

Impacts

Where an impact pathway has been identified between the pressures arising from the activity and a biological receptor group, a summary of the evidence of impacts has been presented below.

Intertidal habitats

Abrasion/disturbance of the surface of the substratum – from launch recovery of the hovercraft or operation of the hovercraft in the intertidal area

Access is required to the foreshore before mobilisation of hovercraft, typically via a motor vehicle and trailer. In general, damage may occur through trampling and/or erosion (eg through the use of vehicles/trailers), at access points (UK CEED. 2000). However, where craft are launched from established slipways, which the HCGB stated was the normal procedure, it is unlikely that significant additional impacts will occur from the launching itself.

During hovercraft operation there is a risk that damage to surface terrain may occur due to hovercraft movements, skirt pressure or lift air escape. This may include displacement of surface material or compaction. However, in reality, such damage is minor given the operational clearance above ground and thus minimal ground pressure exerted by the hovercraft. The passage of a hovercraft over soft mudflats leaves virtually no physical evidence. The mud surface takes on a slightly “brushed” appearance which persists for a few hours before the original surface appearance is regained (eg within a tidal cycle). Hovercraft have no surface piercing projections such as keels or propellers and therefore present an intrinsically low risk of physical damage to habitat (and species). In addition, hovercraft are unable to operate on vegetation of length greater than 10 cm (eg saltmarsh) and thus do not present a risk to these habitats (Brooks, 2014). Abrasion of smaller plants

[3] http://britishhovercraft.com/Buy-A-Hovercraft/Frequently-Asked-Questions.aspx

however is still possible; past studies show that damage from a mid-sized hovercraft was limited to detached vegetation with weak root systems (Abele and Brown, 1977; cited in Gaál, 2014).

Fish

Underwater noise changes

No published research into the underwater noise disturbance impacts of hovercraft on fish was available. However, vessels generally have been shown to increase stress response and potentially mask vocalisations in fish (Celi *et al*., 2015; Neenan *et al.,* 2016). However, hovercraft are likely to be quieter underwater than similar-sized conventional vessels (Blackwell and Greene, 2005; Hovercraft Club of Great Britain, 2016 cited in Natural England's Conservation Advice and Advice on Operations) given that the engine, lift fans and propeller are out of the water.

Marine mammals

Above water noise changes and visual disturbance

Hovercraft have the potential to cause disturbance to grey and common seals hauling out on intertidal soft sediment habitat such as sandbanks. Hauled out seals have been recorded becoming alert to powered craft more generally at distances of up to 800 m although seals generally only disperse into the water at distances <150-200m (Wilson, 2014; Young, 1998; Suryan and Harvey, 1999; Henry and Hammill, 2001). Responses are expected to be similar for hovercraft, although unlike other vessels, hovercraft are not constrained to just the water column and can therefore potentially get closer to hauled out seals. The level of response will be dependent on a range of factors including approach characteristics (distance and angle), frequency of disturbance events and the level of habituation to existing anthropogenic disturbance. A study in Langstone Harbour noted that hauled out harbour seals became agitated, readying themselves to leave the haul out and enter the water when a survey hovercraft moved directly past the haul out site. However, despite the craft passing within 115m of the animals they did not flee the haul out, and resumed normal loafing behaviour immediately after the craft departed (MacCallum, 2014).

Birds

Above water noise changes and visual disturbance

It is very difficult to separate out the relative contribution of noise and visual stimuli in causing a disturbance response to birds due to hovercraft and the available literature generally makes no distinction. Therefore, these pressures are reviewed collectively.

Studies have found that birds generally show similar disturbance responses to hovercraft as other vessels (Brooks, 2014 and references therein). However, unlike other vessels, hovercraft are not constrained to just the water column. This allows them to operate in very shallow water inaccessible to other craft and also in areas of exposed soft sediment intertidal habitat (such as mudflat, sandflat or gravel) which can be inaccessible on foot. Waterbirds foraging or roosting within these habitats are therefore particularly vulnerable to potential hovercraft disturbance.

In general, regular and defined human movements are less disturbing than erratic and random movements to waterbirds (Smit & Visser, 1993). In this respect, recreational hovercraft often produce high speed, unpredictable movements and subsequently a relatively high intensity disturbance stimulus. Research in Chichester and Langstone harbour found that birds reacted with a flight response of distances between 75 and 500 m from a hovercraft, with some species appearing particularly sensitive (e.g. Red-Breasted merganser, Shelduck and Wigeon), which took flight when the craft was up to 500m away while other species appeared less sensitive (e.g. Mute swans and Black headed gulls which remained within 100m of the craft (MacCallum, 2014; Gaál, 2014).

In general, the primary responses observed are likely to include increased vigilance, avoidance walking and flight responses. The level of response will vary depending on a range of factors including the frequency of disturbance and the level of habituation as a result of existing activity (IECS, 2009).

Repetitive disturbance events can result in possible long-term effects such as loss of weight, condition and a reduction in reproductive success, leading to population impacts (Durell *et al.,* 2005; Gill, 2007; Goss-Custard *et al*., 2006; Belanger and Bedard, 1990).

Assessment of risk of significant impact

The following assessment uses the evidence base summarised above, combined with generic information about the likely overlap of the activity with designated features and the sensitivity range of the receptor groups, to provide an indication of the likelihood of:

i) an observable/measurable effect on the feature group. And

ii) significant impact on Conservation Objectives based on the effect on the feature group.

The assessment of significance of impacts has been based on the potential risk to the achievement of the conservation objectives for the features for which a site has been designated. The assessment is made using expert judgement and is designed to help identify those activities that are likely to be of greatest or least concern, and, where possible, suggest at what point impacts may need further investigation to determine potential management requirements within MPAs to reduce the risk of an adverse effect on the integrity of the site. Note, the assessment only considers the impact pathways considered in the evidence section (pressures which were considered negligible in Tables 1 and 2 are not considered in this assessment).

The outputs are shown in Table 3. The relative ratings of likelihood of significant impact on Conservation Objectives (COs) are defined as:

- Low – possible observable/measurable effect on the feature group but unlikely to compromise COs.
- Medium – observable/measurable effect on the feature group that potentially could compromise COs.

- High – observable/measurable effect on the feature group that almost certainly would compromise COs.

The relative risk ratings are based on the activity occurring without any management options, which would be considered current good practice, being applied. The influence that such management may have on the risk rating is discussed in the Management options section below.

It must be noted that the above assessment only provides a generic indication of the likelihood of significant impacts, as site-specific factors, such as the frequency and intensity of the activity, will greatly influence this likelihood. As such, further investigation of the risk to achieving COs will need to be done on a site specific basis, considering the following key site-specific factors:

- The spatial extent of overlap between the activity/pressure and the feature, including whether this is highly localised or widespread.
- The frequency of disturbance eg rare, intermittent, constant etc.
- The severity/intensity of disturbance.
- The sensitivity of specific features (rather than the receptor groups assessed in Table 3) to pressure, and whether the disturbance occurs when the feature may be most sensitive to the pressure (eg when feeding, breeding etc.)
- The level of habituation of the feature to the pressure.
- Any cumulative and in-combination effects of different recreational activities.

For Table 3 see page 13.

Management options

Potential management options for marine recreational activities (note, not specific to recreational hovercraft activity) include:

On-site access management, for example:

- Designated areas for particular activities (voluntary agreements or underpinned by byelaws).
- Provision of designated access points eg slipways, in locations likely to be away from nature conservation access (voluntary or permit condition or underpinned by byelaw).

Education and communication with the public and site users, for example:

- signs, interpretation and leaflets
- voluntary codes of conduct and good practice guidance
- wardening
- provision of off-site education/information to local clubs/training centres and/or residents

Legal enforcement of, for example:

- byelaws which can be created by a range of bodies including regulators, Local Authorities and landowners (collectively referred to as Relevant Authorities); and

- permitting or licence conditions

Examples of management measures which have been applied to recreational hovercraft activities described by stakeholders included:

- Designated launch sites (in an area less sensitive for bird disturbance). And
- Byelaw requiring permission for navigation from the Statutory Harbour Authority

The highest risk to achievement of Conservation Objectives from this activity relates to noise and visual disturbance of hauled out seals and roosting, loafing or feeding birds in the intertidal area. Based on expert judgement, it is considered that where management measures, which would be considered current good practice (eg designated launch sites in less sensitive areas, comprehensive codes of conduct with respect to disturbance of sensitive species), are applied to recreational hovercraft activities, adhered to and enforced (eg by the HCGB on events or through peer-peer pressure), the likely risk of significant impact on a site's Conservation Objectives would be **Low** in relation to all activity/pressure impact pathways.

For further information and recommendations regarding management measures, good practice messaging dissemination and uptake, refer to the accompanying project report which can be accessed from **Marine evidence > Marine recreational activities**.

National governing body and good practice messages for windsurfing and kitesurfing

National governing body

There is no National Governing Body for recreational hovercraft activities. However, the Hovercraft Club of Great Britain, is a national membership organisation for racing and recreational hovercraft. This assessment has not considered racing hovercraft activities as this is primarily conducted on inland waters. The organisation facilitates the recreational use of hovercraft, which is undertaken in coastal waters, by linking members together and organising group events. The HCGB has a Code of Conduct for Cruising, covering the issues of planning the cruise, safety and courtesy. The code of conduct is available **here**.

Good practice messaging

The Code of Conduct covers the issues of planning the cruise, safety and courtesy. The messages relate to being courteous to local residents and wildlife, including not operating excessively fast or at full power. Key messages to minimise impacts include:

- Keep within the law - ensure intended route does not infringe local byelaws, navigation restrictions or wildlife sanctuaries. Obey all rules or directions issued by any authority responsible for the area you are operating in.
- Noise - use minimum speed and throttle when close to populated areas, people or wildlife.
- Avoid beach buzzing - try not to go past the same area more than once per hour. Stay away from populated beaches, shorelines or public areas unless no other route is available.

Although the messages relate to key pressures arising from this activity (eg noise disturbance to wildlife), given the ability of hovercraft to access intertidal areas and hence potentially get closer to sensitive

features than other types of watercraft, further detailed messaging to reduce the likelihood of impacts on features may be desirable. Such a code could be developed by the National Body in collaboration with stakeholders with expert knowledge of the features most likely to be affected. Examples of good practice messaging relating to interacting with wildlife that could be drawn on to develop the code further include the WiSe *Codes of Conduct*, Scottish Natural Heritage's *Marine Wildlife Watching Code* and the Green Blue's *The Green Wildlife Guide for Boaters*.

Further information

Further information about the National membership organisation for recreational hovercraft activities and their good practice messaging resources, site specific conservation advice and management of marine recreational activities can be found through the following links:

- National Body: The HoverCraft Club of Great Britain: **http://www.hovercraft.org.uk/**
- Conservation Advice - Advice on Operations
- For site specific information, please refer to Natural England's conservation advice for each English MPA which can be found on the Designated Sites System **https://designatedsites.naturalengland.org.uk/** This includes Advice on Operations which identifies pressures associated with the most commonly occurring marine activities, and provides a broad scale assessment of the sensitivity of the designated features of the site to these pressures.
- For further species specific sensitivity information a database of disturbance distances for birds (Kent et al, 2016) is available here: **http://www.fwspubs.org/doi/abs/10.3996/082015-JFWM-078?code=ufws-site**
- Some marine species are protected by EU and UK wildlife legislation from intentional or deliberate disturbance. For more information on the potential requirement for a wildlife licence: **https://www.gov.uk/guidance/understand-marine-wildlife-licences-and-report-an-incident**
- The Management Toolkit which can be accessed from **Marine evidence > Marine recreational activities**.

Notes for other marine recreational activities can be accessed from **Marine evidence > Marine recreational activities** and include:

- boardsports with a sail
- boardsports without a sail
- coasteering;
- diving and snorkelling;
- drones;
- general beach leisure;
- motorised and non-motorised land vehicles
- motorised watercraft;
- light aircraft
- non-motorised watercraft;
- personal watercraft;
- wildlife watching.

Natural England Evidence Information Notes are available to download from the Natural England Access to Evidence Catalogue **http://publications.naturalengland.org.uk/** For information on Natural England contact the Natural England Enquiry Service on 0300 060 3900 or e-mail **enquiries@naturalengland.org.uk**.

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References

ABELE, G. & BROWN, J. (1977). Arctic Transportation: Operational and Environmental Evaluation of an Air Cushion Vehicle in Northern Alaska. *Journal of Pressure Vessel Technology* 99: 176-182.

BELANGER, L. & BEDARD, J., (1990). Energetic cost of man-induced disturbance to staging snow geese. *Journal of Wildlife Management,* 54, 36-41.

BLACKWELL, S.B. & GREENE JR., C.R. (2005). Underwater and in-air sounds from a small hovercraft. *Journal of the Acoustic Society of America*, 118(6), 3646-3652.

BROOKS. I.L, (2014). *Environmental Impact Assessment For Recreational Light Hovercraft in Coastal Environment.* The Cruising Hovercraft Club UK.

CELI, M., FILICIOTTO, F., MARICCHIOLO, G., GENOVESE, L., QUINCI, E. M., MACCARRONE, V. & BUSCAINO, G. (2015). Vessel noise pollution as a human threat to fish: assessment of the stress response in gilthead sea bream (Sparus aurata, Linnaeus 1758). *Fish Physiology and Biochemistry*, 1-11.

DURELL, S.E.A. LE V. DIT, STILLMAN, R.A., TRIPLET, P., AULERT, C., BIO, D.O. DIT, BOUCHET, A., DUHAMEL, S., MAYOT, S. & GOSS-CUSTARD, J.D. (2005).Modelling the efficacy of proposed mitigation areas for shorebirds: a case study on the Seine estuary, France. *Biol*. *Conserv*. 123:67–77.

GAÁL, A. (2014). *A "three dimensional" Review of the Impacts of Hovercraft and Paramotor on Waterbirds.* MSc- Dissertation University of Southampton.

HENRY, E., & HAMMILL, M. O. (2001). Impact of small boats on the haul out activity of harbour seals(*Phoca vitulina*) in Metis Bay, Saint Lawrence Estuary, Quebec, Canada. *Aquatic Mammals*, 27(2), 140-148.

GILL, J. A. (2007). Approaches to measuring the effects of human disturbance on birds. *Ibis*, 149(s1), 9-14.

GOSS-CUSTARD, J. D., TRIPLET, P., SUEUR, F., & WEST, A. D. (2006). Critical thresholds of disturbance by people and raptors in foraging wading birds. *Biological Conservation*, 127(1), 88-97.

HOVERCRAFT CLUB OF GREAT BRITAIN (2016). *Recreation and Cruising* (cited in Natural England's Conservation Advice and Advice on Operations)

IECS (2009). *Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance*. Institute of Estuarine and Coastal Studies Report to Humber INCA.

KENT B. LIVEZEY, ESTEBAN FERNÁNDEZ-JURICIC, & DANIEL T. BLUMSTEIN (2016) Database of Bird Flight Initiation Distances to Assist in Estimating Effects from Human Disturbance and Delineating Buffer Areas. *Journal of Fish and Wildlife Management*: June 2016, Vol. 7, No. 1, pp. 181-191.

MACCALLUM, L. (2014). *Monitoring the effects of a hovercraft survey in Langstone and Chichester Harbours*. A report compiled by Lousie MacCallum for Langstone Harbour Board. March 2014.

NEENAN, S.T., PIPER, R., WHITE, P.R., KEMP, P., LEIGHTON, T.G. & SHAW, P.J. (2016). Does Masking Matter? Shipping Noise and Fish Vocalizations. In *The Effects of Noise on Aquatic Life II* (pp. 747-753). Springer New York.

SMIT, C., VISSER, G.J.M. (1993). Effects of disturbance on shorebirds: a summary of existing knowledge from the Dutch Wadden Sea and Delta area. *Wader Study Group Bulletin* 68, 6±19.

SURYAN RM & HARVEY JT. (1999). Variability in reactions of Pacific harbour seals, Phoca vitulina richardsi, to disturbance. *Fish. Bull*. 97: 332–339.

WILSON, S.C (2014). *The impact of human disturbance at seal haul-outs.* A literature review for the Seal Conservation Society.

YOUNG K. (1998). *Seal watching in the UK and Republic of Ireland*. IFAW, UK.

Table 1 Potential direct pressures arising from recreational hovercraft activity

	Abrasion/disturbance of the substrate surface	Abrasion/disturbance below substrate surface	Underwater noise changes	Above water noise changes	Visual disturbance
Access (launch/recovery)	✓[1]	X	X	✓[3]	✓[4]
Activity (use of hovercraft)	✓[1]	X	✓[2]	✓[3]	✓[4]

X - No Impact Pathway

1- Pressure relates to potential abrasion/disturbance of intertidal substratum during launch/recovery or operation of the hovercraft

2 – Pressure relates to underwater noise changes from engine operation during the activity

3 – Pressure relates to changes in air-borne noise created by people and/or vehicles during launch/recovery of hovercraft and from engine operation during the activity

4 - Pressure relates to the presence of the hovercraft and occupants during the activity

Table 2 Biological receptors potentially affected by the pressures arising from recreational hovercraft activity

	Abrasion/disturbance of the substrate surface	Abrasion/disturbance below substrate surface	Underwater noise changes	Above water noise changes	Visual disturbance
Intertidal Habitats	✓	Impact pathways scoped out	Impact pathways scoped out	Impact pathways scoped out	Impact pathways scoped out
Subtidal Habitats	Impact pathways scoped out				
Fish			✓		Negligible
Marine Mammals			Negligible	✓ (hauled out seals)	✓ (hauled out seals)
Birds			Negligible	✓	✓

Table 3 Assessment of indicative likelihood of significant impacts from recreational hovercraft activity

Pressure	Likely overlap between activity and feature (confidence)	Evidence of impact (confidence)	Sensitivity of feature to pressure (confidence)	Likelihood of observable/measurable effect on the feature	Likelihood of significant impact on Conservation Objectives
Surface abrasion / disturbance of intertidal habitat (from trampling and launch / recovery of craft)	**Low** – due to ability to launch/recover craft via established slipways (medium)	No direct evidence of surface abrasion/penetration/disturbance from launch/recovery using trailer Evidence suggests that vehicle use on a wet foreshore would have little impact, but some communities are more vulnerable than others (low confidence). For example, direct evidence of impacts of vehicle access on seagrass beds (medium)	**Low–Medium** Sensitivity will depend on intertidal habitat type and therefore will be site-specific. An example of a features with medium sensitivity to this pressure is intertidal seagrass beds	**Low –** based on low likelihood of overlap of pressure and sensitive features (through use of slipways for launch and recovery of craft)	**Low**
Abrasion / disturbance of intertidal substratum during activity	**High** – hovercraft are designed to be able to travel over intertidal habitat, although they are unable to operate where vegetation height is over 10cm	Limited evidence of impact of hovercraft – observations of impact on mud surface appearance (lasting for one tidal cycle only) and abrasion of detached vegetation with weak root systems (low confidence)	**Low–Medium** Sensitivity will depend on habitat type and therefore will be site- specific. An example of a features with medium sensitivity to this pressure is intertidal seagrass beds	**Low – Medium** Generally low based on nature of craft (air cushion with operational clearance above ground), the low physical pressure exerted by the craft during operation and the low/insensitivity of soft sediment habitats where activity likely to occur. Medium for intertidal habitats more sensitive to pressure (e.g. intertidal seagrass)	**Low**

Underwater noise changes – fish	**Low–Medium** depending on location of activity e.g. estuary, coastal, inshore (low)	Evidence suggests hovercraft likely to be quieter underwater compared to similar sized conventional motorised watercraft (low). In general, little direct evidence of vessel noise on fish although some evidence of increased stress response and masking of vocalisations from this pressure (analogue pressure; medium)	**Low–High** depending on species	**Low** - based on potentially lower levels of change in underwater noise compared to other types of motorised craft and predicted responses of fish species	**Low**
Above water noise changes and visual disturbance – marine mammals (hauled out seals)	**Low–High** depending on geographical location of activity and the potential for hovercraft to get closer to feature than other motorised watercraft as not constrained to the aquatic environment (high)	Anecdotal evidence relating to response of a small number of hauled out seals, which were agitated but did not flush into the water when a survey hovercraft passed within 115m of the haul out site (low) Anecdotal evidence from HCGB (membership body) of minimal/negligible impact on wildlife, including seals, during cruising events (low) Evidence of seals flushing when motorised vessels generally within 150-200m and response being more influenced by boat speed of approach rather than distance (analogue pressure – high)	**High** - hauled out seals sensitive to visual disturbance (medium) Evidence suggests common seals more sensitive to pressure than grey seals (high)	**Medium–High** based on wide range of potential overlap between pressure and feature including in relation to hovercraft ability to get closer to feature than other motorised watercraft where feature is present Where overlap occurs, strong evidence base for impact of motorised watercraft (not hovercraft specific) and high feature sensitivity	**Medium**

Above water noise changes and visual disturbance – birds	**Low–High** depending on geographical location of activity and the potential for hovercraft to get closer than other motorised watercraft (as not constrained to the aquatic environment) and/or areas not accessible by foot (high)	Some evidence that birds generally show similar disturbance response to hovercraft as other vessels (low) Evidence of disturbance to birds by motorised vessels (not hovercraft specific) with greater disturbance caused by erratic and random movements (analogue pressure; high). Hence high speed unpredictable hovercraft movements may produce a high intensity disturbance stimulus (expert judgement), although the HCGB (membership body) states that recreational cruising is not a high speed activity	**Low-High** In general, sensitivity will differ between species and behaviour (i.e. feeding/roosting compared to breeding). One study indicated duck species more sensitive to disturbance from hovercraft than others (Mute swans, black headed gulls) (low) As hovercraft can access areas other vessels cannot, bird species foraging or roosting in shallow water or exposed intertidal habitat may be particularly vulnerable to hovercraft disturbance (expert judgement)	**Medium–High** based on wide range of overlap between pressure and feature, including in relation to hovercraft ability to access areas where certain behavioural activities are considered more susceptible to disturbance e.g. foraging birds) (expert judgement)	**Medium**