Environmental Impact Assessment
For
Recreational Light Hovercraft in Coastal Environments

Summary

The Cruising Hoverclub UK (CHCUK) represents recreational light hovercraft operators in the UK, and has conducted an environmental impact assessment to determine the effects of light hovercraft operation on the environment, including a review of available published data.

It is concluded that following consideration of local conditions and the implementation of any locally required mitigations there will be no significant damage or negative impact to flora, fauna or biotopes as a result of hovercraft operations. The operation of light hovercraft in accordance with these details may therefore be considered to be a sustainable activity.

The results of this assessment are consistent with DEFRA studies which list hovercraft as an activity of "Low Concern" in relation to conservation of bio-diversity (15.)

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Rev 3

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1 Introduction

Light hovercraft have operated around the UK coast for approximately 40 years.

The Cruising Hoverclub UK represents hovercraft operators in the UK, is working with responsible authorities as appropriate to ensure that hovercraft operations are safe, sustainable and take account of other stakeholders needs.

2 Details of proposal

Hovercraft require no fixed infrastructure to launch, or may use existing infrastructure, therefore is it unlikely that there will be any plans or projects associated with hovercraft operation. This impact assessment therefore deals with actual or potential operational environmental impacts, which are generalised and therefore not location specific. Any infrastructure or location specific impacts should be covered by an assessment relating to specific proposals. However, this document will be useful in determining those factors which are common to all proposals.

3 Environmental Assessment

This environmental assessment has been completed to determine the environmental impact of light hovercraft operations. In particular, it is intended to:

- Identify possible environmental effects
- Determine what is known about each environmental effect
- Propose measures to mitigate adverse effects

Using this study, it is intended to:

- Minimize or avoid adverse environmental effects before they occur
- Incorporate environmental factors into decision making

4 Environmental Risks associated with hovercraft

In order to consider the level of environmental risk associated with hovercraft operations, it is first necessary to identify all possible (actual or potential) environmental interactions, whether or not there is evidence that these exist. However, this list is restricted to interactions that have a plausible basis or are described in the literature.

Reference 15. lists noise, habitat disturbance and engine emissions as the principle environmental risks associated with hovercraft use. Further consideration and a review of the literature (1., 5., 16.) add to this, and the principle environmental risks are listed below:

- Surface interactions (i.e. damage to surface terrain, compaction, etc.)
- Water interactions (i.e. wash, turbidity etc.)
- Damage to flora

- Damage to birds nests, birds eggs
- Bird disturbance
- Cetacean disturbance
- Pollution & emissions
- Noise

Habitats Directive definition of "disturb"

In this work, the meaning of the word "disturb" is a defined by the Habitats Directive, Article 12. This makes it clear that interrupting an individual animal from its normal behaviour is not to be considered to be disturbance, but rather that disturbance should be considered at the level of local populations. For example, causing a single bird to cease feeding and become alert would not be disturbance, but causing a local population to abandon a good feeding ground for a poor feeding ground would be disturbance.

5 Potential effects on the environment

The potential effects on the environment are discussed here, whilst the actual effects are considered later in the document, together with mitigating provisions leading to a discussion of the end effects of each potential risk factor.

5.1 Surface interactions

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.

5.2 Water interactions

There is a risk that water interactions causing wash due to the passage of the hovercraft, or the escape of lift air.

5.3 Damage to flora

There is a risk that damage to flora may occur by abrasion, crushing, by the passage of the craft, or by the escape of lift air.

5.4 Damage to birds nest, birds eggs

There is a risk that damage to ground nesting birds nests or eggs may occur by the passage of hovercraft.

5.5 Bird disturbance

There is a risk that disturbance to feeding, nesting or loafing birds may occur due the sight or sound of passing craft.

5.6 Seals, cetaceans and fish harm

There is a risk that seals, cetaceans and fish may come into contact with passing hovercraft and harm may occur due to impact.

5.7 Cetacean disturbance

There is a risk that disturbance to cetaceans may occur due the sight or sound of passing craft.

5.8 Pollution & emissions

There is a risk that emissions of fuel or lubricating oil may, unless mitigations are considered, pollute the ground or sea. Emission of CO_2 may contribute to global warming. Emission of unburned hydrocarbons may pollute the environment.

5.9 Noise

Whilst noise is considered to be a nuisance, it is not of itself an environmental risk except in so far as it may contribute to disturbance. However, due to the nuisance factor it is concluded specifically in this work.

6 Review of what is known about hovercraft operations

There is a considerable body of relevant data available relating to the environmental impacts of hovercraft, and this data is discussed and referenced here.

6.1 Surface interactions

It is convenient to consider typical ground terrain types found in the UK coastal environment in order to determine the possible effects of light hovercraft operation.

6.1.1 Coastal Saltmarsh

Light hovercraft have a hover-clearance which is limited to 2-3 cm plus a soft-skirt of 15 to 25cm. As a result they cannot operate on vegetation of length greater than approximately 10 cm. The vegetation found on coastal saltmarsh prevents light hovercraft from operating in these regions therefore there can be no damage or disturbance to such terrain.

6.1.2 Floodplain and coastal grazing marsh

Light hovercraft have a hover-clearance which is limited to 2-3 cm plus a soft-skirt of 15 to 25cm. As a result they cannot operate on vegetation of length greater than approximately 10 cm. The vegetation found on floodplain and grazing marsh prevents light hovercraft from operating in these regions therefore there is no damage or disturbance to such terrain.

6.1.3 Littoral sediments and sands

The hovercraft has an extraordinarily low ground pressure (5. 3.18.). Ground pressure of a hovercraft is compared to other vehicles, and people in Table 1.

A ground pressure of less than 14kPa (2psi) or less is recommended (4.) for fragile ecosystems like marshes to avoid compaction or damage, and it is apparent that hovercraft are able to satisfy this requirement with significant margin of safety

The passage of hovercraft over even very soft mudflats leaves virtually no physical evidence (22.). The mud surface takes on a slightly “brushed” appearance, which persists for a few hours before the original surface appearance is regained. There is no other damage to the surface and no significant displacement of material (14.).

Passage of hovercraft over littoral sediments and sands will therefore leave no permanent damage and indications of such passage will be erased on or before the next tide (14. 22.).

In the context of surface disturbance, light hovercraft operation may therefore be considered a sustainable activity.

Item	Ground pressure kPa (psi)
Hovercraft	0.6-1.0 (0.09-0.15)
Motor vehicle	190-230 (28-33)
Human Footprint	60-80 (8.7-11.6)

Table 1 - Ground pressures

6.2 Water interactions

In a study on the Kuskoswim river delta in Alaska, a large commercial hovercraft was operated a part of a postal service. Monitoring was undertaken and there is no damage due to wash, and there was no fish or fry dislocation (1.).

A study was undertaken to determine whether large commercial hovercraft could be used to impart a vertical mixing component in surface waters in connection with oil spill cleanup operations. It was found that there was no vertical mixing of surface waters (17.) and therefore no increase in turbidity.

The following conclusions are drawn in the studies referenced:

• Underwater noise levels are considerably lower than conventional vessels (19.)

• There is no increase in turbidity (16.)

• No emissions to the water (eg contaminated cooling water, bilge water 3.

• No anti-fouling applied (stored on land)

• No craft storage on mudflats.

6.3 Damage to flora

Light hovercraft are unable to operate in vegetation exceeding approximately 10 cm in height, which in practise means that ungrazed land is beyond reach.

Passage of large hovercraft over the surface of fragile ecosystems was studied by Abele and Brown (1977) (5.), who conducted a detailed study in the summer of 1971, near Barrow, Alaska, on the effects of a mid-sized ACV (Air Cushion Vehicle or hovercraft) on wet and dry tundra. It was found that surface damage was limited to detached vegetation with weak root systems, with no other surface damage occurring. These effects were considered as slight.

In the case of light hovercraft, which could not operate in the areas described in this study (section6.1.1 to 6.1.3), these slight effects will not occur.

6.4 Damage to birds nest, birds eggs

6.4.1 Below mean high springs

Birds do not nest below mean high spring, and therefore damage to birds nests and eggs in the intertidal zone is not possible

6.4.2 Above mean high springs

Many ground nesting birds require some level of vegetation in which to nest. It is not possible for light hovercraft to operate in vegetation exceeding approximately 10cm in height, therefore effectively protecting ground nesting birds from hovercraft operation.

Some ground nesting birds nest in simple scrapes, eg Oystercatchers, and these may be found in sandy ground just above the mean high springs lines in some locations.

6.5 Bird disturbance

6.5.1 General

Studies have been conducted that show that bird disturbance by hovercraft is similar to that caused by other water vessels (18., 22.). This conclusion is supported by observations in relation to appropriate assessments made by Natural England (14.) that birds are less disturbed by hovercraft than by people on foot. It was noted that hovercraft provided little disturbance to feeding birds during trials in the Lindesfarne area (20.) In studies on the Solent (22.), observers concluded that waterfowl react to hovercraft in a manner similar to a motorboat, and that there were no significant differences in the birds reaction to these two types of craft (22.)

6.5.2 Type of disturbance

Disturbance was categorised according to its potential effects on birds, (13.). Figure 1 details four types, hovercraft activity falls into the “Active high-level infrequent” category. This chart suggests that under this type of disturbance the site will maintain its attractiveness to bird populations.

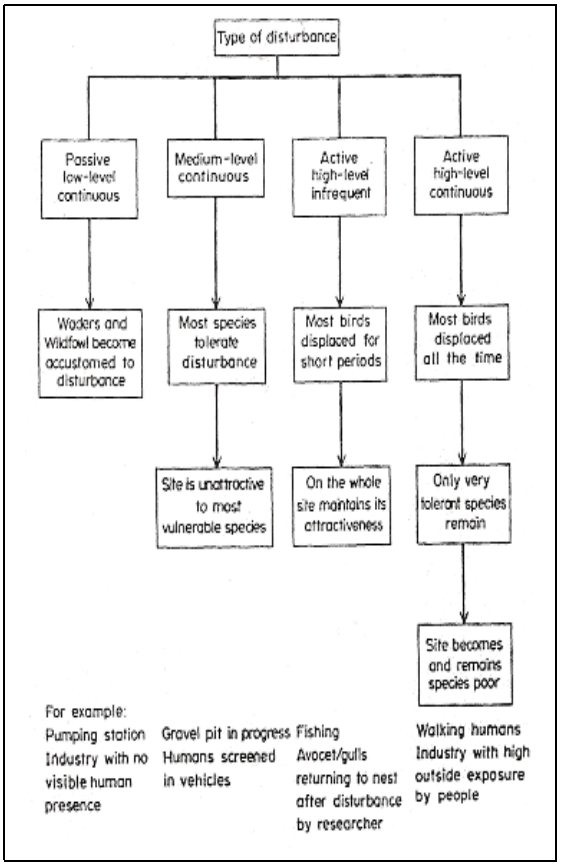

Figure 1 - Disturbance categories

6.5.3 Effects of disturbance

Disturbance of birds reduces the time and habitat available for feeding, and in addition increases the energetic load on the individuals, reducing bodyweight and leading to increased chance of mortality.

Individuals-based modelling has been used to predict the overwinter mortality of waterbirds when subject to various disturbances (6.,8.), and has been shown to provide accurate assessments of the effects of proposed sources of disturbance on bird population mortality and bodyweight (6.).

6.5.4 Seasonal disturbance

Disturbance is more likely to cause a significant increase in mortality when it occurs in the overwintering period, especially later in the winter (after 1st December (6.)) when food is less plentiful (8.).

It was shown (6.) that disturbance of over-wintering birds in the early winter period (before 1st December) has lesser effects than disturbance in the later winter period. This study shows no significant increase in mortality when disturbance is limited to the early winter period, and a very small increase in mortality when disturbance is limited to daytime only for a small portion of the feeding range.

6.5.5 Set-back zones

A 150m set-back zone (6.) was shown to eliminate the effects of disturbance and ensure that mortality will not increase above the background rate.

6.5.6 Rate of disturbance

In the Baie de Somme, France, an individuals-based model was used to predict how the effect of disturbance on Oystercatcher mortality interacts with food abundance. In this model, the birds were unaffected by up to 1.0-1.5 disturbances per hour, provided that cockle stocks were high. However, if, as sometimes happens in the Baie de Somme, large amounts of the cockle stock die in midwinter, the model predicted disturbances should be kept below 0.2-0.5 per hour to prevent increased Oystercatcher mortality (8.).

6.5.7 Flushing distance

The propensity to disturb, and therefore flush, birds is a function of distance from the disturbing influence. It has been established that disturbance by hovercraft is similar to that by other water vessels (18.).

In studies, the mean flushing distances varied from 22m (Tern) to 58m (Heron) (9.). This result is consistent with similar studies conducted in Australia (21.)Various studies have suggested buffer zones, and recommendations are typically in the range of 100-150m (Ref 6., 9., 10., 11.).

6.5.8 Waterfowl use of habitat in rivers subject to hovercraft traffic

In a study in the Solent, data was considered to determine whether wildfowl were likely to leave an area subject to hovercraft traffic in favour of other areas not subject to such traffic. It was concluded that recreational use of hovercraft would not have an adverse effect on waterfowl use of habitat (22.) This is confirmed in a separate study on the Kuskoswim Delta (16.)

6.6 Harm to seals, cetaceans, fish and other water creatures

Hovercraft have no surface piercing projections such as keels or propellers and therefore present an intrinsically low risk to seals, cetaceans, fish and other water creatures (18.).

Light hovercraft hard hull structure is carried 20-30 cm above the surface of the water by the air cushion, and therefore presents no risk to creatures at or below the surface of the water.

The hovercraft air cushion is contained by a soft fabric skirt which is unlikely to harm cetaceans, fish of other creatures since it is designed to conform easily to any obstructions encountered (18.)

A study was conducted on the Kuskokwim river delta to determine whether passage of a large commercial hovercraft would cause injury to fish or fry, including beaching the craft and the use of underwater cameras to observe the effects of the craft passing. No significant harm was caused to fish or fry (1.). There was no disturbance to the feeding of fish in the vicinity of the passing craft.

Underwater noise levels due to a large passing hovercraft (Griffon 2000 TD) have been studied (18. 19.) and were found to be considerably lower than similar sized conventional vessels, resulting in sounds being audible to an underwater observer for a distance some 20 to 60 times less than a conventional vessel.

6.7 Cetacean disturbance

In a study on the Forth, in which a hovercraft was operated on a pre-determined route whilst observers recorded the reactions of seals and porpoises, no reaction to the passage of the hovercraft was noted (18.)

6.8 Pollution & emissions

Modern light hovercraft are designed to minimise emissions into the environment.

6.8.1 Fluids

Hovercraft are designed with a water-tight hull into which is contained the machinery. Any spillage or leakage of fuel, oils, etc., will be contained in the hull and will not pollute the environment.

6.8.2 Exhaust gases

Modern hovercraft use 4 stroke engines designed to meet current legislation regarding exhaust fumes such as NOX or unburned hydrocarbons. There will be no significant release of polluting gases or unburned hydrocarbons.

6.8.3 CO2

The hovercraft was conceived and developed to reduce the water-drag associated with conventional vessels. This is achieved by the provision of a lubricating cushion of air which separates the vessel from the water, thereby reducing friction.

Reduced hull friction reduces the power required to maintain forward motions, and this results in enhanced efficiency of the craft. The result is that a hovercraft consumes approximately 50% of the fuel of a similar sized conventional vessel at a similar speed, meaning that the release of CO2 is similarly reduced.

6.9 Noise

Modern light hovercraft are designed specifically to reduce emitted noise. For example, two-stroke engines have been eliminated from modern cruising craft, which now use quieter four stroke engines. Considerable development has occurred recently, and new state-of-the-art craft can now operate at noise levels meeting the recreational craft directive.

Modern light hovercraft, operated at full power, produce noise levels under 84dB at 25m, with many craft now achieving levels less than 78dB. Under cruising conditions such craft produce less noise, with levels in the region of 75dBa being common. Ref 2. refers to the noise levels of a medium sized commercial (12m) craft which is larger than recreational craft (3m-5m) but is included as objective evidence of low noise levels.

It should be noted that UK survey craft are specialised for their purpose, and are not typical of the cruising fleet. Experience gained though hovercraft survey work should not be extrapolated onto the Cruising fleet, which are typically 10-15dBa quieter.

7 Mitigations

7.1 Surface interactions

As described in section 6.1, the potential to damage surfaces is very low, and is largely self-mitigated by the very low surface pressure exerted by the craft. It is unlikely that any further mitigating provision will be required.

7.2 Water interactions

As described in section 6.2, hovercraft do not produce significant surface interactions such as wash or vertical mixing, and in tests it was shown that damage did not occur to banks, and there was no impact on fish or fry in shallow water. It is unlikely that any further mitigating provisions will be required.

7.3 Damage to flora

As described in section 6.3, hovercraft cannot operate in any significant vegetation and for this reason the risk of damage to flora is mitigated. It is unlikely that any further mitigating provisions will be required.

7.4 Damage to birds nests & eggs

As described in section 6.4, light hovercraft typically operate on the water, which clearly mitigates the risk to ground nesting birds. Whilst there is often a launch and recovery, which may cross intertidal margins, this will necessarily be from the road system and therefore subject to existing human activity making the presence of ground nesting birds unlikely.

The residual risk of damage to ground nesting birds may be mitigated by the provision of relevant information to hovercraft pilots such that they are aware of the presence of sensitive areas at certain times of the year. This will ensure that sensitive areas remain undisturbed. If appropriate, this information may be provided as part of local access schemes, or through information provided to hovercraft pilots via the Cruising Hovercraft Club.

7.5 Bird disturbance

Proposed operation of light hovercraft should be designed to minimise the effects of disturbance to birds. The following factors should be considered:

- Existing levels of disturbance by watercraft
- Locations of affected species & craft operating corridors
- Frequency of disturbances
- Time of year of disturbance & food supply
- Whether formal set-back zones are required
- Bird avoidance by pilots

Risk of disturbance may be mitigated by a combination of temporal and spatial separation, and avoidance of feeding flocks. Certain particularly sensitive locations should be avoided, and other locations may need to be avoided at certain times of the year. Consideration should be given to the use of launch corridors designed to route craft away from main local populations, and in some cases set-back distances from the

shoreline may be appropriate. CHC hovercraft pilots are trained to avoid feeding birds by steering a course to avoid them.

Using an appropriate combination of these measures, the risk of disturbance to bird populations may be mitigated.

7.6 Harm to seals, cetaceans, fish

As described in section 6.6, there is no significant risk of harm to seals, cetaceans or fish which are in the water. It is unlikely that any further mitigating provisions are required.

7.7 Cetacean disturbance

As described in section 6.7, in a study on the Forth estuary, it was noted that cetaceans were not disturbed by hovercraft passing. It is unlikely that any further mitigating provisions are required.

7.8 Pollution and emissions

As described in section 6.8, there are no emissions of fluids to the environment, and CO2 emissions are reduced as compared to similarly sized conventional powered boats travelling at similar speeds.

7.9 Noise

Noise is substantially mitigated by engineering improvements to modern recreational hovercraft, which should not be compared to the current survey craft fleet (see section 6.9).

Whilst noise is not an environmental risk as such, it is considered to be a nuisance and may contribute to disturbance of wildlife. The residual noise nuisance is mitigated by ensuring that the exposure time is low. CHC pilots are trained not to pass the same location repeatedly, instead making a significant passage and only returning several hours later.

8 Summary & Conclusion

The Cruising Hoverclub UK (CHCUK) has conducted an Environmental Impact Assessment to determine the effects of light hovercraft operation on the Environment. This assessment includes a review of the available environmental data relevant to hovercraft operation.

There will be no significant damage nor other negative impact to flora, fauna or biotopes as a result of the hovercraft operations once local conditions described in this study are considered, and appropriate mitigations put in place. The operation of light hovercraft in accordance with the details of any required local mitigations may therefore be considered to be a sustainable activity.

The results of this assessment are consistent with DEFRA studies which list hovercraft as an activity of “Low Concern” in relation to conservation of biodiversity. (15.).

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