



# Cross Forth Passenger Ferry Study

## Stagecoach Hovercraft Trial

Data Collation

19 October 2007

Report no: RT/DV01356/16/02







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## Stagecoach Hovercraft Trial

Data Collation

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**Report no:** RT/DV01356/16/02

**Date:** 19 October 2007

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# 1 Summary

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Hyder Consulting Ltd. have been appointed by Fife Council, on behalf of a Steering Group comprising Fife Council, City of Edinburgh Council, Forth Estuary Transport Authority (FETA), SEStran and Forth Ports plc, to assess the viability of a passenger ferry service across the Forth Estuary.

Hyder's previous Business Viability Assessment (dated 26<sup>th</sup> July 2007) had recommended that the Kirkcaldy – Seafield route should not be progressed as it did not meet the test of covering its operational costs. These costs indicated that a hovercraft service on the route would only breakeven at a patronage of 2,305 passengers per day (ppd) at £3.85 single journey fare.

However, as part of this study, Hyder Consulting were commissioned to undertake a data collation exercise on the hovercraft trial (see Appendix A).

Stagecoach ran a trial hovercraft service across the Firth of Forth for two weeks from Monday 16 July to Saturday 28 July, excluding Sunday 22 July. A total of 22 services a day – 11 in each direction were promised between Kirkcaldy (Fife) and Portobello (Edinburgh).

A 28-metre BHT130 hovercraft, manufactured by Isle of Wight-based Hoverwork Limited and incorporating the latest diesel engine technology, was used for the trial. The hovercraft travelled up the east coast from the Solent and, after initial trial runs, a special VIP trip was laid on for Friday 13 July. Subsequent trialling of arrangements for passengers was undertaken on the following Saturday and Sunday.

With a total of 32,099 passenger trips, the trial attracted greater patronage than had been anticipated by Stagecoach. As a result lengthy queues formed and Stagecoach eventually laid on extra crossings.

For those travelling to the Kirkcaldy hovercraft terminal by bus, fares were set at the same level as the single/return bus fare between Fife and Edinburgh and included concessionary fares. Peak-time services and integrated bus links were designed to accommodate commuters looking to avoid congestion on the Forth Road Bridge. Stagecoach concluded that 2,213 (6.9%) were commuters by assuming that the first two trips of the day were solely occupied by commuters. The figure does not include commuters during the afternoon and evening.

During the trial the Forth Rail Bridge was closed from Sunday 22 to Sunday 29 July 2007 by Network Rail so that it could renew a major set of points at Inverkeithing and improve drainage in the North Queensferry tunnel, thereby improving reliability. Trains from Edinburgh to Dundee or Aberdeen were diverted through Stirling and Perth, whilst services to / from Fife were replaced by buses. The work was timed to coincide with the Fife trade holiday and suspension of roadworks on the road bridge. This closure was announced well in advance and Stagecoach was quoted as having timed their hovercraft trial to coincide with the closure of the rail bridge.

Figures provided by Stagecoach give an average daily patronage over the trial of 2,675 ppd which compares favourably with the breakeven patronage required of 2,305 ppd.

The average revenue generated by the trial from fare-paying passengers was £2.81. The fare for a breakeven patronage is £3.85 as modelled by the Hyder Business Viability Assessment.

However, from the 1,310 responses received to the Patronage Survey, nearly half the people who responded were travelling on the hovercraft for the experience, rather than to trial the hovercraft as a potential method of commuting. This shows that the advertising for the trial had worked and that hovercraft, despite having been used continuously in the UK for over 40 years, still have attractions when introduced to a new area. This indicates a willingness amongst people to try out a new service (just as they did on the Solent in 1961). It also, perhaps, reflects the timing of the trial in the summer holiday rather than in a more "neutral" month (say May or October).

Average journey time was recorded as 17 mins with an operating speed of 37 knots.

The operational statistics received from Stagecoach indicate that the hovercraft achieved a fuel consumption of 290 litres/hour at an operational speed of 37 knts (see Appendix D). This would give an annual fuel cost of £511,166 at the quoted 45.9ppl. for 2 hovercraft over the 11.2 nautical mile journey (30min peak / hourly off-peak service). This compares favourably against Hyder's original business plan assumptions of 669 litres/hour at an operational speed of 35 knts at 40ppl which gave an annual fuel cost of £1,083,463.

By removing payroll costs from Hyder's Business Plan and applying the hovercraft charter costs for the 2 week trial over an annual basis, this gives an annual hovercraft cost of £1,197,000. This figure would include for craft depreciation, accruals for interior and engine refits, maintenance, insurance, transport costs and profit and overheads. This is in line with Hyder's Business Plan allowance of £927,750 per hovercraft (exc. transport and profit) and thus is taken as a further validation of Hyder's Business Viability Assessment of a hovercraft service.

Approximately 69% of passengers carried agreed or strongly agreed that the transport links in Fife were from the most appropriate place, compared with 77% from the Edinburgh side.

Passenger seating comfort on the hovercraft was rated as HIGH although measurements were taken when the sea state was relatively calm for the Firth of Forth.

From the 231 responses received to the Residents' Survey that it is noted that 13% of residents objected to the hovercraft route remaining at the trial locations. Blocking the promenade and other environmental issues (ie noise; dust; car parking) seem to be the main causes of concern for the local residents (particularly at Portobello).



It is recommended that if the hovercraft was to become a regular service then good pedestrian signage would help reduce noise and disruption on side streets which are off the access route. Also adequate parking provision should be made for a regular service.

## 2 Hovercraft Trial Overview

---

Hyder Consulting Ltd. have been appointed by Fife Council, on behalf of a Steering Group comprising Fife Council, City of Edinburgh Council, Forth Estuary Transport Authority (FETA), SEStran and Forth Ports plc, to assess the viability of a passenger ferry service across the Forth Estuary.

Hyder's previous Business Viability Assessment (dated 26<sup>th</sup> July 2007) had recommended that the Kirkcaldy – Seafield route should not be progressed as it did not meet the test of covering its operational costs. These costs indicated that a hovercraft service on the route would breakeven at a patronage of 2,305 passengers per day (ppd) at £3.85 single journey fare.

However, as part of this study, Hyder Consulting were commissioned to undertake a data collation exercise on the hovercraft trial (see Appendix A).

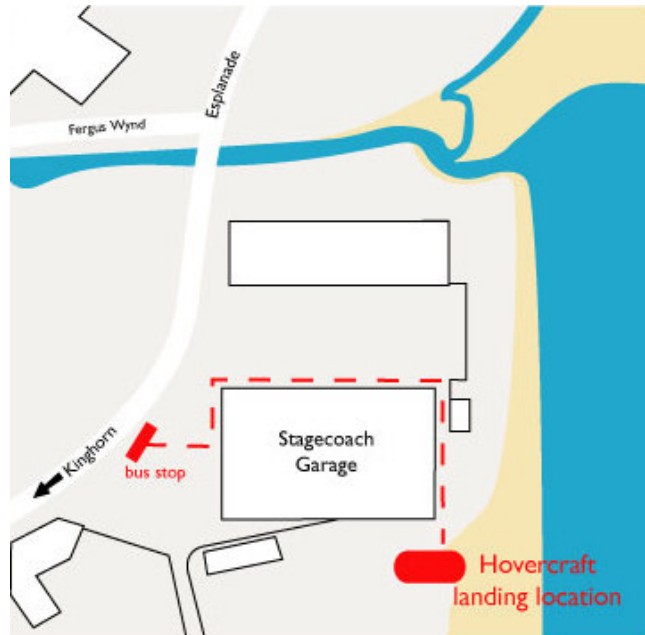
This trial was promoted and part funded by Stagecoach with support from SEStrans. A 28-metre BHT130 hovercraft, manufactured by Isle of Wight-based Hoverwork Limited and incorporating the latest diesel engine technology, was used for the trial. The hovercraft travelled up the east coast from the Solent and, after initial trial runs, a special VIP trip was laid on for Friday 13 July. Subsequent trialling of arrangements for passengers was undertaken on the following Saturday and Sunday.

The full passenger trial of the hovercraft service ran for two weeks from Monday 16 July to Saturday 28 July, excluding Sunday 22 July. Although a total of 22 services a day – 11 in each direction – was promised on the route, the trial attracted greater patronage than had been anticipated by Stagecoach. As a result lengthy queues formed and Stagecoach eventually laid on extra crossings.

For those travelling to the Kirkcaldy hovercraft terminal by bus, fares were set at the same level as the single/return bus fare between Fife and Edinburgh and included concessionary fares. Peak-time services and integrated bus links were designed to accommodate commuters looking to avoid congestion on the Forth Road Bridge.

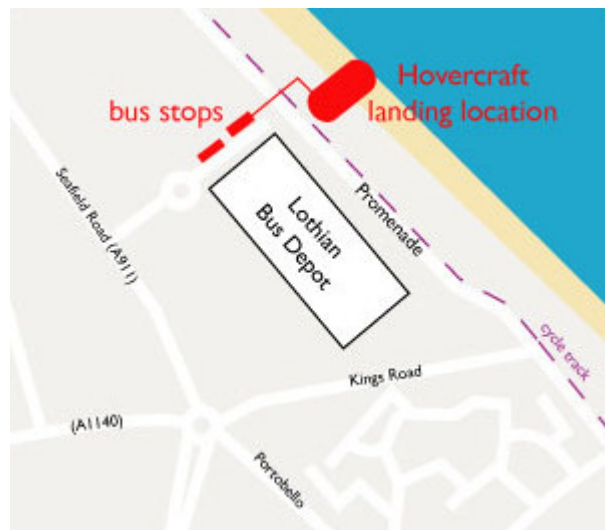
The Kirkcaldy site was serviced by Stagecoach's existing 6, 6A, 7, X59 and X60 bus services which stopped at the Kirkcaldy departure point. There was also a park and ride facility for those arriving by car.

The Kirkcaldy landing site was located on the beach at the rear of the former Stagecoach bus depot at the west end of the Esplanade (see Fig.2.1)



**Fig.2.1 Kirkcaldy landing location**

The Seafield landing site was located on the beach at the rear of the Lothian Bus Depot at Portobello, Edinburgh (see Fig.2.2)



**Fig.2.2 Seafield landing location**

Shuttle bus services X90 and X91 operated between Portobello and Edinburgh city centre and Leith.

No car parking was available at Portobello and customers were advised to travel to Portobello by Lothian bus or park away from the site and arrive by foot.

During the trial the Forth Rail Bridge was closed from Sunday 22 to Sunday 29 July 2007 by Network Rail so that it could renew a major set of points at Inverkeithing and improve drainage in the North Queensferry tunnel,

thereby improving reliability. Trains from Edinburgh to Dundee or Aberdeen were diverted through Stirling and Perth, whilst services to / from Fife were replaced by buses. The work was timed to coincide with the Fife trade holiday and suspension of roadworks on the road bridge. This closure was announced well in advance and Stagecoach was quoted as having timed their hovercraft trial to coincide with the closure of the rail bridge.

## 2.1 Stagecoach Information

**forthfast** brought to you by  
Stagecoach

SEStrans, who have committed £92,000 to an overall £100,000 package of public funding towards the trial, have required Stagecoach to provide information in accordance with Appendix C & D.



### 2.1.1 Trip Details

It was assumed that passenger numbers would be received in the format noted in Appendix C (Trip details) from Stagecoach and that these would be incorporated into this report. Instead Stagecoach provided overall patronage figures for each day (see Appendix C).

In total, Stagecoach reported 32,099 single journeys were made on the service, of which 2,213 (6.9%) were commuters. It is apparent that, in reaching this conclusion, Stagecoach have assumed that all people travelling on the first two trips of each day (Mon – Fri) from each terminal were commuters and that the figure is expressed as a percentage of the whole (which includes Saturdays). The figure does not include commuters during the afternoon and evening. This figure also then gives the load factors on these first two round trips as 42.56%. If the number of commuters is related to the total weekday passengers (27,150), then the share increases to 8.15%.

Following the above assumption through, Stagecoach have then concluded that commuter traffic doubled from 715 in the first week to 1,498 journeys in the second week. During the second week of the trial, the Forth Rail Bridge was closed which resulted in the rail service from Kirkcaldy to Edinburgh being suspended. This seems to have influenced the number of commuters using the hovercraft during this period. Slightly less than half of the passengers (47%) used the X90 & X91 connecting bus services.

However, Alistair MacLeod gave a presentation (on behalf of Stagecoach) to the Transport Day Conference on Monday 3<sup>rd</sup> September at Pickaquoy Conference Centre, Kirkwell, Orkney (see Appendix D). This contained a note on key statistics:

- 32,099 passengers carried in 12 days

- On 288 trips @ 85.7% load factor
- 2,213 passengers on 20 commuter services between 07:10 & 08:30 hrs
- Bus Links operated by Lothian Buses:
  - 15,215 passengers carried in 12 days
  - 9,349 to city Centre
  - 5,866 to Ocean Terminal
  - 47% of passengers used buses
  - 53% on local or roundtrips

## 2.1.2 Sea State observations

It was assumed that sea state observations will be received in the format noted in Appendix C (Trip details) from Stagecoach.

Information supplied by Stagecoach notes that the service commenced on Monday 16<sup>th</sup> July at 07:10hrs with a Wind Force 7 ENE at 30 knots and seas up to 2.5m. This improved from 11:00hrs onwards to NE veering southerly at 10 knots. It should be noted that Stagecoach reported that the weather saw a considerable improvement over the rest of the trial varying from Calm to F3-4 N/NE during the first week and from F1-2 Variable to F6 SW-WSW during the second week. Passenger numbers seem only slightly affected by the weather.

## 2.1.3 Timetable compliance / variation information

It was assumed that timetable compliance / variation information will be received in the format noted in Appendix C (Trip details) from Stagecoach. The only information received to date is the Stagecoach provided overall patronage figures for each day (see Appendix C). The column headed 'Sectors' refers to the number of one-way crossings made by the hovercraft on each day. Where this is 22, the timetable was run as advertised. Where this is 24, a lunchtime trip was added departing Kirkcaldy at 12:00 and Portobello at 12:30. Where noted as 26, an additional end of day trip (19:00 from Kirkcaldy and 19:30 from Portobello) was added. A shuttle service was operated on 27 & 28 July which resulted in 2 additional roundtrips being operated with no midday break. The last services were operated from Portobello at 19:05 and 19:03 respectively. From 29 July an additional 12:00 service was operated for the rest of the trial which provided better bus connections.

Alistair MacLeod noted in his presentation (see Section 2.1.1) that only two trips were cancelled during entire trial due to a fault on board the hovercraft (fault corrected in 45 mins). The fault, which was on one of the lift fan shafts, caused the 16:00 ex-Kirkcaldy service on 27 July to be cancelled. The schedule was reported as being quickly recovered and the 17:00

service departed on schedule. It is believed that other timetable compliance was good.

Trip details supplied show an average crossing time of 17 mins. However, figures have been provided that indicate a minimum journey time of 11 min. With a route length of 11.2 nautical miles this gives an average speed of 59 – 64 knots!

## 2.1.4 Patronage Information - Financial

It was assumed that financial details from the hovercraft trial would be provided by Stagecoach in the format noted in Appendix C (Financial details).

Stagecoach provided financial information as shown in Appendix C.

This shows that of the 32,099 passengers carried, 30,968 were fare paying (96%). Non-fare paying passengers were Stagecoach staff, babes-in-arms and VIP's. It is not possible to determine the overall split in the fare paying passengers, between Adult; Child and Concessionaires since only overall figures from the X90 & X91 services were supplied. However, the split on the services for which information was given (ie Bus Routes 6, 7, X59 & X60) indicates a split of 42.5 / 18.4 / 39.1 % between Adult / Child / Concessionaire passengers. Fare income also seems to vary with Concessionaires paying an average of £14.22 on Services 6 & 7 against £3.48 on X59 & X60. Adult fares vary from £4.21 to £7.47 whilst child fares vary from £2.32 to £2.85. The average ticket price on the X90 & X91 services appears to be £1.48 with an overall average ticket price of £2.81. This compares well with the Hyder Business Viability Assessment of £3.00 (peak) and £2.20 (off-peak) (low fare scenario).

On the Edinburgh side, all hovercraft tickets were sold by a Lothian Transport subsidiary, with identical ticket machines being used for on-bus ticket sales and hovercraft queue ticket sales. It is doubted that Lothian would be able to notify which ticket machine was used where. However, Lothian would know the total sales and should have totals by fares (adult/child). There will be no adult/child split per hovercraft trip as the only figure recorded was a count of people with boarding passes getting on the hovercraft. On the Fife side, for any passengers buying their tickets on buses, there would be no record of whether they then changed to the hovercraft or not.

Also missing are the pre-booking figures for commuters, particularly on evening trips in the second week. It is believed that all trips on Saturday 28th were pre-bookable and this may have put-off casual passengers on the final day. It does explain the reduction in load factor this day.

## 2.1.5 Hovercraft Operational Statistics

It was assumed that hovercraft operational statistics from the hovercraft trial would be provided by Stagecoach in the format noted in Appendix D.

However, Alistair MacLeod's presentation (see Section 2.1.1), contained the following notes:

- Problems experienced during the trial:
  - The hovercraft had to be re-positioned along the Kirkcaldy beach with overnight surveillance
  - At Portobello the leading edge of the Rolatrac began to float at high tide despite being anchored. This had to be buried in the sand.
- Re-fuelling occurred during the 10 min turnarounds.
- Key statistics:
  - Fuel consumption = 150.5 litres per roundtrip.
  - Hovercraft Fuel per passenger = 1.36 litres

The operational statistics received from Stagecoach indicate that the hovercraft achieved a fuel consumption of 290 litres/hour at an operational speed of 37 knts (see Appendix D). This would give an annual fuel cost of £511,166 at the quoted 45.9ppl. for 2 hovercraft over the 11.2 nautical mile journey (30min peak / hourly off-peak service). This compares favourably against Hyder's original business plan assumptions of 669 litres/hour at an operational speed of 35 knts at 40ppl which gave an annual fuel cost of £1,083,463. However, this is still an insufficient saving to bring the service into profit and the service would still require an estimated annual subsidy of between £2.6 – 2.7m using forecast patronage figures.

The sensitivity of the service to fuel price can be seen by varying the fuel price against Stagecoach's quoted fuel consumption. A range of 35 to 50ppl gives annual fuel consumption costs for 2 hovercraft of between £388,900 and £555,600.

The crewing figures provided by Stagecoach (11no.) validate Hyder's Business Plan assumptions of 5 crew per hovercraft plus 6 land-based staff.

By removing payroll costs from Hyder's Business Plan and applying the hovercraft charter costs for the 2 week trial over an annual basis, this gives an annual hovercraft cost of £1,197,000. This figure would include for craft depreciation, accruals for interior and engine refits, maintenance, insurance, transport costs and profit and overheads. This is in line with Hyder's Business Plan allowance of £927,750 per hovercraft (exc. transport and profit) and thus is taken as a further validation of Hyder's Business Viability Assessment of a hovercraft service.

## 2.1.6 Trial Comments

It was assumed that non-passenger and passenger comments from the hovercraft trial would be provided by Stagecoach in the format noted in Appendix D (Trial Comments). None have been received to date.

## 2.2 Passenger Survey

Information provided by Stagecoach notes that 32,099 passengers were carried by the hovercraft (one-way). A total of 1,310 completed patronage questionnaires have been received.

The Passenger Survey responses were collated and reported under a separate commission. The report can be found in Appendix E.

### Summary

A large number of people travelled in groups. The average group size was 2.90. Assuming that one person responded on behalf of the group, this indicates that the survey covered 11.8% of the total number of passengers (32,099). If it is assumed that all journeys were return trips then this doubles the response rate to 23.7%.

It can be concluded from the responses received that nearly half the people who responded were travelling on the hovercraft for the experience, rather than to trial the hovercraft as a potential method of commuting. Approximately 69% of people agreed or strongly agreed that the transport links in Fife were from the most appropriate place, compared with 77% from the Edinburgh side.

The times that the respondents would most frequently use the hovercraft service were fairly well distributed throughout the day, although the peak times were during 08.00 to 12.00, and 16.00 to 18.00. The average prices that patrons were prepared to pay for a single trip was £3.80. This rises to £5.08 when bus journeys to/from the hovercraft are included.

A large number of respondents (665 = 56%) arrived at the hovercraft trial by car. This is greater than the number of respondents who would have normally used their car to get to their final destination (535 = 45.1%)

It is recommended that if the hovercraft was to become a regular service then adequate parking provision and waiting areas should be made for a regular service.

It should also be noted that Napier University's Transport Research Institute (Tri) was also looking to improve the development and implementation of the Forthfast Hovercraft Link initiative. Hence, Stagecoach encouraged passengers to complete an online survey (<http://www.forth-hovercraft.s-and-w.org/survey/>). There was also an open blog (<http://www.forth-hovercraft.s-and-w.org/blog/>) which asked two basic questions:

- What do you think about implementing ferries across the Forth?

22 Comments

- Please tell us your experience from your hovercraft ride.



## 2.3 Residents' Survey

A residents' survey was distributed to 2,200 addresses by post using a local delivery company. 231 responses were received. The full report can be found in Appendix F.

### Summary

From the responses received that it is noted that 13% of residents objected to the hovercraft route remaining at the trial locations. Blocking the promenade and other environmental issues (ie noise; dust; car parking) seem to be the main causes of concern for the local residents (particularly at Portobello. It appears that local residents do not want to use the service for regular commuting purposes. This is possibly due to the high number of elderly people in the distribution area (38% are over the age of 60).

Local residents indicated that, on average, they would be prepared to pay £4.05 for a single hovercraft trip. This rises to £5.45 when bus journeys to/from the hovercraft are included.

It is recommended that if the hovercraft was to become a regular service then good pedestrian signage would help reduce noise and disruption on side streets which are off the access route. Also adequate parking provision should be made for a regular service.

## 2.4 Motion sensor data – Wolfson MTIA

It had been hoped that vertical accelerometer measurements would be allowed during the trial by Stagecoach but they restricted the measurements to the pre-trial test runs on 14<sup>th</sup>/15<sup>th</sup> July.

Wolfson MTIA (University of Southampton) was commissioned to undertake vertical accelerometer tests during the pre-trial test of 14<sup>th</sup> July. However a problem arose in the data measurements and the above restriction was relaxed. This allowed a further reading to be made on Wednesday 25<sup>th</sup> July.

The report from the test is incorporated in Appendix G.

### Summary

The British Standard Incidence of Seasickness (BSI%) is a prediction of the percentage of passengers likely to be seasick. It is derived using the method described in BS6841:1987 and is based upon measurements and data from mixed groups of passengers on ferries. Measurements were taken at the forward and middle of the passenger seating area.

The sea state on Saturday 14<sup>th</sup> July was slight, varying from between 0 - 0.5m with a westerly wind speed between 15 – 25 knots. On Wednesday

25<sup>th</sup> there was no discernable sea state with a southerly wind of approximately 5 knots.

The accelerometer tests picked up very little energy in the ship motion regime (0 - 5 Hz) due to the slight sea states. This resulted in a low Sickness Incidence rate of 1% for seated passengers. However, at this level, the nauseous effect is unlikely to translate into actual vomiting due to the short travel time.

DNV Comfort Class is a systematic evaluation of the comfort on different types of ships in the 5 – 100Hz range. A poor DNV classification will not lead to seasickness as such, but discomfort due to vibration (mainly due to touch, but due to incidental noise as well). However, in all cases, passenger seating comfort was rated as HIGH (CR1). Measurements taken on the floor gave a rating of GOOD (CR2) except during the 14:30hrs crossing on 25<sup>th</sup> July when it dropped to ACCEPTABLE (CR3) due to the poorer sea state. However, this would vary throughout the vessel due to structural response as well as the direction of travel with respect to the direction of the sea state.

There were significant accelerations at the higher frequencies due to normal hovercraft vibration but this would not necessarily translate into passenger discomfort.

## 2.5 Noise surveys by Fife & Edinburgh Councils

Fife and Edinburgh Councils are undertook independent noise monitoring of the trial at Kirkcaldy and Seafield respectively. None have been received to date but when they are supplied they will be incorporated into the report Appendix H.

### 3 Conclusions

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- 1) With a total of 32,099 passenger trips, the trial attracted greater patronage than Stagecoach had originally anticipated. This gives an average daily patronage over the trial of 2,675 ppd which compares favourably with the breakeven patronage required of 2,305 ppd.
- 2) The average revenue generated by the trial from fare-paying passengers was £2.81. The fare for a breakeven patronage is £3.85 as modelled by the Hyder Business Viability Assessment.
- 3) Average journey time was recorded as 17 mins with an operating speed of 37 knots.
- 4) The operational statistics received from Stagecoach indicate that the hovercraft achieved a fuel consumption of 290 litres/hour at an operational speed of 37 knts (see Appendix D). This would give an annual fuel cost of £511,166 at the quoted 45.9ppl. for 2 hovercraft over the 11.2 nautical mile journey (30min peak / hourly off-peak service). This compares favourably against Hyder's original business plan assumptions of 669 litres/hour at an operational speed of 35 knts at 40ppl which gave an annual fuel cost of £1,083,463.
- 5) The crewing figures provided by Stagecoach (11no.) validate Hyder's Business Plan assumptions of 5 crew per hovercraft plus 6 land-based staff.
- 6) By removing payroll costs from Hyder's Business Plan and applying the hovercraft charter costs for the 2 week trial over an annual basis, this gives an annual hovercraft cost of £1,197,000. This figure would include for craft depreciation, accruals for interior and engine refits, maintenance, insurance, transport costs and profit and overheads. This is in line with Hyder's Business Plan allowance of £927,750 per hovercraft (exc. transport and profit) and thus is taken as a further validation of Hyder's Business Viability Assessment of a hovercraft service.
- 7) From the 1,310 responses received to the Patronage Survey, nearly half the people who responded were travelling on the hovercraft for the experience, rather than to trial the hovercraft as a potential method of commuting. This shows that the advertising for the trial had worked and that hovercraft, despite having been used continuously in the UK for over 40 years, still have attractions when introduced to a new area. This indicates a willingness amongst people to try out a new service (just as they did on the Solent in 1961). It also, perhaps, reflects the timing of the trial in the summer holiday rather than in a more "neutral" month (say May or October).
- 8) Approximately 69% of passengers carried agreed or strongly agreed that the transport links in Fife were from the most appropriate place, compared with 77% from the Edinburgh side.

- 9) Passenger seating comfort on the hovercraft was rated as HIGH although measurements were taken when the sea state was calm.
- 10) From the 231 responses received to the Residents' Survey that it is noted that 13% of residents objected to the hovercraft route remaining at the trial locations. Blocking the promenade and other environmental issues (ie noise; dust; car parking) seem to be the main causes of concern for the local residents (particularly at Portobello. It appears that local residents do not want to use the service for regular commuting purposes.
- 11) It is recommended that if the hovercraft was to become a regular service then good pedestrian signage would help reduce noise and disruption on side streets which are off the access route. Also adequate parking provision should be made for a regular service.

# Appendix A

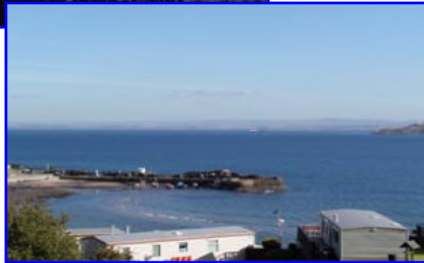
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Data Collation Proposal



# Cross Forth Passenger Ferry Study - Proposal

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Hovercraft Trial Data  
Collation

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| Appendix C | Residents' Survey Questionnaire                     |          |



## 2 Proposal

The full passenger trial of the hovercraft service will run for two weeks from Monday 16 July to Saturday 28 July, excluding Sunday 22 July. A total of 22 services a day – 11 in each direction - will operate on the route, with peak-time services and integrated bus links to accommodate commuters looking to avoid congestion on the Forth Road Bridge. A 28-metre BHT130 hovercraft, manufactured by Isle of Wight-based Hoverwork Limited and incorporating the latest diesel engine technology, will be used for the trial. Further details are included in the news release included in Appendix A.

The Kirkcaldy site will be serviced by Stagecoach's existing 6, 6A, 7, X59 and X60 bus services which will stop at the Kirkcaldy departure point. There is also a park and ride facility for those arriving by car.

The Kirkcaldy landing site is located on the beach at the rear of the former Stagecoach bus depot at the west end of the Esplanade (see Fig.2.1)

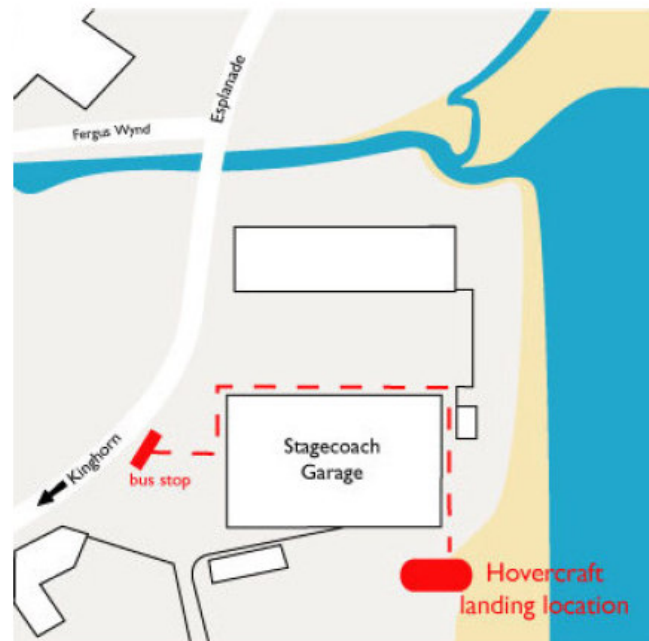
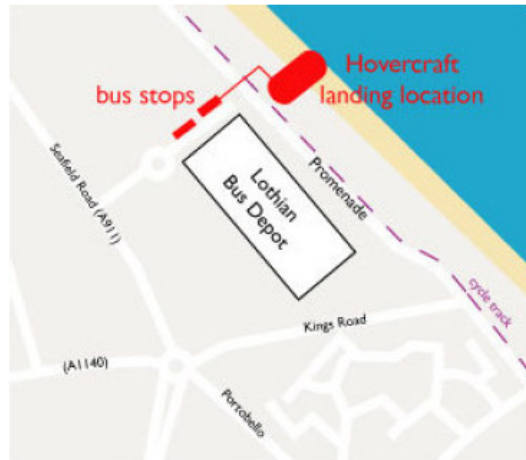


Fig.2.1 Kirkcaldy landing location

The Seafield landing site is located on the beach at the rear of the Lothian Bus Depot at Portobello, Edinburgh (see Fig.2.2)



**Fig.2.2 Seafield landing location**

Shuttle bus services X90 and X91 operate between Portobello and Edinburgh city centre or Leith.

No car parking is available at Portobello and customers are advised to travel to Portobello by Lothian bus or park away from the site and arrive by foot.

**This proposal is based on the work necessary to collect and collate the data from the trial. It does not include for any interpretation.**

## 2.1 Noise surveys by Fife & Edinburgh Councils

Fife and Edinburgh Councils are undertaking independent noise monitoring of the trial at Kirkcaldy and Seafield respectively. It is assumed that their reports will be incorporated into the report without comment.

## 2.2 Stagecoach Information

SEStrans will require Stagecoach to provide information in accordance with Appendix B. It is assumed that the information will be supplied direct to Hyder for comment and incorporation into the report.

### 2.2.1 Trip Details

It is assumed that passenger numbers will be received in the format noted in Appendix B (Trip details) from Stagecoach and that these will be incorporated into the report.

## 2.2.2 Sea State observations

It is assumed that sea state observations will be received in the format noted in Appendix B (Trip details) from Stagecoach and that these will be incorporated into the report. It had been hoped that vertical accelerometer measurements would be allowed during the trial by Stagecoach but they have restricted the measurements to the pre-trial test runs on 14<sup>th</sup>/15<sup>th</sup> July.

Future comparison of sea state observations with the vertical accelerometer measurements may allow correlation with the response from the passenger questionnaire on the comfort levels experienced. However, this depends on sea state observations during the trial being close to those noted during the pre-trial tests. It will not be possible to verify any attempt at extrapolation.

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## 2.2.3 Timetable compliance / variation information

It is assumed that timetable compliance / variation information will be received in the format noted in Appendix B (Trip details) from Stagecoach and that these will be incorporated into the report.

## 2.2.4 Patronage Information

It is assumed that financial details from the hovercraft trial will be provided by Stagecoach in the format noted in Appendix B (Financial details) and that these will be incorporated into the report.

## 2.2.5 Hovercraft Operational Statistics

It is assumed that hovercraft operational statistics from the hovercraft trial will be provided by Stagecoach in the format noted in Appendix B and that these will be incorporated into the report.

## 2.2.6 Trial Comments

It is assumed that non-passenger and passenger comments from the hovercraft trial will be provided by Stagecoach in the format noted in Appendix B (Trial Comments) and that these will be incorporated into the report.

## 2.3 Residents' Survey

A residents' survey will be undertaken by post using an address list to be supplied by Stagecoach with appropriate comment in the body of the report. A draft questionnaire is included in Appendix C.

## 2.4 Motion sensor data – Wolfson MTIA

As noted in section 2.3, Wolfson MTIA has been commissioned to undertake vertical accelerometer tests during the pre-trial test of 14<sup>th</sup>/15<sup>th</sup> July. (Client Instruction 22<sup>nd</sup> June 2007 – Value: £2,300). Their report from this test will be incorporated as a separate Appendix within the Hovercraft Trial Data Collation Report.

## 2.5 Passenger Survey (Separate commission agreed)

The Passenger Survey responses are being collated and reported under a separate commission (Client Instruction 21<sup>st</sup> June 2007 - Value: £6,000). The report will be included as a separate Appendix within the Hovercraft Trial Data Collation Report with appropriate comment in the body of the report.

# 3 Proposal Outputs

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The key output will be a report which will collect together the data received from the Residents' survey and from various third parties. In addition, the hovercraft patronage survey (provided under separate commission by Hyder) will be included as an appendix.

This proposal is based on the work necessary to collect and collate the data from the trial with comment. **The report will not interpret the data.**

If all reports are available within 4 weeks of trial completion, then a report will be produced a week later, 31 August 2007.





# Appendix B

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Stagecoach Website Information





## **Stagecoach Confirms Cross-Forth Hovercraft Trial Launch 19 June 2007**

- Two-week pilot study scheduled for July to test Kirkcaldy-Portobello link
- Regular services and integrated bus links planned to help passengers
- Scottish Executive and SEStran support test of innovative service
- Services to offer public transport option during Forth Bridge closure

Stagecoach today (19 June 2007) confirmed plans for a full passenger trial of a cross-Forth hovercraft link next month.

The Perth-based international transport group will test a hi-tech 130-passenger craft on a route between Kirkcaldy and Portobello for two weeks from Monday 16 July to Saturday 28 July.

A total of 22 services a day – 11 in each direction - will operate on the route, with convenient peak-time services and integrated bus links to accommodate commuters looking to avoid congestion on the Forth Road Bridge.

The £300,000 trial will cover part of the period of the Forth Bridge closure, giving commuters a further public transport alternative to the train in addition to existing regular bus services.

Brian Souter, Stagecoach Group Chief Executive, said: "We are delighted that after a huge amount of work, as well as strong support from statutory organisations and the local community, we are now able to get a hovercraft on the water.

"The Forth estuary is an underused resource and we are looking forward to giving people a chance to see the benefits this technology could bring to the region's communities, economy and public transport system. It is crucial we have a wide range of public transport options to cope with the increasing flow of people between Fife and the Edinburgh area."

A 28-metre BHT130 hovercraft, manufactured by Isle of Wight-based Hoverwork Limited and incorporating the latest diesel engine technology, will be used for the trial. The crossing time will be around 20 minutes and the craft, with normal operating speeds of approximately 35 knots, will be able to run in waves of up to two metres.

Passengers will be able to travel for the same price as existing bus fares, with return tickets from £4.50. Stagecoach's existing 6, 6A, 7, X59 and X60 bus services will stop at the Kirkcaldy departure point at the west end of the Esplanade. Link buses will operate from the Portobello landing point at rear of the Lothian Buses depot on the Promenade to both Leith and Edinburgh City Centre. Shuttle buses will also run from Edinburgh City Centre and Leith to the Portobello departure point.

The first service will leave Kirkcaldy at 7.10am, with the last service to Portobello departing at 6pm. Services from Portobello will operate between 7.35am and 6.30pm. No services will operate on Sunday 22 July. Full timetable, fares and bus link information is available on the web at [www.stagecoachbus.com/fife/forthfast](http://www.stagecoachbus.com/fife/forthfast). Customers can also call 01592 642394 for further information.

Stagecoach estimates that running a two-craft operation would cost around £2million a year. Around 9,000 passengers a week - and up to 470,000 passengers a year – are estimated would use the service. While the service would require initial public investment, Stagecoach believes that within a few years passenger volumes could grow to make it commercially sustainable

Marine consultant Alistair Macleod has carried out detailed planning work on the hovercraft project on behalf of Stagecoach, including extensive discussions with public and statutory bodies. Scottish Natural Heritage has approved the pilot project and Stagecoach will be carrying out ongoing environmental impact studies, particularly in relation to bird life, during the two-week trial

The Scottish Executive, SEStran (the South East of Scotland Transport Partnership), and Fife and City of Edinburgh Councils – all of whom have given financial and other support to the project – today welcomed confirmation the trial was to go ahead.

SEStran Chair Councillor Russell Imrie said: "This trial hovercraft service is an example of the sort of creative thinking needed to provide South East Scotland with a 21st century transport system. That's why we are backing it with £92,000 of funding.

"A journey time of 20 minutes, followed by a short bus journey to the centre of Edinburgh, compares well with the time and effort of driving into the city - and doesn't include the added hassle of searching for parking.

"If the trial proves a success, the service could offer an additional travel option to commuters between Fife and Edinburgh that is fast, cheap and reliable. It will also contribute towards meeting SEStran's objectives of reducing traffic congestion and carbon emissions in the region."

Councillor Phil Wheeler, Executive Member for Transport, City of Edinburgh Council, and Chair of the Forth Estuary Transport Authority, said: "Millions of people around the world start their working day on a hovercraft or ferry. Providing commuters with innovative and attractive public transport options is critical to ensuring journeys are quick and stress-free, congestion is eased and pollution is cut. This has the potential to be a popular alternative to car journeys and ease growing pressures on the Forth Road Bridge."

Councillor Tony Martin, chair of Fife Council's Environment and Transportation Committee said: "We support this trial. Hopefully, people will be able to use the hovercraft for both leisure and business purposes. Anything that reduces the need for car travel is to be welcomed. I am sure everyone will want the trial to be successful."

**Stagecoach Website Information** ([www.stagecoachbus.com/fife/forthfast.html](http://www.stagecoachbus.com/fife/forthfast.html))

## Website Information Provided in advance of the trial

### A new Forth Crossing

Stagecoach is offering you the chance to take part in a two week trial hovercraft service between Kirkcaldy and Portobello!

Services will operate hourly, with crossing times of an impressive 20 minutes. Connecting shuttle services are available at Portobello for travel to Waverley Bridge, Edinburgh and Ocean Terminal, Leith.

In order to make the trip as easy as possible, Stagecoach services 6, 6A, 7, X59 and X60 serve the terminal point in Kirkcaldy.

The hi-tech 130 passenger craft offers an alternative to the traffic congestion of the Forth Road Bridge without disrupting the local ecosystems. If the trial proves successful, it may be introduced as a permanent method of sustainable transport between Fife and Edinburgh.

*This trial is part funded by [SEStran](#), South East of Scotland Transport Partnership.*

### When can I catch the Forthfast?

Services operate hourly from Kirkcaldy and Portobello. Shuttle bus services X90 and X91 operate between Portobello and Edinburgh city centre or Leith.

Please note that the shuttle buses operate as service numbers

X90 (Portobello - Edinburgh city centre) and

X91 (Portobello - Ocean Terminal, Leith).

Edinburgh arrival / departure times shown are for Waverley Bridge.

Leith arrival / departure times shown are for Ocean Terminal.

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Mondays - Saturdays

### *Forthfast* Kirkcaldy - Portobello

|            |      |      |      |      |      |      |      |      |      |      |      |
|------------|------|------|------|------|------|------|------|------|------|------|------|
| Kirkcaldy  | 0710 | 0800 | 0900 | 1000 | 1100 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 |
| Portobello | 0730 | 0820 | 0920 | 1020 | 1120 | 1320 | 1420 | 1520 | 1620 | 1720 | 1820 |

*connecting with shuttle bus services for Waverley Bridge, Edinburgh or Ocean Terminal, Leith at Portobello*

|            |      |      |      |      |      |      |      |      |      |      |      |
|------------|------|------|------|------|------|------|------|------|------|------|------|
| Portobello | 0735 | 0825 | 0925 | 1025 | 1125 | 1325 | 1425 | 1525 | 1625 | 1725 | 1825 |
| Edinburgh  | 0754 | 0844 | 0944 | 1044 | 1144 | 1344 | 1444 | 1544 | 1644 | 1744 | 1844 |
| Leith      | 0755 | 0845 | 0945 | 1045 | 1145 | 1345 | 1445 | 1545 | 1645 | 1745 | 1845 |

### *Forthfast* Portobello - Kirkcaldy

*shuttle bus services from Ocean Terminal, Leith or Waverley Bridge, Edinburgh.*

|            |      |      |      |      |      |      |      |      |      |      |      |
|------------|------|------|------|------|------|------|------|------|------|------|------|
| Leith      | 0705 | 0800 | 0900 | 1000 | 1100 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 |
| Edinburgh  | 0705 | 0800 | 0900 | 1000 | 1100 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 |
| Portobello | 0725 | 0820 | 0920 | 1020 | 1120 | 1320 | 1420 | 1520 | 1620 | 1720 | 1820 |

*connecting with Forthfast hovercraft at Portobello*

|            |      |      |      |      |      |      |      |      |      |      |      |
|------------|------|------|------|------|------|------|------|------|------|------|------|
| Portobello | 0735 | 0830 | 0930 | 1030 | 1130 | 1330 | 1430 | 1530 | 1630 | 1730 | 1830 |
| Kirkcaldy  | 0755 | 0850 | 0950 | 1050 | 1150 | 1350 | 1450 | 1550 | 1650 | 1750 | 1850 |

### No Sunday Service

Services shown in red do not operate on a Saturday.

#### X90 Route Description

Marine Hovercraft Terminal (at Marine bus garage) then; Seafield Road East, Portobello Road, London Road, Cadzow Place, Regent Road, Waterloo Place, Princes Street, Waverley Bridge.

#### Return

Return via above route reversed.

#### Route variations

From Marine Terminal (at Marine bus garage) then; Seafield Road East, Portobello Road, London Road, Leith Walk, York Place Elder Street to Edinburgh bus station.

#### Variations on Demand

This service operates in conjunction with the Forthfast Hovercraft Service. In the event of cancellation of the Hovercraft service for an entire day, this bus service will not operate.

In the event of cancellation of the Hovercraft service part-way through the day, this bus service will continue to operate journeys to Marine Terminal only and convey passengers to Edinburgh bus station for transfer to Stagecoach in Fife bus services for onward travel. The route to Edinburgh bus station is via the above route.

#### X91 Route Description

Marine Hovercraft terminal, Seafield Road East, Seafield Road, Seafield place, Claremont Park, East Hermitage Place, Duke Street, Great Junction Street, Henderson Street, The Shore, Commercial Street, Britannia Way, Ocean Drive, Ocean Terminal.

#### Return

Return via above route reversed.

#### Route Variations

From Marine Terminal (at Marine bus garage) then; Seafield Road East, Portobello Road, Londodn Road, Leith Walk, York Place, Elder Street to Edinburgh bus station.

#### Variations on Demand

This service operates in conjunction with the Forthfast Hovercraft Service. In the event of cancellation of the Hovercraft service for an entire day, this bus service will not operate.

In the event of cancellation of the Hovercraft service part-way through the day, this bus service will continue to operate journeys to Marine Terminal only and convey passengers to Edinburgh bus station for transfer to Stagecoach in Fife bus services for onward travel. The route to Edinburgh bus station is via the above route.

#### Stopping Arrangements

This service will stop at all recognised stopping places.

For connecting times serving the Kirkcaldy terminal please use the drop down menu to the left and click on 6, 6A, 7, X59 or X60. You could even co-ordinate travel from Portobello to the Burntisland Games in Fife on Monday 16th July.

#### **Where do I catch the Forthfast?**

Travelling with Forthfast couldn't be easier!

The terminal in Kirkcaldy is situated at the west end of the Esplanade. If you are travelling to the hovercraft terminal by bus, services 6, 7, X59 and X60 will allow you to make your connection. Free parking is also available at Kirkcaldy terminal!

Portobello terminal is located behind the Lothian Buses depot on the promenade.

Dedicated shuttle services will operate from Portobello to Edinburgh city centre and Leith and are included in the cost of your Forthfast ticket. Please note that there are no parking facilities available at Portobello terminal.

To ensure that your return journey goes just as smoothly, you can catch a shuttle bus back from Waverley Bridge or Ocean Terminal.

### **Forthfast Ticket and Fares**

|                  | adult | child |
|------------------|-------|-------|
| single           | £5.50 | £2.75 |
| return           | £9.50 | £4.75 |
| off-peak return* | £4.50 | £2.25 |

For those travelling to the Kirkcaldy Forthfast terminal by bus, tickets are the same price as a single/return bus fare between Fife and Edinburgh. They can be purchased on any connecting Stagecoach bus! For example...

|            | single | return | off-peak* |
|------------|--------|--------|-----------|
| Kirkcaldy  | £5.50  | £9.50  | £4.50     |
| Glenrothes | £6.50  | £9.50  | £5.00     |
| Cupar      | £7.50  | £9.50  | -         |
| Leven      | £7.00  | £9.50  | -         |

*\*off-peak returns are valid after 0900 Mon - Fri & all day Sat*

Edinburgh megarider, all zone Multiride tickets and National Entitlement Concession cards are also valid on Forthfast.

All fares include a shuttle service between Portobello and Edinburgh city centre (X90) or Ocean Terminal, Leith (X91).

Boarding passes will be issued before departure. These should be retained for the duration of the journey along with bus tickets, if applicable.

Please note that Forthfast tickets can only be purchased on the day of boarding.

## Hovercraft Gallery

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Stagecoach

**Forthfast** brought to you by  
Stagecoach



Please note that the hovercraft journeys are not wheelchair accessible during this trial. Should a commercial service be introduced in the future, Stagecoach would ensure that the needs of wheelchair users are met.

## Website Information Provided after the trial

### **More than 32,000 passengers travel on Kirkcaldy-Portobello service**

- **Boost for economy as local retailers report increased shoppers**
- **Regular commuters ditch car for quicker integrated transport link**
- **Work starts on analysis of passenger data and customer surveys**

Stagecoach's cross-Forth hovercraft service was hailed a "major operational success" today (29 July 2007) as work starts to evaluate the two-week trial.

More than 32,000 passengers used the Forthfast service between Kirkcaldy and Portobello during the £300,000 trial, according to final figures released today.

Both commuters and leisure travellers tested the fast 20-minute crossing, with many motorists deciding to ditch the car in favour of an integrated hovercraft and bus journey from Fife to Edinburgh.

Retailers on both sides of the Forth have also reported increased footfall and sales during the trial, which has been part-funded by SEStran (the South East of Scotland Transport Partnership).

Robert Andrew, Regional Director for Stagecoach Scotland, said: "The two-week trial has been a major operational success. It has been incredibly informative in helping to shape a new public transport alternative that delivers what customers want.

"The hovercraft has attracted a wide range of passengers and we have carried commuters, tourists, cyclists, wheelchair users and families with children in pushchairs.

We have been particularly encouraged by the morning commuter journeys, which have risen steadily over the past two weeks, with a number operating at full capacity.

"During the trial, we have collected a wealth of passenger data and customer feedback. We look forward to working in partnership with SEStran, the Scottish Executive, as well as the Fife and City of Edinburgh Councils, to establish whether there is a business case to create a permanent cross Forth transport link."

Councillor Russell Imrie, Chair of SEStran, said: "This trial helps to prove the case that cross-Forth travel using the under-used waterway could be a success. This trial has demonstrated that there is a core commuter demand that could be built on and also a considerable potential for leisure trips to supplement the business case.

"We look forward to analysing the results of the trial in the context of the wider study into the viability and preferred option for a regular, year round cross-Forth service."

The hovercraft service has included dedicated bus shuttle links from Portobello to Leith and Edinburgh city centre. Nearly 9,000 travellers used the shuttle bus to travel to Waverley Bridge, with around 7,000 passengers heading to Ocean Terminal, providing a welcome boost to local business.

Dennis Jones, Centre Manager, Ocean Terminal, said: "The hovercraft service from Fife seems to be a winner. Several retailers have reported new visitors coming to the centre for the first time and enjoying a day out via the hovercraft trip. It's been an excellent boost for the summer holidays for Ocean Terminal. "

Most trips on the 28-metre 130-passenger hovercraft - manufactured by Isle of Wight-based Hoverwork Limited - have been full and the average load factor of the service for the trial was more than 85%.

The hovercraft made the crossing in an average of just 17 minutes – three minutes faster than its scheduled journey time – and coped well in stormy conditions on the first day of service when it met a Force 6 gale and two metre waves.

Mr Andrew added: "We have been delighted with the performance of the hovercraft, which has been supported by a superb crew and a dedicated customer service and operational team on the ground."

A total of 22 scheduled services a day – 11 in each direction – operated during the trial, with additional trips at extremely busy periods. The trial ran from Monday 16 July to Saturday 28 July, excluding Sunday 22 July.

Stagecoach estimates that running a two-craft operation would cost around £2million a year. Around 9,000 passengers a week - and up to 470,000 passengers a year – are estimated would use the service. While the service would require initial public investment, Stagecoach believes that within a few years passenger volumes could grow to make it commercially sustainable.

*This trial is part funded by **SEStran**, South East of Scotland Transport Partnership.*





# HOVERTRAVEL

## The BHT-130 Hovercraft



Hovertravel are proud to be participating with Stagecoach and SEStran in this 2 week trial across the Forth from Kirkcaldy to Portobello with their BHT-130 hovercraft. We hope that the hovercraft will demonstrate its potential to provide an alternative means to cross the Forth and encourage both commuters and leisure travellers to consider this as an alternative option.

The hovercraft is a British invention by the engineer Sir Christopher Cockrell. The prototype was completed by Saunders Roe at Cowes on the Isle of Wight in 1959. The hovercraft is an ideal alternative to conventional fast ferries where harbour and pontoon facilities are either not practicable or are too expensive to construct.

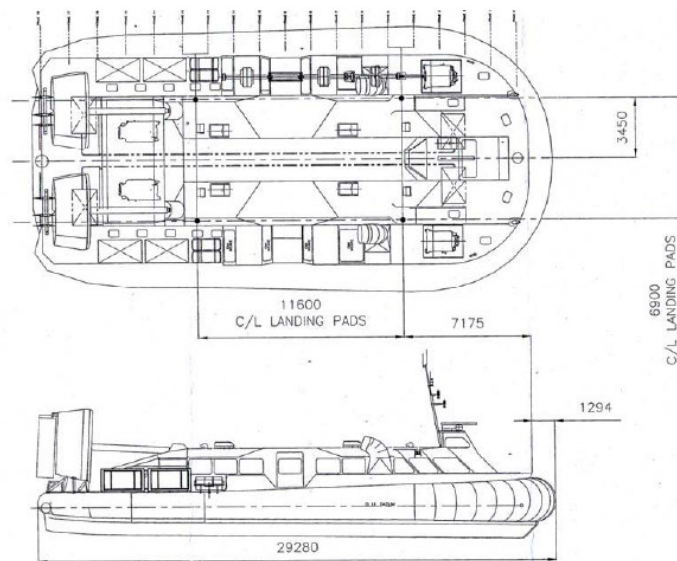
Hovertravel have operated a service from the beach at Ryde on the Isle of Wight to Southsea beach for 42 years and have carried over 21 million passengers during that period. Three different types of craft have been used during that period as design improvements and engine developments have progressed. The culmination of all Hovertravel's operational experience has been embodied in the latest BHT-130 craft being used for the trial. The craft has been built at Hovertravel's subsidiary company Hoverwork's factory at St Helen's on Isle of Wight.

Hovercraft built on the Isle of Wight have been used in many different roles throughout the world. It is widely used in the oil exploration industry for seismic surveys, Coastguard rescue operations on the west coast of Canada and most recently in Alaska with another BHT-130, built under licence in Seattle USA, for the transportation of passengers and an ambulance from a remote community.



*forthfast*





## BHT-130 Technical details

|                    |   |
|--------------------|---|
| Duty               | Amphibious Passenger Craft  |
| Crew               | Pilot and one crew in control cabin + 2 crew in passenger cabin   |
| Seating            | 131 passengers, main cabin  |
| Dimensions         | Length OA - 28M<br>Beam OA - 15M  |
| Operating Speed    | 35 knots  |
| <b>MACHINERY</b>   |   |
| Lift Engines       | 2 X MTU 12V2000-R1237K37, water cooled, turbo charged diesels, 672 bhp at 1800 rpm  |
| Lift Fans          | 2 pairs, centrifugal fans, each pair consisting of one 1180 mm (46.5 in) diameter fan and one 1067 mm (35 in) diameter fan, one pair each, port and starboard, for bow thrusters and engine cooling. Four pairs, 1067 mm (35 in) diameter centrifugal fans, two pairs each, port and starboard for lift |
| Propulsion Engines | 2 X MTU 16V2000-R1637K37, water cooled, turbo charged, diesels, 899 bhp at 1800 rpm. The pulley teeth on the belt drives are calculated to give 1200 rpm at the propellers  |
| Propellers         | 2 five bladed, Hoffmann 3,5 m diam variable pitch propellers  |

# Appendix C

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Stagecoach Trial Patronage







# Information provided by Stagecoach



## Hovercraft Trial 23-28 July

|                                      | Passengers Carried            | Morning Commuters | Accumulated total | Sectors    | Load Factor   | Average Crossing time | Connecting Bus Passengers        |               |
|--------------------------------------|-------------------------------|-------------------|-------------------|------------|---------------|-----------------------|----------------------------------|---------------|
|                                      |                               |                   |                   |            |               |                       | X90                              | X91           |
| Mon 16-Jul                           | 2,254                         | 100               |                   | 24         | 72.24%        | 18.83                 | 608                              | 667           |
| Tue 17-Jul                           | 2,902                         | 122               | 5,156             | 26         | 85.86%        | 17.50                 | 630                              | 581           |
| Wed 18-Jul                           | 3,051                         | 211               | 8,207             | 26         | 90.27%        | 18.75                 | 566                              | 599           |
| Thu 19-Jul                           | 2,481                         | 156               | 10,688            | 24         | 79.52%        | 18.83                 | 755                              | 428           |
| Fri 20-Jul                           | 2,822                         | 126               | 13,310            | 24         | 84.04%        | 17.50                 | 859                              | 506           |
| Sat 21-Jul                           | 2,806                         |                   | 16,116            | 24         | 89.94%        | 15.96                 | 984                              | 601           |
|                                      | <b>Total for wk</b>           | <b>715</b>        | <b>16,116</b>     | <b>148</b> | <b>83.76%</b> | <b>17.83</b>          | <b>4,402</b>                     | <b>3,380</b>  |
| Mon 23-Jul                           | 2813                          | 246               | 18,929            | 24         | 90.16%        | 16.21                 | 716                              | 421           |
| Tue 24-Jul                           | 2788                          | 280               | 21,717            | 24         | 89.36%        | 16.33                 | 885                              | 368           |
| Wed 25-Jul                           | 2893                          | 331               | 24,610            | 24         | 92.72%        | 16.08                 | 1053                             | 518           |
| Thu 26-Jul                           | 2771                          | 297               | 27,381            | 24         | 88.81%        | 15.79                 | 980                              | 362           |
| Fri 27-Jul                           | 2575                          | 344               | 29,956            | 22         | 90.03%        | 15.68                 | 930                              | 430           |
| Sat 28-Jul                           | 2143                          |                   | 32,099            | 22         | 74.83%        | 17.91                 | 383                              | 387           |
|                                      | <b>Total for wk</b>           | <b>1498</b>       | <b>32,099</b>     | <b>140</b> | <b>87.82%</b> | <b>16.33</b>          | <b>4,947</b>                     | <b>2,486</b>  |
|                                      | <b>TOTAL for Trial Period</b> | <b>2,213</b>      | <b>32,099</b>     | <b>288</b> | <b>85.73%</b> | <b>17.08</b>          | <b>9,349</b>                     | <b>5,866</b>  |
| Weekday Passengers                   | 27,150                        |                   |                   |            |               |                       | <b>TOTAL</b>                     | <b>15,215</b> |
| Commuter share on 0710-0830 services | 8.15%                         |                   |                   |            |               |                       | <b>Percentage who used buses</b> | <b>47%</b>    |
| Av Load Factor on 2 roundtrips       | 42.56%                        |                   |                   |            |               |                       |                                  |               |

F7 30KTS  
NE/ENE  
Mon 16 July 2.5M  
0700-1100 waves  
1100-1300 10KTS NE veering S  
CALM  
F3 NE  
F3 NE  
F3-4 N/NE

F1-2 VARIABLE  
F2-3 VARIABLE  
F3 SE  
F4 SW  
F6 SW-WSW  
F5-6 W 22KNOTS

**Mon 16 Jul**

|                |      |      |      |      |      |      |      |      |      |      |      |      |       |
|----------------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Scheduled Dep  | 0710 | 0800 | 0900 | 1000 | 1100 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 | 1853 |       |
| Actual KDY dep | 711  | 803  | 900  | 1011 | 1118 | 1259 | 1400 | 1459 | 1600 | 1659 | 1800 | 1853 |       |
| Actual PBO arr | 731  | 822  | 920  | 1032 | 1135 | 1317 | 1417 | 1517 | 1618 | 1716 | 1817 | 1910 |       |
| Time           | 20   | 19   | 20   | 21   | 17   | 18   | 18   | 18   | 18   | 17   | 18   | 17   | 18.42 |
| pax carried    | 39   | 29   | 70   | 122  | 129  | 122  | 128  | 128  | 125  | 130  | 56   | 5    |       |
|                |      |      |      |      |      | 16   |      |      |      |      |      | 1083 |       |

|                |      |      |      |      |      |      |      |      |      |      |      |      |       |
|----------------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Scheduled Dep  | 0735 | 0830 | 0930 | 1030 | 1130 | 1330 | 1430 | 1530 | 1630 | 1730 | 1830 | 1917 |       |
| Actual PBO dep | 737  | 828  | 932  | 1045 | 1130 | 1331 | 1430 | 1529 | 1630 | 1730 | 1828 | 1935 |       |
| Actual KDY arr | 757  | 850  | 953  | 1107 | 1147 | 1349 | 1447 | 1547 | 1647 | 1749 | 1845 |      |       |
| Time           | 20   | 22   | 21   | 22   | 17   | 18   | 17   | 18   | 17   | 19   | 17   | 18   | 18.83 |
| pax carried    | 23   | 9    | 64   | 132  | 131  | 130  | 129  | 129  | 129  | 130  | 128  | 37   |       |
|                |      |      |      |      |      |      |      |      |      |      |      | 1171 |       |

|                 |                  |            |                      |
|-----------------|------------------|------------|----------------------|
| Av. Load Factor | Av. Pax per Trip | Total Pax. | Av. Trip Time (mins) |
| 72.24%          | 94               | 2254       | 18.63                |

**Tues 17 Jul**

|                |      |      |      |      |      |      |      |      |      |      |      |      |      |       |
|----------------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Scheduled Dep  | 0710 | 0800 | 0900 | 1000 |      |      |      |      |      |      |      |      |      |       |
| Actual KDY dep | 709  | 800  | 900  | 1000 | 1055 | 1155 | 1252 | 1347 | 1440 | 1535 | 1635 | 1740 | 1837 |       |
| Actual PBO arr | 725  | 816  | 914  | 1015 | 1114 | 1213 | 1307 | 1402 | 1454 | 1552 | 1652 | 1755 | 1853 |       |
| Time           | 16   | 16   | 16   | 17   | 19   | 18   | 18   | 15   | 14   | 17   | 18   | 15   | 16   | 17.92 |
| pax carried    | 34   | 38   | 126  | 125  | 130  | 126  | 125  | 123  | 121  | 130  | 125  | 131  | 130  |       |
|                |      |      |      |      |      |      |      |      |      |      |      |      | 1464 |       |

|                |      |      |      |      |      |      |      |      |      |      |      |      |      |       |
|----------------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Scheduled Dep  | 0735 | 0830 | 0930 | 1030 | 1130 |      |      |      |      |      |      |      |      |       |
| Actual PBO dep | 735  | 830  | 931  | 1030 | 1125 | 1225 | 1320 | 1415 | 1506 | 1605 | 1710 | 1810 | 1903 |       |
| Actual KDY arr | 747  | 846  | 947  | 1045 | 1144 | 1241 | 1335 | 1429 | 1522 | 1621 | 1725 | 1823 | 1924 |       |
| Time           | 12   | 16   | 16   | 16   | 19   | 16   | 15   | 14   | 16   | 16   | 15   | 13   | 21   | 17.08 |
| pax carried    | 10   | 40   | 97   | 127  | 128  | 130  | 131  | 126  | 129  | 130  | 129  | 131  | 130  |       |
|                |      |      |      |      |      |      |      |      |      |      |      |      | 1438 |       |

|                 |                  |            |                      |
|-----------------|------------------|------------|----------------------|
| Av. Load Factor | Av. Pax per Trip | Total Pax. | Av. Trip Time (mins) |
| 85.86%          | 112              | 2902       | 17.50                |

**Wed 18 Jul**

|                |      |      |      |      |      |      |      |      |      |      |      |      |      |       |
|----------------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Scheduled Dep  | 0710 | 0800 | 0900 |      |      |      |      |      |      |      |      |      |      |       |
| Actual KDY dep | 710  | 800  | 855  | 954  | 1100 | 1155 | 1253 | 1351 | 1445 | 1541 | 1640 | 1737 | 1835 |       |
| Actual PBO arr | 724  | 816  | 912  | 1010 | 1112 | 1214 | 1310 | 1408 | 1502 | 1600 | 1657 | 1756 | 1855 |       |
| Time           | 14   | 16   | 17   | 17   | 12   | 19   | 17   | 17   | 17   | 19   | 17   | 19   | 20   | 18.42 |
| pax carried    | 81   | 65   | 129  | 129  | 128  | 129  | 127  | 126  | 127  | 130  | 129  | 130  | 126  |       |
|                |      |      |      |      |      |      |      |      |      |      |      |      | 1556 |       |

|                |      |      |      |      |                 |      |      |      |      |      |      |      |      |       |
|----------------|------|------|------|------|-----------------|------|------|------|------|------|------|------|------|-------|
| Scheduled Dep  | 0735 | 0830 | 0930 | 1030 | Shuttle service |      |      |      |      |      |      |      |      |       |
| Actual PBO dep | 732  | 830  | 926  | 1025 | 1125            | 1224 | 1323 | 1419 | 1512 | 1610 | 1708 | 1806 | 1905 |       |
| Actual KDY arr | 747  | 845  | 944  | 1043 | 1140            | 1242 | 1342 | 1435 | 1530 | 1629 | 1728 | 1825 | 1924 |       |
| Time           | 15   | 15   | 18   | 18   | 15              | 18   | 19   | 16   | 18   | 19   | 20   | 19   | 19   | 19.08 |
| pax carried    | 35   | 30   | 133  | 131  | 131             | 129  | 133  | 131  | 131  | 131  | 131  | 131  | 118  |       |
|                |      |      |      |      |                 |      |      |      |      |      |      |      | 1495 |       |

|                 |                  |            |                      |
|-----------------|------------------|------------|----------------------|
| Av. Load Factor | Av. Pax per Trip | Total Pax. | Av. Trip Time (mins) |
| 90.27%          | 117              | 3051       | 18.75                |

**Thurs 19 Jul**

|                |      |      |      |      |      |      |      |      |      |      |      |      |    |       |
|----------------|------|------|------|------|------|------|------|------|------|------|------|------|----|-------|
| Scheduled Dep  | 0710 | 0800 | 0900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 |    |       |
| Actual KDY dep | 711  | 801  | 900  | 1010 | 1115 | 1240 | 1335 | 1432 | 1530 | 1631 | 1737 | 1822 |    |       |
| Actual PBO arr | 729  | 819  | 924  | 1028 | 1132 | 1255 | 1354 | 1451 | 1549 | 1651 | 1747 | 1841 |    |       |
| Time           | 18   | 18   | 24   | 18   | 17   | 15   | 19   | 19   | 19   | 19   | 20   | 10   | 19 | 18.00 |
| pax carried    | 51   | 60   | 130  | 126  | 120  | 125  | 130  | 127  | 129  | 128  | 130  | 54   |    |       |
|                |      |      |      |      |      |      |      |      |      |      |      | 1310 |    |       |

|                |      |      |      |      |      |      |      |      |      |      |      |      |       |
|----------------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Scheduled Dep  | 0735 | 0830 | 0930 | 1030 | 1130 | 1230 | 1330 | 1430 | 1530 | 1630 | 1730 | 1830 |       |
| Actual PBO dep | 734  | 831  | 935  | 1037 | 1210 | 1305 | 1404 | 1501 | 1600 | 1658 | 1756 | 1847 |       |
| Actual KDY arr | 755  | 851  | 959  | 1058 | 1225 | 1324 | 1423 | 1520 | 1619 | 1718 | 1817 | 1905 |       |
| Time           | 21   | 20   | 24   | 18   | 15   | 19   | 19   | 19   | 19   | 20   | 19   | 18   | 19.25 |
| pax carried    | 22   | 23   | 130  | 127  | 129  | 128  | 123  | 129  | 130  | 121  | 89   | 20   |       |
|                |      |      |      |      |      |      |      |      |      |      |      | 1171 |       |

|                 |                  |            |                      |
|-----------------|------------------|------------|----------------------|
| Av. Load Factor | Av. Pax per Trip | Total Pax. | Av. Trip Time (mins) |
| 79.52%          | 103              | 2481       | 18.63                |

**Fri 20 Jul**

|                |      |      |      |      |      |      |      |      |      |      |      |      |       |
|----------------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Scheduled Dep  | 0710 | 0800 | 0900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 |       |
| Actual KDY dep | 710  | 800  | 855  | 952  | 1104 | 1200 | 1253 | 1355 | 1500 | 1552 | 1700 | 1800 |       |
| Actual PBO arr | 720  | 820  | 912  | 1110 | 1122 | 1216 | 1310 | 1413 | 1516 | 1610 | 1717 | 1816 |       |
| Time           | 10   | 20   | 17   | 18   | 18   | 16   | 17   | 18   | 16   | 18   | 17   | 16   | 16.75 |
| pax carried    | 38   | 47   | 130  | 128  | 128  | 129  | 126  | 129  | 126  | 130  | 130  | 95   |       |
|                |      |      |      |      |      |      |      |      |      |      |      | 1336 |       |

|                |      |      |      |      |      |      |      |      |      |      |      |      |       |
|----------------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Scheduled Dep  | 0735 | 0830 | 0930 | 1030 | 1130 | 1230 | 1330 | 1430 | 1530 | 1630 | 1730 | 1830 |       |
| Actual PBO dep | 735  | 830  | 924  | 1028 | 1130 | 1223 | 1330 | 1430 | 1523 | 1627 | 1730 | 1828 |       |
| Actual KDY arr | 754  | 848  | 943  | 1047 | 1149 | 1242 | 1347 | 1445 | 1542 | 1647 | 1746 | 1845 |       |
| Time           | 19   | 18   | 19   | 18   | 19   | 19   | 17   | 15   | 19   | 20   | 19   | 17   | 18.25 |
| pax carried    | 24   | 17   | 130  | 130  | 130  | 130  | 130  | 130  | 130  | 127  | 130  | 78   |       |
|                |      |      |      |      |      |      |      |      |      |      |      | 1286 |       |

|                 |                  |            |                      |
|-----------------|------------------|------------|----------------------|
| Av. Load Factor | Av. Pax per Trip | Total Pax. | Av. Trip Time (mins) |
| 109             | 84.04%           | 2622       | 17.5                 |

**Sat 21 Jul**

|                |      |      |      |      |      |      |      |      |      |      |      |      |       |
|----------------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Scheduled Dep  | 0710 | 0800 | 0900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 |       |
| Actual KDY dep |      | 755  | 905  | 1001 | 1102 | 1156 | 1301 | 1401 | 1500 | 1600 | 1700 | 1758 |       |
| Actual PBO arr |      | 812  | 922  | 1020 | 1119 | 1212 | 1320 | 1419 | 1516 | 1616 | 1715 | 1814 |       |
| Time           |      | 17   | 17   | 19   | 17   | 16   | 19   | 18   | 16   | 16   | 15   | 16   | 15.50 |
| pax carried    |      | 130  | 130  | 129  | 127  | 130  | 130  | 128  | 130  | 130  | 130  | 128  |       |
|                |      |      |      |      |      |      |      |      |      |      |      | 1422 |       |

|                |      |      |      |      |      |      |      |      |      |      |      |      |       |
|----------------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Scheduled Dep  | 0735 | 0830 | 0930 | 1030 | 1130 | 1230 | 1330 | 1430 | 1530 | 1630 | 1730 | 1830 |       |
| Actual PBO dep |      | 835  | 905  | 1030 | 1130 | 1222 | 1330 | 1430 | 1530 | 1630 | 1726 | 1825 |       |
| Actual KDY arr |      | 857  | 922  | 1047 | 1145 | 1240 | 1352 | 1449 | 1544 | 1646 | 1745 | 1844 |       |
| Time           |      | 22   | 17   | 17   | 15   | 18   | 22   | 19   | 14   | 16   | 18   | 19   | 16.42 |
| pax carried    |      | 124  | 130  | 128  | 130  | 130  | 130  | 128  | 130  | 130  | 130  | 94   |       |
|                |      |      |      |      |      |      |      |      |      |      |      | 1384 |       |

|                 |                  |            |                      |
|-----------------|------------------|------------|----------------------|
| Av. Load Factor | Av. Pax per Trip | Total Pax. | Av. Trip Time (mins) |
| 117             | 89.94%           | 2806       | 15.96                |







# Appendix D

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Other Information from Stagecoach



## Hovercraft Trial Information required from Stagecoach

### Hovercraft Operational Statistics

Number of Craft (Trial)  
 Crew Numbers  
 Annual Payroll Cost per crew  
 Passenger Capacity  
 Maximum Speed  
 Operating Speed  
 Fuel Type  
 Fuel Density  
 Fuel Cost (£/litre)  
 Fuel Consumption at Maximum Speed  
 Fuel Consumption at Operating Speed  
 Annual Operating Hours (*Estimated*)  
 Annual Fuel Consumption (*Estimated*)  
 Annual Lubrication Cost (*Estimated*)  
 Downtime for maintenance (days per year) (*Estimated*)  
 Annual Maintenance (*Estimated*)  
 Annual Insurance Cost  
 Annual Inspection Cost  
 Capital Cost (New)  
 Annual Accrual for Cabin Refurbishment  
 Annual Accrual for Engine Replacement

### Trial Comments

| Non-Passengers (ie Local Residents) | Commendation |             | Complaint |             |
|-------------------------------------|--------------|-------------|-----------|-------------|
|                                     | Number       | Sample Text | Number    | Sample Text |
| Letters/Fax                         |              |             |           |             |
| Email                               |              |             |           |             |
| Other                               |              |             |           |             |
| Total                               |              |             |           |             |

| Passengers  | Commendation |             | Complaint |             |
|-------------|--------------|-------------|-----------|-------------|
|             | Number       | Sample Text | Number    | Sample Text |
| Letters/Fax |              |             |           |             |
| Emails      |              |             |           |             |
| Other       |              |             |           |             |
| Total       |              |             |           |             |

### Hovercraft Trial - Passenger Numbers

|         |          | Passengers |       |       |        | Estimated Revenue |            |           |           |            |
|---------|----------|------------|-------|-------|--------|-------------------|------------|-----------|-----------|------------|
| Service |          | Adult      | Child | Conc  | Total  | Service           | Adult      | Child     | Conc      | Total      |
| 6,7     | Wk 1     | 85         | 25    | 68    | 178    | 6,7               | £634.75    | £71.30    | £967.10   | £1,673.15  |
| 6,7     | Wk 2     |            |       |       |        | 6,7               |            |           |           |            |
| X59,X60 | Bus Wk 1 | 199        | 92    | 1,040 | 1,331  | X59,X60           | £838.50    | £254.00   | £3,620.53 | £4,713.03  |
| X59,X60 | Kdy Wk 1 | 2,541      | 1,188 | 1,710 | 5,439  | X59,X60           | £12,546.50 | £2,758.50 | £5,952.99 | £21,257.99 |
| X59,X60 | Bus Wk 2 | 1,396      | 406   | 1,470 | 3,272  | X59,X60           | £8,020.55  | £1,068.13 | £5,117.48 | £14,206.16 |
| X59,X60 | Kdy Wk 2 | 2,474      | 1,179 | 1,880 | 5,533  | X59,X60           | £13,196.20 | £2,855.75 | £6,544.81 | £22,596.76 |
| X90,X91 | Wk 1     |            |       |       | 7,782  | X90,X91           |            |           |           | £0.00      |
| X90,X91 | Wk 2     |            |       |       | 7,433  | X90,X91           |            |           |           | £22,479.10 |
|         |          |            |       |       | 30,968 |                   |            |           |           | £86,926.18 |

### Hovercraft Operational Statistics

|   |           | Trial         |
|---|-----------|---------------|
| Number of Craft (Trial)   |           | 1             |
| Crew Numbers  | craft     | 11            |
|   | shore     |               |
|   | engineers |               |
| 1 Annual Payroll Cost per crew                                  |           |               |
| 2 Passenger Capacity  |           | 130           |
| 3 Maximum Speed   |           | 45kts         |
| 4 Operating Speed   |           | 37kts         |
| 5 Fuel Type   |           | MSGO          |
| 6 Fuel Density  |           |               |
| 7 Fuel Cost (£/litre)   |           | 0.459         |
| 8 Fuel Consumption at Maximum Speed                             |           |               |
| 9 Fuel Consumption at Operating Speed                           |           | 290 l/hr      |
| 10 Annual Operating Hours ( <i>Estimate</i> )                   | at sea    | 171 hrs       |
| 11 Annual Fuel Consumption ( <i>Estimate</i> )                  | trial     | 49,908 litres |
| 12 Annual Lubrication Cost ( <i>Estimate</i> )                  |           |               |
| 13 Downtime for maintenance (days per year) ( <i>Estimate</i> ) |           |               |
| 14 Annual Maintenance ( <i>Estimate</i> )                       |           |               |
| 15 <b>Charter Cost - included crew costs and maintenance</b>    | <b>£K</b> | <b>64.5</b>   |
| 16 Annual Insurance Cost  |           |               |
| 17 Annual Inspection Cost                                       |           |               |
| 18 Capital Cost (New) including spares                          |           |               |
| 19 Annual Accrual for Cabin Refurbishment                       |           |               |
| 20 Annual Accrual for Engine Replacement                        |           |               |

**Transport Day Conference**

**Monday 3rd September**

**Pickaquoy Conference Centre, Kirkwall, Orkney**

**Presentation by Alistair MacLeod**

Alistair Macleod (on behalf of Stagecoach) gave a presentation to the Transport Day Conference on Monday 3rd September at Pickaquoy Conference Centre, Kirkwall, Orkney. This conference was coordinated and co-sponsored by:

[Napier University Transport Research Institute \(TRi\)](#)

[Orkney Science Festival](#)

Alistair's presentation was contained in Session IV entitled:

**SESSION IV: FERRY OPERATIONS AND MODAL SHIFT INITIATIVES**

The presentation slides can be obtained from the website:

<http://www.orkney-tri-transport-day.s-and-w.org/session.php?id=4>

However, extracts from his presentation included the following information:

- Kirkcaldy was chosen because of a suitable beach with easy access and 1,200m<sup>2</sup> of parking and waiting area within the bus terminal.
- Portobello had similar considerations although the bus depot is owned by Lothian Buses.
- Scottish National Heritage required a bird impact study and bird count during the winter together with on-board surveillance during the trial. There is an ongoing survey by environmental consultants Young Associates.
- A Noise Impact report on BHT-130 craft in the USA was submitted to Edinburgh and Fife Councils.
- Site preparation included security fencing to the High Water mark and Rolatrac Composite Surfacing (laid in 4 days). At Portobello the landing area had to be raised by 450mm.
- Hovercraft benefits on the Forth compared with catamarans were listed as:
  - Beach to beach from Kirkcaldy to Portobello
  - No major infrastructure requirements
  - Adjacent to Bus networks at both locations
- On Monday 16<sup>th</sup> July the service commences at 07:10hrs with a Wind Force 7 ENE at 30knots and seas up to 2.5m
- Fare comparison indicated a bus equivalent from Kirkcaldy to Edinburgh of £9.00 return (Off-peak £4.50) on 6; 7; X59 & X60 services. Train from Kirkcaldy to Waverley day return of £10.30 (Off-Peak £7.10).
- Comparative Journey times were:

- Bus Kirkcaldy – Edinburgh 65 – 90 mins
- Train Kirkcaldy – Waverley 35 – 52 mins
- Hovercraft + Bus = 18 + 18 = 36 mins
- Problems experienced during the trial were:
  - The hovercraft had to be re-positioned along the Kirkcaldy beach with overnight surveillance
  - At Portobello the leading edge of the Rolatrac began to float at high tide despite being anchored. This had to be buried in the sand.
- Re-fuelling occurred during the 10 min turnarounds.
- Wheelchair passengers were accommodated with the use of a stair climber (1<sup>st</sup> on the 21<sup>st</sup> July).
- Key statistics:
  - 32,099 passengers carried in 12 days
  - On 288 trips @ 85.7% load factor
  - Only two trips cancelled during entire trial (fault corrected in 45 mins)
  - 2,213 passengers on 20 commuter services between 07:10 & 08:30 hrs
  - Fuel consumption = 150.5 litres per roundtrip.
  - Bus Links operated by Lothian Buses:
    - 15,215 passengers carried in 12 days
    - 9,349 to city Centre
    - 5,866 to Ocean Terminal
    - 47% of passengers used buses
    - 53% on local or roundtrips
- Environmental comparison:
  - Hovercraft Fuel per passenger = 1.36 litres
  - By car Kirkcaldy – Portobello = 32 miles
  - Average Car Occupancy = 1.3 people
  - Average car fuel consumption = 40 mpg
  - Car Consumption per passenger = 2.78 litres
  - Conclusion: Hovercraft / Car (Fuel Consumption per passenger) = 49%
- Route choices:
  - Kirkcaldy – Leith (Hovercraft)
    - Ramp required at Kirkcaldy



- Ramp required at Leith over breakwater
  - Good Car parking at Leith
  - Shorter Bus Journey to City Centre
  - Quicker when tram service introduced
- Burntisland – Granton (Catamaran / Monohull)
  - Pontoon Facilities required at Burntisland
  - Pontoon Facilities required at Granton
  - Limited Car parking at Granton
  - Longer Bus Journey to City Centre
  - Quicker when tram service introduced
- Rosyth – Granton (Catamaran / Monohull)
  - Pontoon Facilities required at Rosyth
  - Pontoon Facilities required at Granton
  - Longer Bus Journey to City Centre
  - Quicker when tram service introduced
- Rosyth – Cramond (Hovercraft)
  - Ramp required at Rosyth
  - Ramp required at Cramond
  - Longer Bus Journey to City Centre
- Kirkcaldy – Portobello
  - Ramp required at Kirkcaldy
  - Ramp required at Portobello
  - Car parking required at Portobello
  - Short Bus Journey to City Centre
  - Minimal Road Congestion

# Appendix E

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Patronage Survey Report

# Appendix F

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Residents' Survey Report



# Appendix G

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Wolfson Unit Vertical Acceleration Report



Report No. 1994

30th July 2007

**HYDER CONSULTING LTD.**

**Motion Measurements on a passenger hovercraft**

**1 INTRODUCTION**

This report describes motion measurements made on a 28m hovercraft, designated BTH-130. The requirement to carry out the trials was initiated by Nigel Horwell, representing Hyder Consulting, and a brief proposal was emailed with Wolfson Unit reference P3095. An order to conduct the measurements was placed via an email on 22nd June 2007. The object of the trials was to quantify motions and their effect upon passenger comfort during normal operations for comparison with a conventional fast ferry..

**2 VESSEL DETAILS**

The vessel is a hovercraft with an overall length of 28m and a beam of 15m. It can seat 131 passengers with a crew of one pilot and 3 crew. The lift and propulsion engines are all turbo charged diesels, with 2 five bladed 3.5m diameter variable pitch propellers giving an operating speed of 35 knots.

**3 INSTRUMENTATION**

The acceleration data was gathered using a lap top computer. The two axis transducer used incorporated IC Sensors 3145 – 10 and 3145 – 2 accelerometers, measuring vertical and transverse accelerations, and has a serial number of WU 2V. This transducer has a flat frequency response from zero to 600 Hz. The accelerometers were calibrated through the system prior to and subsequent to the trials and found to vary by less than 0.1%. Data were gathered at a sampling rate of 211 samples/second and each data set was acquired over at least 5 minutes of operation.

**4 ANALYSIS**

The data from the trials were converted from raw time series acceleration data into acceleration and velocity power spectral density data using proprietary Wolfson Unit software. Subsequently these data were further analysed to yield the motions due to sea state and vibration levels for single frequency components.

**5 TRIALS**

Trials were carried out on the Firth of Forth, between Kirkcaldy and Portobello on Saturday 14<sup>th</sup> July and on the afternoon of Wednesday 25<sup>th</sup> July 2007. The route was approximately 11 miles in length, and took between 13 and 22 minutes. Measurements were made of vertical and transverse accelerations at the forward end and middle of the passenger seating area. Measurements were taken on the steelwork of the window frame, on the floor in front of the seats and on the seats themselves, as shown in Table 1.

The sea state on Saturday the 14<sup>th</sup> was slight, varying between 0m and 0.5m, with a westerly wind speed between 15 knots and 25 knots. On Wednesday 25<sup>th</sup> there was no discernable sea state, with a south westerly wind of approximately 5 knots.

## 6 DISCUSSION OF RESULTS

### 6.1 Discomfort Criteria and BSI

As per Wolfson Unit proposal the data was analysed via an acceleration spectral plot, weighted in accordance with BS 6841:1987, and integrated with time. The analysed data is presented in Table 2.

It should be noted that the sea states were small on the monitored crossings, and very little of the energy present in the spectra was in the 0 to 5 Hz (i.e. ship motions) regime. Figure 1 presents the acceleration and velocity PSD plots for a sample run. As can be seen, there are several large accelerations at high frequencies, but there are of very small movements, hence the velocities noted are small. With this in mind, and from the experience of being a passenger in the vessel, the motions were analysed with respect to vibration standards.

### 6.2 DNV Comfort Criteria

DNV Comfort Class is a systematic evaluation of the comfort on different types of ships. The class is a voluntary class notation giving comfort limits on noise, vibration and indoor climate. The rating ranges from 1 to 3, which reflects "high" to "acceptable" comfort standards. Comfort criteria relate to the peak vibration value in mm/second, for single frequency vibrations in the range of 5 Hz to 100 Hz and for High Speed and Light Craft are as follows -

| Location         | CR1      | CR2      | CR3      |
|------------------|----------|----------|----------|
| Passenger spaces | 2.0 mm/s | 3.5 mm/s | 5.0 mm/s |

The accelerations monitored were integrated into velocities, and the spectra plot analysed for peak values. Results from the second day of trials are presented in Table 3 for vibrations incurred on a seat, on the floor and on the window sill during 3 crossings. Examples of the weighted velocity spectra plots are shown in Figure 2 to Figure 5. Measurements taken on the seat passed the criteria with a comfort rating of 1 (high comfort) for all cases measured. Measurements taken on the floor gained a rating of 2 for the 14:00 crossing and the 15:00 crossing, but 3 for the 14:30 crossing. The change in rating is due to the sea state encounter frequency of the vessel shifting the motions from approximately 2 Hz to just over 5 Hz, as can be seen by comparing Figure 4 and Figure 5. This increase in encounter frequency moved the motion from the 'whole body motions range (0 – 5 Hz) into the vibration range analysed in the DNV rating. The vibration of the floor would also vary according to the position of measurement within the vessel due to global and local structural response.

## 7 CONCLUSIONS

1. Acceleration data from the two days of trials shows there were little vessel motions due to sea state, but there were significant accelerations at higher frequencies, due to vibration.
2. A spectral density plot of the velocities recorded show that the movements incurred were small, with a comfort rating of 1 (the highest) when sitting.
3. The vibrations measured on the floor were larger, with a comfort rating of 2 in general, but this would vary through out the vessel due to structural response as well as the direction of travel with respect to the direction of the sea state.
4. Similar measurements should be recorded on a conventional fast ferry to make a valid comparison with the data from the hovercraft.



**Table 1 Location of measurements**

| Name          | Location  |
|---------------|---|
| Fwd frame     | Starboard side of vessel, furthest forward seat   |
| Midship frame | Starboard side of vessel, immediately aft of exit |
| Midship seat  | Starboard side of vessel, immediately aft of exit |
| Midship floor | Starboard side of vessel, immediately aft of exit |

**Table 2 BSI calculations due to ship motions**

| Location            | Hand control<br>(RMS<br>acceleration) | Discomfort<br>(RMS acceleration) | BSI |
|---------------------|---------------------------------------|----------------------------------|-----|
| Saturday 14th July  |                                       |                                  |     |
| Seat                | -                                     | -                                | 1%  |
| Window Frame        | -                                     | -                                | 5%  |
| Wednesday 25th July |                                       |                                  |     |
| Seat                | 0.17                                  | 0.24                             | 1%  |
| Floor               | 1.23                                  | 1.62                             | 3%  |
| Window frame        | 0.87                                  | 1.11                             | 3%  |

**Table 3 Peak vibration measurements**

| Crossing | Peak velocity (mm/s) |       |        |
|----------|----------------------|-------|--------|
|          | Seat                 | Floor | Window |
| 14:00    | 1.15                 | 2.27  | 1.30   |
| 14:30    | 0.99                 | 3.99  | 1.84   |
| 15:00    | 0.76                 | 2.29  | 1.51   |

Figure 1 Spectral plot of acceleration and velocities recorded on a seat

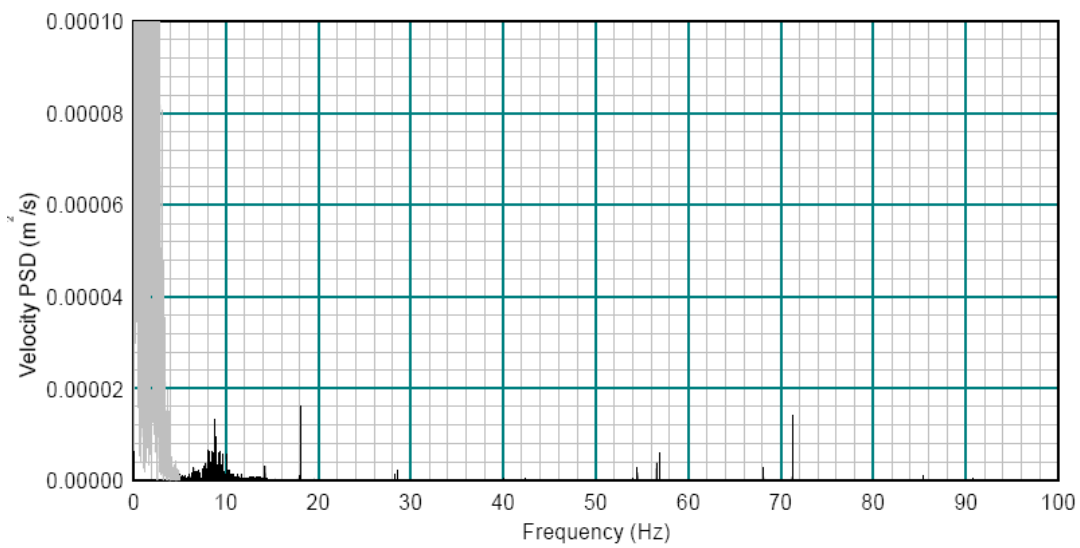
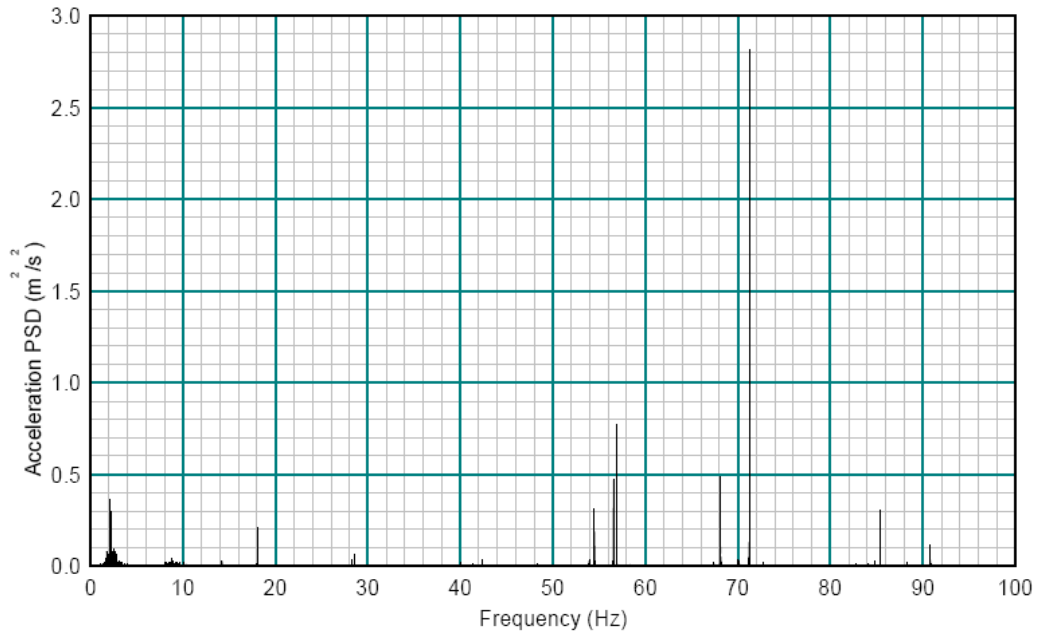


Figure 2 Comfort velocities on seat (14:00 crossing, 25<sup>th</sup> July)

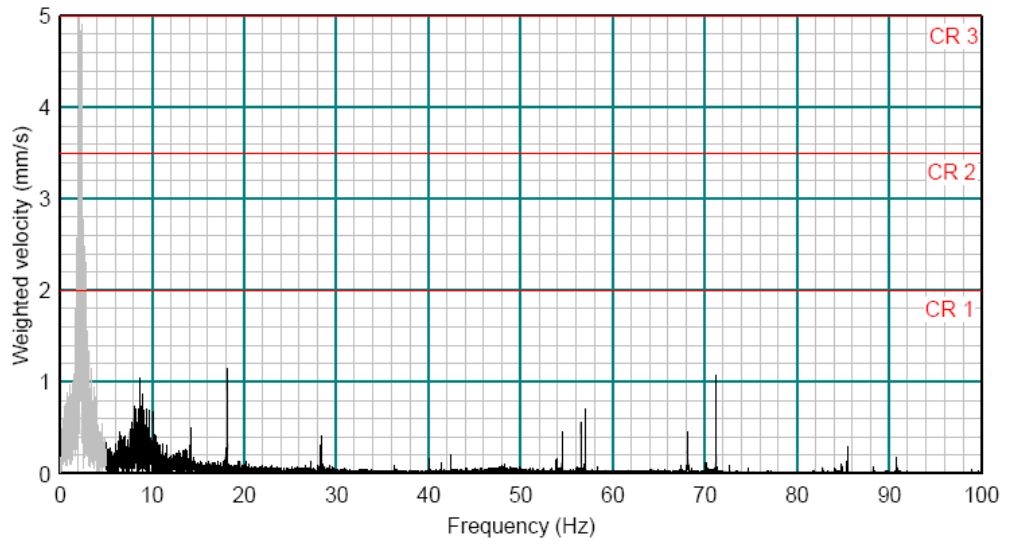


Figure 3 Comfort velocities on window frame (14:00 crossing, 25<sup>th</sup> July)

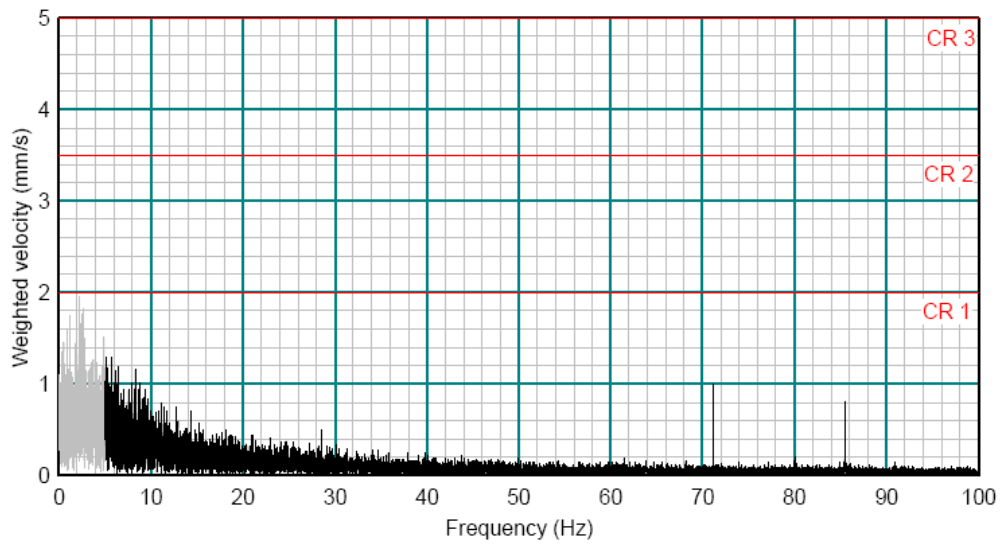


Figure 4 Comfort velocities on floor (14:00 crossing, 25<sup>th</sup> July)

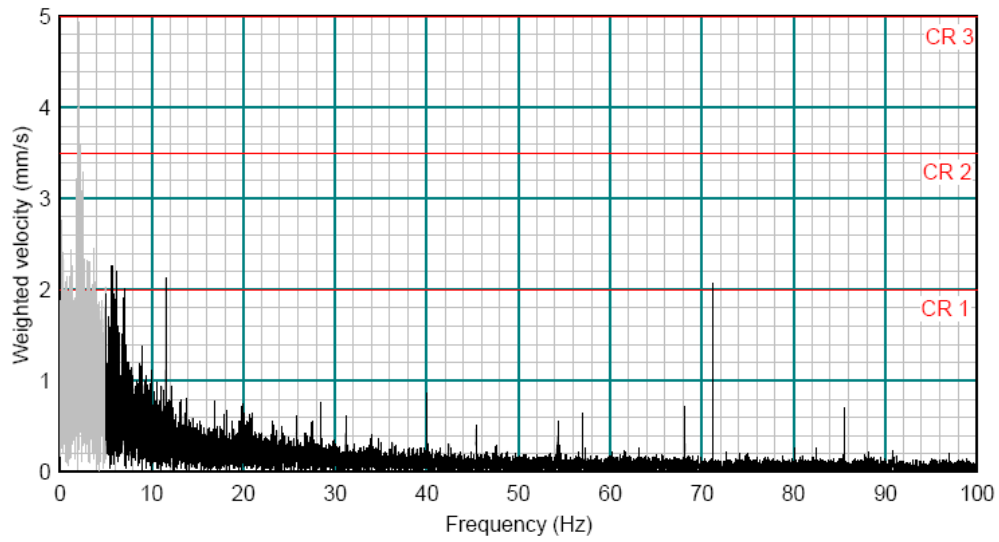
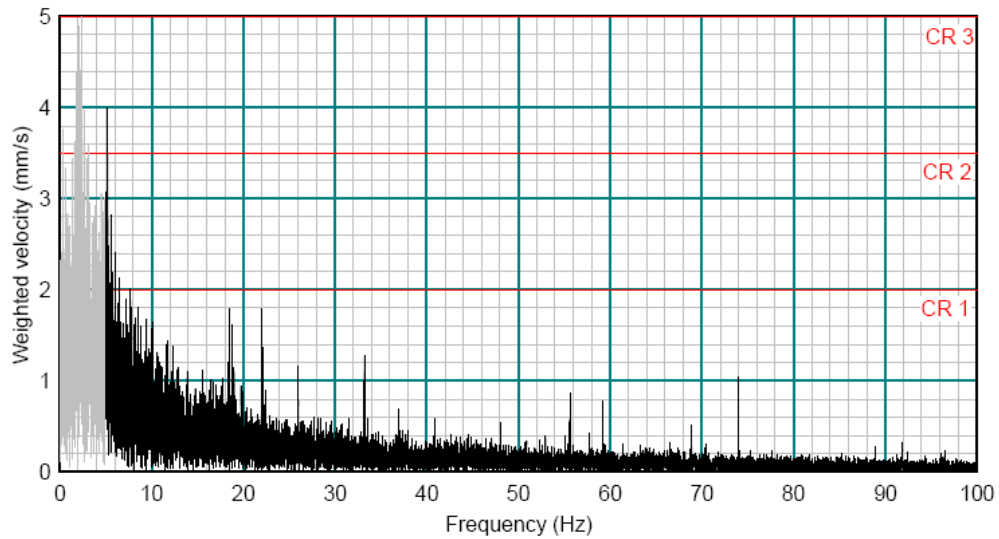


Figure 5 Comfort velocities on floor (14:30 crossing, 25<sup>th</sup> July)



# Appendix H

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Noise Monitoring Reports



**Fife Council**

***Information to be provided***





**Edinburgh City Council**

***Information to be provided***