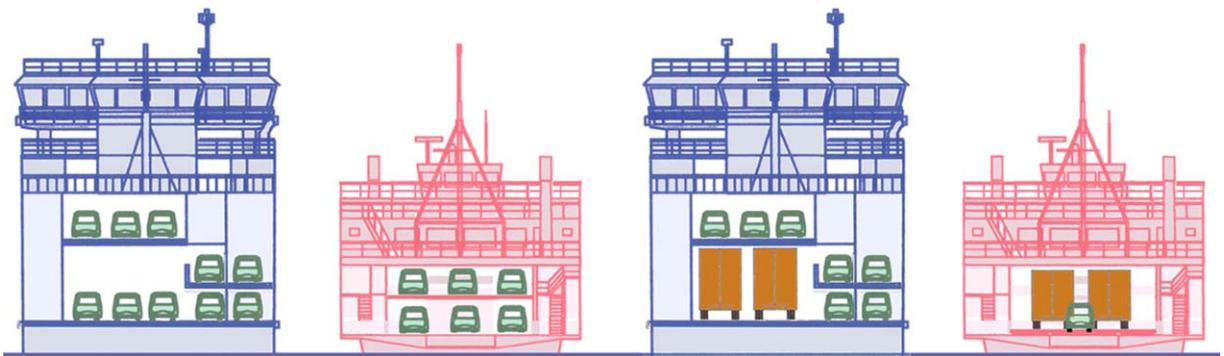
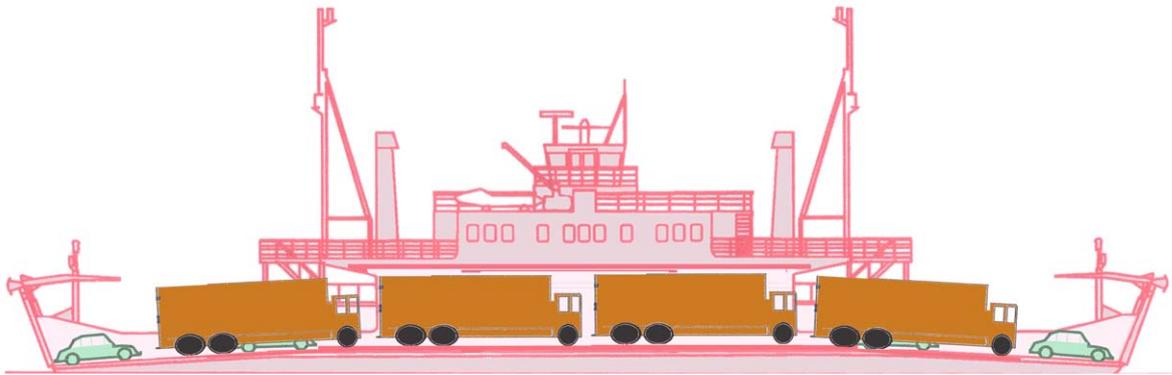
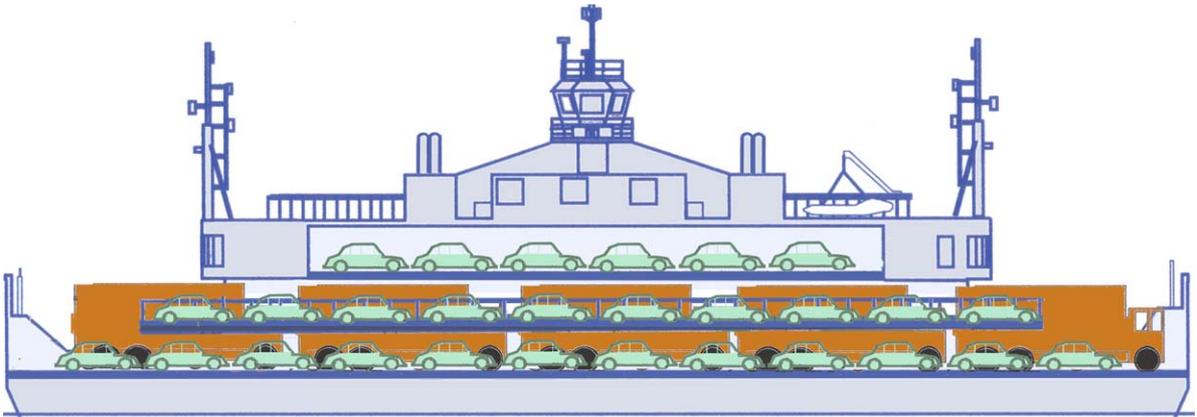


# An Analysis of Lymington-Yarmouth Ferry Capacity

The Lymington River Association



Version 2.1a - 13/6/08

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## **Introduction**

At peak holiday times, traffic congestion is an increasing problem in Lymington and the New Forest. We are concerned that the bigger Wight-Class ferries will add significantly to this congestion.

Wightlink have repeatedly stated that the proposed W-Class will have a capacity of 15 more cars than the existing C-Class. We cannot reconcile this with our analysis of Wightlink published plans and diagrams which shows a capacity of 30 more cars.

On the 31<sup>st</sup> of May, the Lymington Times published Wightlink's reply to our claims that the W-class ferry capacity was not 65 cars but 82 cars. This reply included car-deck layouts; these confirmed that the areas on which we have been basing our calculations of vehicle capacity are correct.

The difference is that we based our calculations of cars on an average of 4.5 lane-metres per car for both ferries whereas Wightlink used 5.2 lane-metres per vehicle for the proposed ferries and a shorter length for the existing ferries.

Lane metres per car	C-Class Cars	W-Class Cars	Increase	
4.5 metres	52 cars**	82 cars	30 cars	+ 57%
5.2 metres	40 cars	65 cars**	15 Cars	+ 65%

\*\* Wightlink provided figures

This document describes our analysis and conclusions. Measurements are taken from Wightlink plans using CAD software. Other than in Section 5.1, we used a lane-length of 4.5 metres per car as this reflects actual experience of the existing ferries. Section 5.1 includes Wightlink's vehicle-deck layouts published in the Lymington Times and our analysis of them.

Throughout this report, W-Class has been outlined in **blue** and C-Class in **red**.

Wightlink has stated passenger capacity has been reduced from 500 on the C-Class to 360 on the W-Class. We gather that this is due to the number of life-saving appliances. We have seen no information on the actual comfortable seating capacity (inside or out) nor have we tried to calculate any.

### **Document Split**

Version 1 of this analysis was included in a document which also discussed the dimensions of the ferries. In Version 2, these have been separated into two to keep the documents to a manageable size. It is also because the natures of the analyses are somewhat different.

## 1 Analysis Summary and Conclusions

Wightlink has stated, "Car capacity will increase from an average of 50 CEUs (car equivalent units) on existing ferries to 65 CEUs on the new ferries. Freight carrying capacity remains unchanged at 100 lane metres and is included within the overall CEU capacity - not in addition too (sic)".

Wightlink, on 31<sup>st</sup> May 2008, published plans of how the 65 cars capacity was derived. Examination of these should that applying the same parameters to the C-class gives a capacity of 40 cars as opposed to the figure of 52 cars which they quote. We believe that these plans are highly misleading and therefore we have based our analysis on the 52 cars on the C-class.

We measured the ferries' capacities in two situations:

- With no high vehicles:
  - The W-class vehicle deck area is 53% greater than that of the C-class.
  - The W-class can take up to 30 more cars
- With a full-load of high vehicles (such as caravans, campers, cars with bicycles on top, coaches, trucks and HGVs):
  - The W-class usable deck area is 138% greater than that of the C-class.
  - The W-class has 22% more high-vehicle lane metres than the C-class
  - The W-class can take 44 more cars along with a load of maximum high vehicles
  - The W-class vehicle deck area is much greater than that of the C-class because in these circumstances the C-class cannot use its mezzanine; there is no such restriction on the W-class

**Summary of Ferry Capacity**

	<b>C-Class</b>	<b>W-Class</b>	<b>Difference</b>
<b>No high vehicles</b>			
Vehicle Deck Area	722 m <sup>2</sup>	1111 m <sup>2</sup>	+ 53%
Lane metres	235 m	378 m	+ 61%
Car capacities	52 cars	82 Cars	+ 30 cars
<b>With maximum high-vehicle load</b>			
Vehicle Deck Area	467 m <sup>2</sup>	1111 m <sup>2</sup>	+ 138%
Lane metres high vehicle	86 m	105 m	+ 22%
Lane metres for cars	20 m	225 m	+ 1125%
Car capacities	4 cars	48 Cars	+ 44 cars
Passenger Capacity	500	360	- 28%

The following diagrams show the vehicle capacity allowing 4.5 lane-metres per car; they are to scale based upon Wightlink plans. Note that they are a simplification as cars do not all come in the same size.

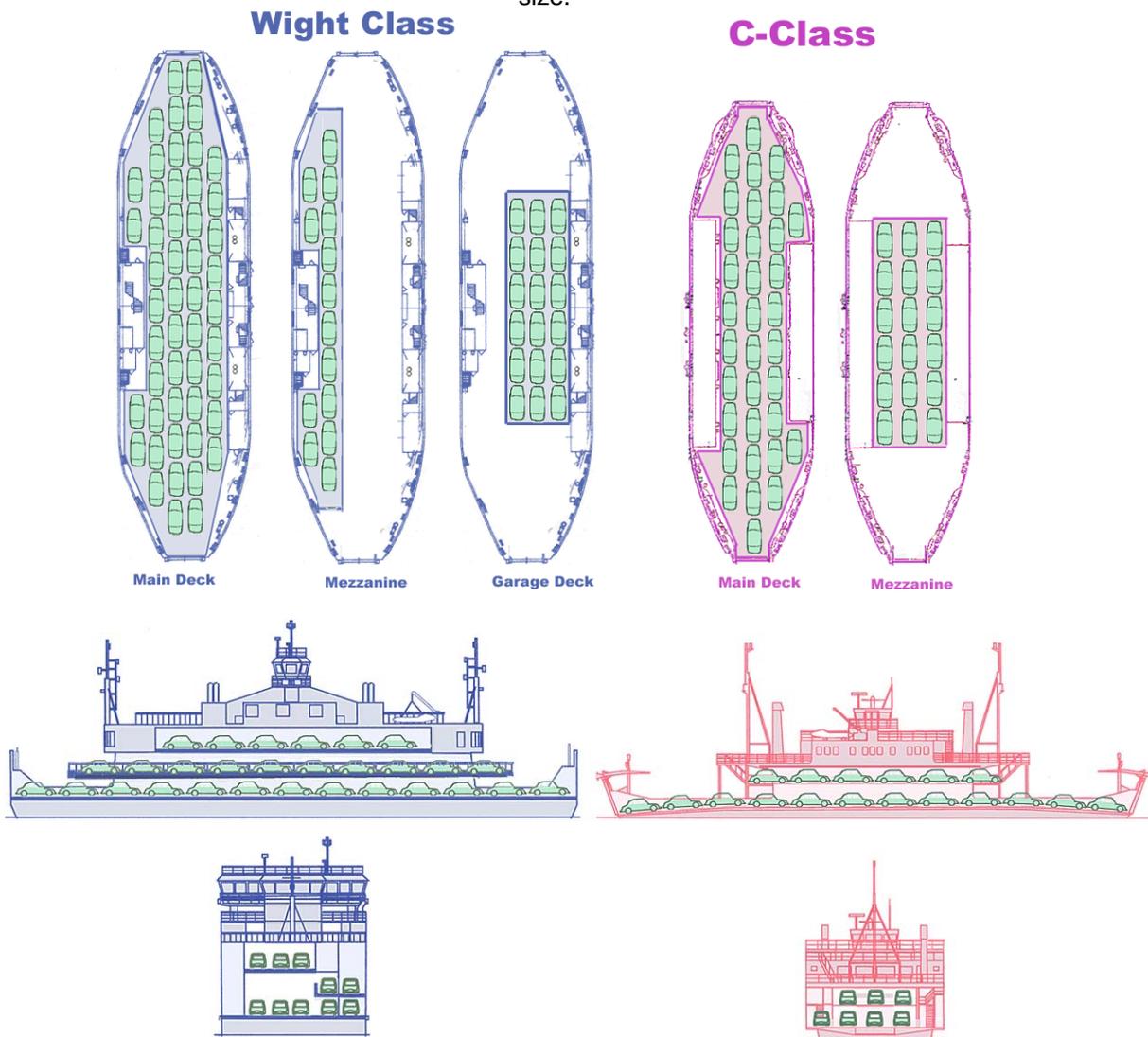


Figure 1 Cars Only

The following diagram also shows 4.5 lane-metres per car. The high vehicles shown are trucks: he diagram shows 11 metres long high vehicles (with shorter ones filling the spare space); they are 5 metre high on the W-class and 4.15 metres high on the C-class.

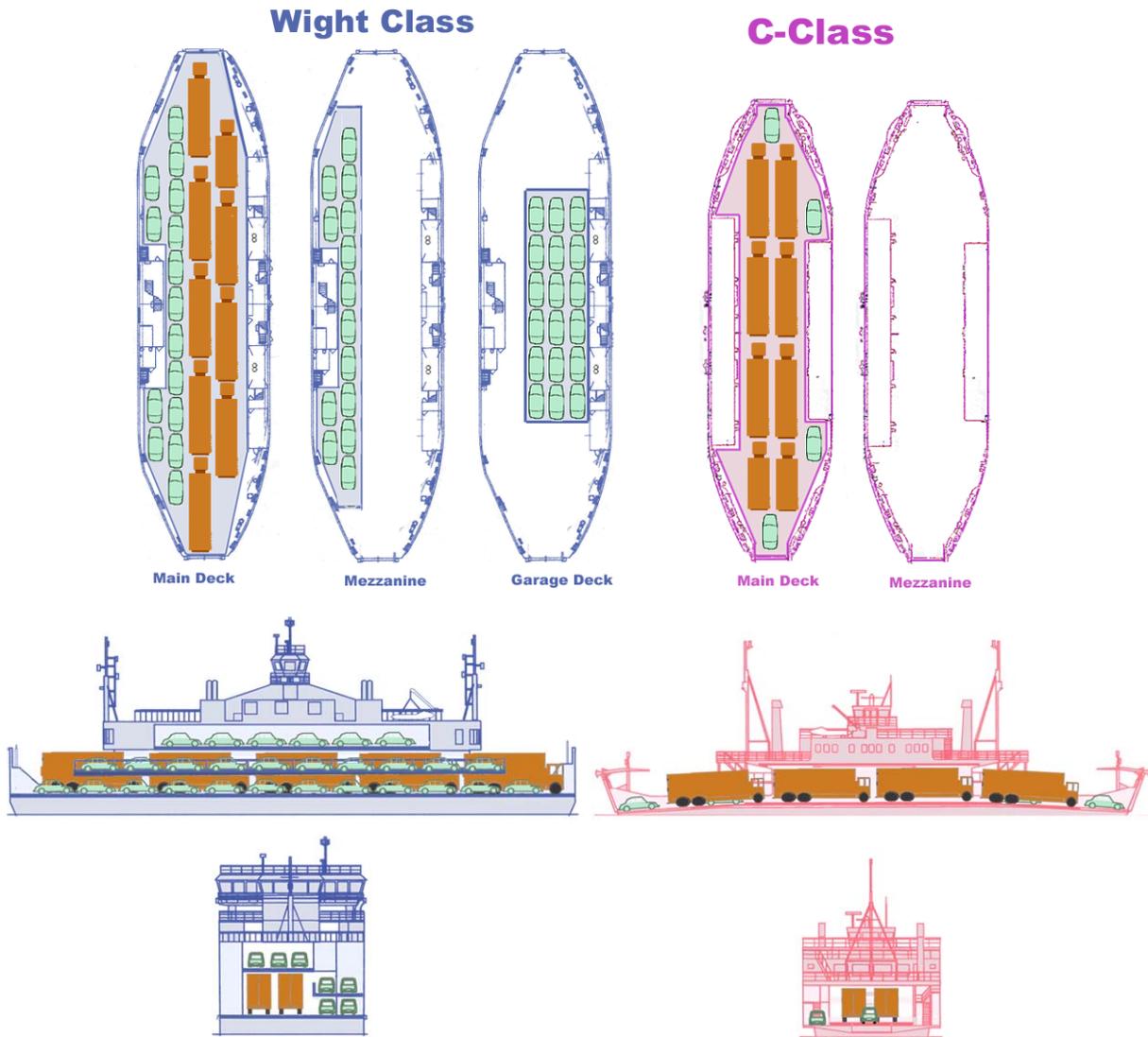


Figure 2 Maximum High Vehicles

2

## The Plans

### 2.1 The Wightlink Class (ex R-Class)

The main-deck layouts from the Hart Fenton Plan, cross-sections of the ferry, the exploded isometric diagram of the W-Class and perspective drawing all from the Wightlink web site were used. The layouts were confirmed by the plans released by Wight link on 30<sup>th</sup> May 2008.

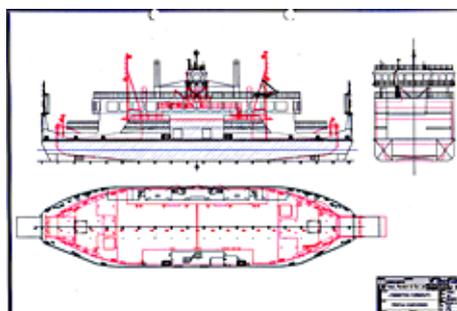


Figure 3 Hart Fenton Plan



Figure 4 Profile and Cross-section of W-Class

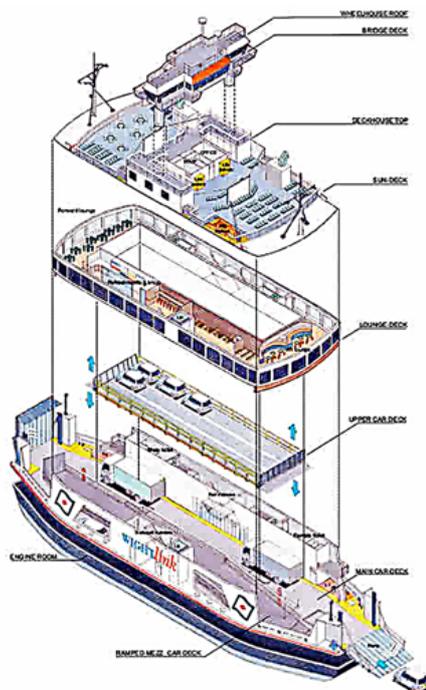


Figure 5. Exploded W-Class Diagram (From Wightlink Website)



**Figure 6 W-Class Perspective**

### **Main Vehicle Deck**

The main vehicle deck can be measured directly from the Hart Fenton Plan. An allowance was made for the deck fittings shown on the Hart Fenton plan and for the stairs just visible on the Exploded Diagram and in the following photograph.



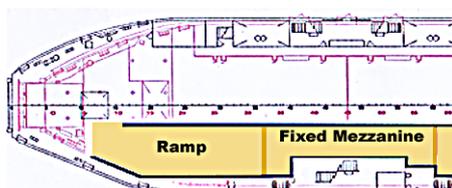
**Picture 1 W-class profile showing steps from mezzanine level**

### **Mezzanine**

The width of the mezzanine is shown on the Hart Fenton Plan. The length is that on the profile from the Wightlink web site; this is less than that on the Hart Fenton plan.

The Wight-Class mezzanine is split into three:

- A fixed central section
- Ramps at either end for loading the mezzanine; it is possible that these will be used to load the garage deck before it is hoisted to its full height. Entry onto the ramps is from the side.



**Figure 7 W-Class Mezzanine**

The following photographs of the ferry under construction show the fixed section of the mezzanine and the view down the mezzanine ramp.



**Picture 2 Fixed section of W-class mezzanine**



**Picture 3 View down the ramp of W-class mezzanine**

### **Garage Deck**

The upper or garage deck can be hoisted to one level higher than the mezzanine. The width is as shown on the cross-section on the Wightlink web site and the length is calculated from the exploded diagram.

## **2.2 The C-Class**

The sources used for the analysis of the C-Class capacity have been the Hart Fenton Plan and the ferries themselves.

Note that two totals, 48 and 52 cars, have been given for the C-class. We believe that this is due to differing deck fittings on the main deck of one of the vessels. We have used 52 cars throughout our analysis.

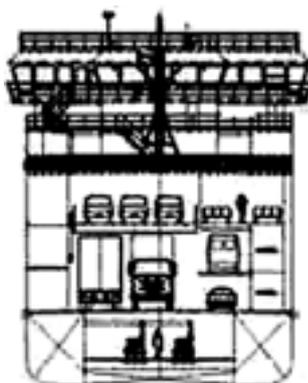
### **Main Deck**

The capacity was derived in the same way as that for the W-class again allowing for deck fittings.

### **Mezzanine**

The C-Class mezzanine was fitted some years after the ferries were built. The mezzanines are loaded at main-deck level. They are split in two: if the load mix requires, only half of the mezzanine can be used allowing more high vehicles to be carried on the main deck while still using part of the mezzanine.

## 2.3 Vehicle Dimensions



Our calculations were based upon the C-Class carload of 52 applied over the deck plans and the Wightlink cross-sections of the ferries.

- Width of high-vehicle lanes: 4 metres
- Width of car lanes: 2.5 metres
- Average lane length per car: 4.5 metres

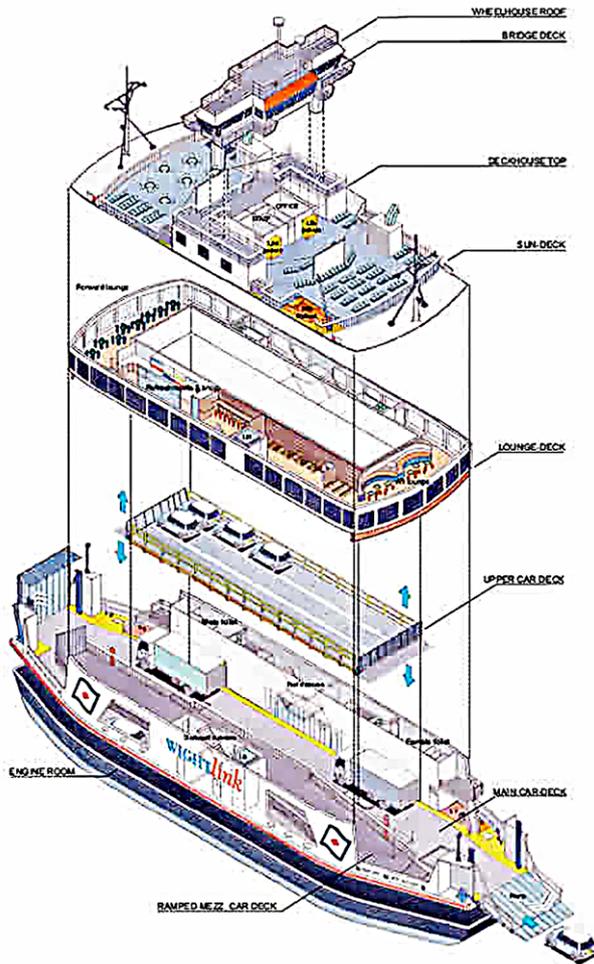
No estimate was made of high-vehicle length: this is conventionally measured in lane metres. However, in the diagrams the longer vehicles shown are 11 metres long, the shorter ones fill in the space.

(Note that, conventionally, small trucks are 5 metres, medium trucks are 8 metres, maximum trucks are 11 metres, large coaches are 12 metres and maximum 44-tonne articulated HGVs are 18 metres.)

The W-class will take 5 metre high HGVs and double-deck coaches. The C-class will take a maximum of 4.15 metre vehicles; this because the lowered mezzanine effectively raises the main deck floor and restricts the headroom.

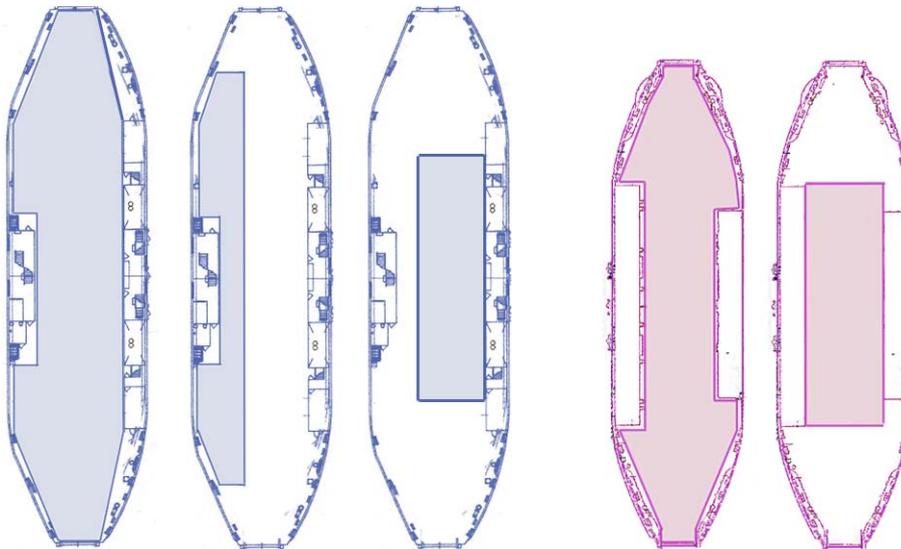
### 3 Calculations of Ferry Capacity

This section analyses the vehicle space available on the W-Class and C-Class ferries.



### 3.1 Vehicle-deck Area

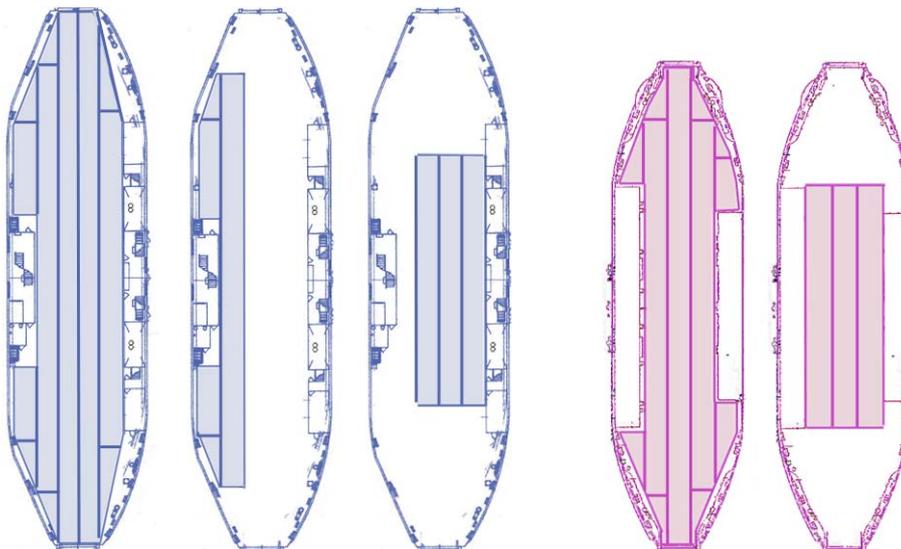
The W-Class has three vehicles decks and the C-Class two:



Car Deck Area		C-Class	W-Class	Difference
	Main deck	467 m <sup>2</sup>	650 m <sup>2</sup>	
	Mezzanine	255 m <sup>2</sup>	187 m <sup>2</sup>	
	Garage Deck		274 m <sup>2</sup>	
	<b>Total</b>	722 m <sup>2</sup>	1111 m <sup>2</sup>	+ 53%

### 3.2 Car Lane Metres

Another, arguable better, way of estimating car capacity is by car lane metres. Our calculations assumed a car lane width of 2.5 metres which matches the three lanes used in the middle of the C-class ferries and the garage deck of the W-class.



Car Lane Metres		C-Class	W-Class	Difference
	Main deck	151 m	222 m	
	Mezzanine	84 m	69 m	
	Garage Deck		87 m	
	<b>Total</b>	235 m	378 m	+ 61%

These areas would suggest that the car carrying capacity of the W-Class is 61% more (83 cars) than that of the C-Class (52 cars).

### 3.3 Cars

Since cars come in very different lengths, laying out cars on the deck is not a good way of actually calculating capacity. However it is easy to understand and is therefore has been used in the diagrams in Section 1.

The "average" car space or Car Equivalent Unit (CEU) was calculated based upon the Wightlink-quoted C-class capacity of 52 cars. This gives 4.5 lane metres per car. Applying this across the various decks, we get:

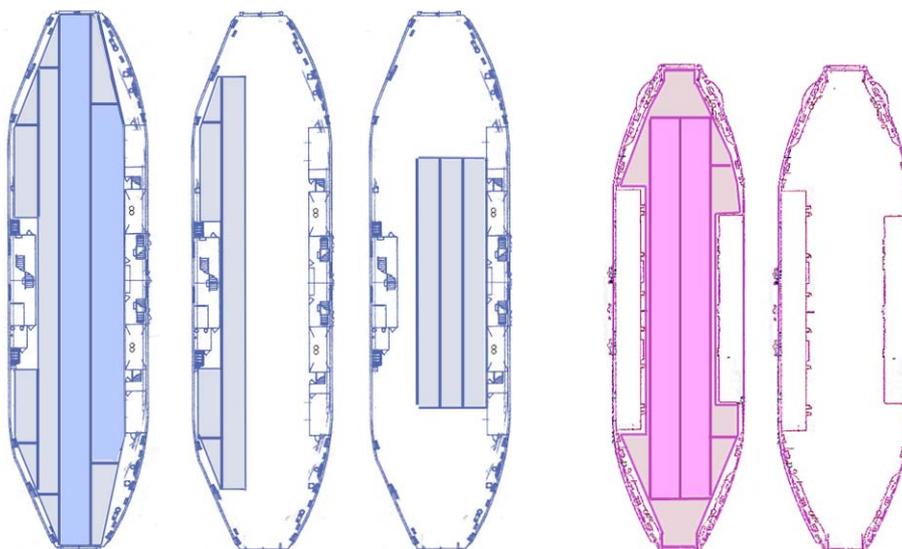
Cars at 4.5 Lane metres		C-Class	W-Class	Difference
	Main deck	34 cars	49 cars	
	Mezzanine	18 cars	15 cars	
	Garage Deck		18 cars	
	<b>Total</b>	52 cars	82 Cars	+ 30 cars

These figures resulted in the diagram shown in Section 1.

### 3.4 High Loads

High loads include cars with, say, bicycles on top, campers, caravans, coaches, trucks and HGVs. Wightlink say that, at peak holiday times, they have considerable trouble accommodating loads which include these and that the garage deck was added to address this problem.<sup>1</sup>

High-load capacity is measured in lane metres; high load lanes are taken as 4 metres wide.



<sup>1</sup> This is important in looking at the wider impact of the W-Class ferries, because to accommodate the garage deck, the profile is nearly twice that of the C-class. This results in greater windage and the need for greater power to keep the ferry on course in the river in crosswinds. We feel that, in overcoming their problem, Wightlink will introduce a very significant problem for the river environment and for small craft in the river.

The W-class will take 5-metre HGVs and double deck coaches; this is the highest on any Solent crossing. The C-class will take a maximum of 4.15 metre vehicles.

<b>Deck Area with maximum high loads</b>		<b>C-Class</b>	<b>W-Class</b>	<b>Difference</b>
	Main deck	467 m <sup>2</sup>	650 m <sup>2</sup>	
	Mezzanine		187 m <sup>2</sup>	
	Garage Deck		247 m <sup>2</sup>	
	<b>Total</b>	467 m <sup>2</sup>	1111 m <sup>2</sup>	+ 138%

<b>Lane Metre with maximum high loads</b>		<b>C-Class</b>	<b>W-Class</b>	<b>Difference</b>
	High Load Metres	86 m	105 m	+ 22%
	Main Deck Cars	20 m	69 m	
	Mezzanine		69 m	
	Garage Deck		87 m	
	<b>Total Car Lane Metres</b>	20 m	225 m	+1125%

<b>Cars with maximum high loads</b>		<b>C-Class</b>	<b>W-Class</b>	<b>Difference</b>
	High Load Metres	86 m	105 m	+ 22%
	Main Deck Cars	4 cars	15 cars	
	Mezzanine	0 cars	15 cars	
	Garage Deck		18 cars	
	<b>Total</b>	4 cars	48 Cars	+ 44 cars

The deadweight (carrying capacity) of the W-class is much greater than that of the C-class. When mainly cars are carried this may not be significant. However it may become an important factor in carrying loaded HGVs.

## 4 Capacity by Deck

The following table brings together all the above data:

**Comparison of Vehicle Capacity by Deck**

	<b>C-Class</b>	<b>Wight-Class</b>	<b>Difference</b>
<b>Main Decks with No High Vehicles</b>			
Areas	467 m <sup>2</sup>	650 m <sup>2</sup>	+ 39%
Lane metres	151 m	222 m	+ 47%
Car capacities	34 cars	50 cars	+ 16 cars
<b>Main Decks with Max High Vehicles</b>			
Area high loads	350 m <sup>2</sup>	448 m <sup>2</sup>	+ 28 %
Lane metres (with high vehicles)	86 m	105 m	+ 22%
Area for cars only	45 m <sup>2</sup>	200 m <sup>2</sup>	+ 444%
Remaining lane metres for cars	20	69 m	+ 345%
Car capacity	4	15 cars	+ 11 cars
<b>Mezzanines</b>			
Areas	255 m <sup>2</sup>	187 m <sup>2</sup>	
Lane metres	84 m	69 m	
Car capacities	18 cars	14 cars	- 4 cars
<b>Top deck (Garage/Upper Deck)</b>			
Area	-	247 m <sup>2</sup>	
Lane metres	-	87 m	
Car capacity	-	18 cars	+ 18 cars

**Note** that the discrepancy between this table and that above is due to rounding errors.

## 5 Wightlink Statements

On the 13<sup>th</sup> August 2007 Wightlink gave some background to the C-class ferry capacity: *"The current vessels had an original carrying capacity of 58 cars which was quickly deemed insufficient for this route and each vessel had a mezzanine deck installed which increased its capacity by 14-18 cars (dependent on vessel) i.e. 72-79 cars in total. With the advent of time, the size of cars has increased to the extent that the current vessels can now carry only 48-52 cars."*

In an email to the LRA 28<sup>th</sup> Feb 2008, Wightlink gave a "Useable Deck Area" of 751 sqm for the C-class and 1,011 sqm for the W-class - an increase of 34.6%. We cannot reconcile this with the Hart Fenton plans which show an area of 722 sqm for the C-class and 1,111 sqm for the W-class - an increase of 53%.

In the same email Wightlink stated that the W-class garage deck had a capacity of 15 cars. This is incompatible with the capacity of 18 cars shown on the exploded diagram and the fact that that the mezzanine on the C-class which is slightly shorter can take 18 cars.

At various times, Wightlink have stated that the W-class can take 37 cars as well as maximum high vehicles. Again we cannot reconcile this with our calculation of 48 cars.

Wightlink has repeatedly stated that both ferry classes will take 110 metres of high vehicles despite the fact that the W-class is 4 metres longer than the C-class. Our calculations give 105 metres and 86 metres respectively.

On the Wightlink website, the following table is given (CEU = Car Equivalent Unit).

	<b>Total CEUs</b>	<b>Freight CEUs</b>	<b>Cars</b>	<b>Unusable CEUs</b>
C-Class	48-52	28	4	16-20
W-Class	65	28	37	

Strangely if the car lane metres used for freight (110 metres x 3/2 = 165 metres) is divided by the reduction in car capacity, the W-Class figures give a CEU length of 5.9 metres whereas the C-class figures give a CEU length of 4.4 metres!

We are not sure what is meant by unusable CEUs for the C-class.

### 5.1 **Wightlink Plans**

Finally Wightlink published plans of vehicle capacity in the Lymington Times of 31<sup>st</sup> May 2008. This section analyses them.

The Wightlink statement only examined the capacity with cars only. Therefore we have confined ourselves to this.

The two major differences in the Wightlink analysis and ours are that:

- Wightlink assumed an average lane-metre length of 5.2 metres per car whereas we used an average length of 4.5 metres,
- The Wightlink analysis assumed generous space allowed at the end of the lanes whereas ours crammed cars in as experience of the C-class and other ferry operators has shown to be the norm.

Interestingly, the Wightlink plans show a capacity on the W-class garage deck of 15 cars whereas on the C-class mezzanine which is of a very similar size, Wightlink load 18 cars.

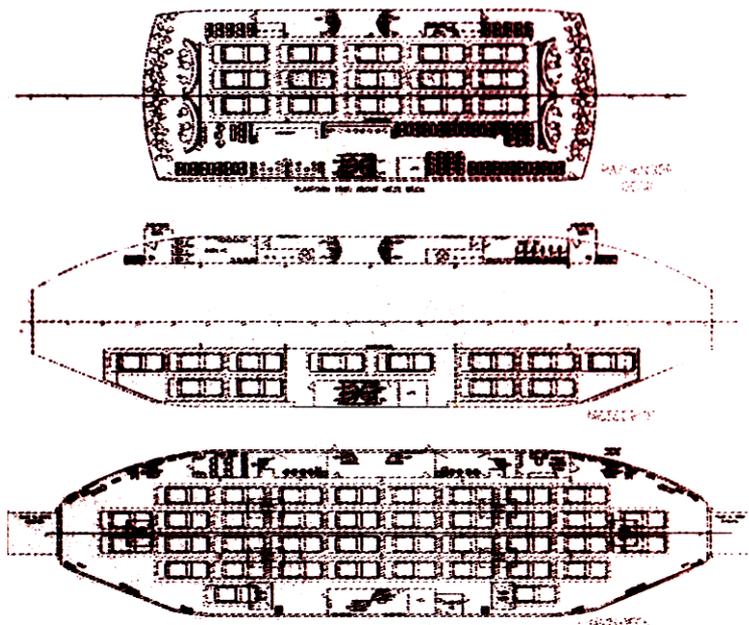
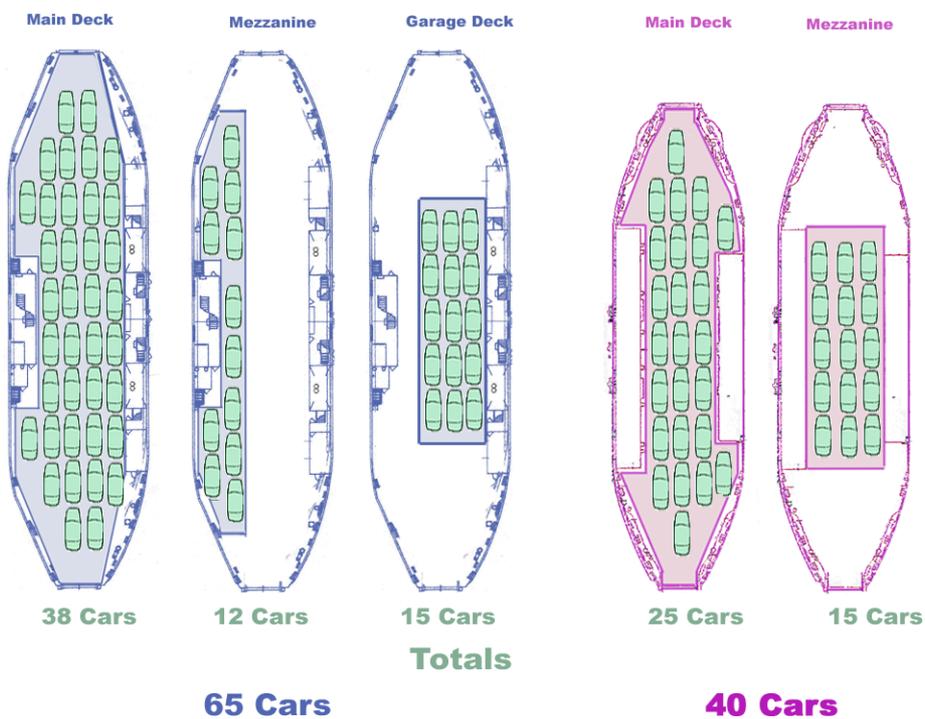


Figure 8 Wightlink W-Class Car-only load plan

The following plan shows the layout above compared with the same approach used to layout the cars on the W-class.

**Proposed Ferry**

**Existing Ferry**



### Comparison of Vehicle Capacity by Deck based on Wightlink Calculations

	C-Class	Wight-Class	Difference
<b>Main Decks with No High Vehicles</b>			
Lane metres	127 m	200 m	+ 57%
Car capacities	25 cars	38 cars	+ 14 cars
<b>Mezzanines</b>			
Lane metres	84 m	69 m	
Car capacities	15 cars	12 cars	- 3 cars
<b>Top deck (Garage/Upper Deck)</b>			
Lane metres	-	87 m	
Car capacity	-	15 cars	+ 15 cars
<b>Total</b>			
Lane metres	211 m	356 m	+ 69%
Car capacity	40 cars	65 cars	+ 25 cars

In response to comments on these plans, Wightlink, in a letter to the Lymington Times of 14<sup>th</sup> June, stated, *"The capacity of a new Wight Class vessel has been set at 65 cars; this has always stated to be the case. In comparison to an existing C Class ferry, a Wight Class vessel has around 34.5% additional deck space for the transportation of vehicles. Based on a carrying capacity of around 50 vehicles for a C Class vessel, this equates to around 67 cars for a Wight Class vessel. For a slightly more conservative estimate of 48 cars for a C Class vessel, this would equate to 65 cars for a Wight Class vessel. Whilst this calculation is not definitive, it does provide a reasonable basis for determining what the carrying capacity of a Wight Class ferry will be in reality. Estimates of a carrying capacity of 82 cars are therefore grossly exaggerated."*

As this report shows, the estimate of 82 cars is based on a consistent estimate of ferry capacity; this was confirmed by the plans of the Wightlink vehicle-deck plans provided by in the Lymington Times of 31<sup>st</sup> May 2008. The plans also show the inconsistent approach which has lead Wightlink to their claim of 65 cars.

## 5.2 Extended Mezzanine

Wightlink have also stated, in an interview with A&T 6/10/07, *"the design of the ferries would make it impossible to add a mezzanine deck to increase the load capacity"*. We are puzzled by this statement.

In the email to the LRA 28<sup>th</sup> Feb 2008, Wightlink said::

*"There is no possibility of fitting retrospectively an extended mezzanine deck into a Wight Class vessel for the following reasons:*

- *Vessel already has a garage/platform deck fitted (15 cars capacity). This would be rendered inoperable if another mezzanine deck were to be fitted" as it " must be loaded at main deck level and then hoisted up to the passenger deck level".*
- *Existing pillars and structure would be incapable of supporting an extended mezzanine deck. Structural design of vessel would require changing to accommodate an extra deck - the cost of which would be prohibitive.*
- *The main deck height clearance would be compromised, thereby sacrificing flexibility of loading."*

We have difficulty accepting this, even if the W-class was not designed for an extended mezzanine; however nor were the original C-class.

- There is space for the addition of an extension to the mezzanine of the same size as the planned top deck.

- The loading ramps and the access to the passenger lounges are already included for the planned section of the mezzanine.
- Hoist mechanisms for the planned top deck are already included and, we would have thought that it could be readily enhanced to allow the hoisting of a mezzanine extension of the same size. Loading the higher levels could be via the planned ramps to the existing mezzanine.
- There is surplus deadweight in the W-class design which would allow for the weight of an extended mezzanine and its additional load.
- The addition of a mezzanine to the C-class required the addition of hoist and access platforms and loss of high-vehicle "head room" when not in use.
- When not required, the mezzanine extension could either be stowed, open-ended, on the main deck as in the current C-class or stowed under the garage deck; this would reduce the maximum height of high loads to something like the 4.15 metres of the C-Class.

With the extended mezzanine in use, the Wight-Class would take an additional 18 cars.

#### Vehicle Capacity with an Extended Mezzanine

	C-Class	Wight-Class	Difference
<b>Additional car capacity with extended mezzanine</b>			
Area	-	274 m <sup>2</sup>	
Lane metres	-	87 m	
Car capacity	-	18 cars	+ 18 cars
<b>Total car capacity with extended mezzanine</b>			
Areas	704 m <sup>2</sup>	1385 m <sup>2</sup>	+ 97%
Lane metres	235 m	465 m	+ 98%
Car capacities	52 cars	98 cars	+ 46 cars