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River Hamble Harbour Authority

Warsash Slipway

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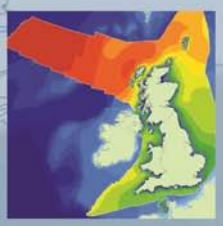


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Warsash Slipway

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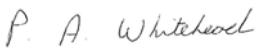
Project Manager:	P A Whitehead		02/05//2013
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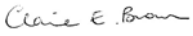
Project Director:	C E Brown		02/05/2013

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Warsash Slipway

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1. Introduction

The public slipway at Warsash on the River Hamble is relatively steep and the high water mark on spring tides approaches close to the road giving little space for manoeuvring of vehicles and boat trailers at tide levels near to high water (HW). The present configuration of the foreshore and its interaction with the slipway along with the jetty structures also mean that seaweed accumulates at the top of the slipway near to the road creating an 'aesthetic (visual) nuisance'. A sub-committee of the River Hamble Management Committee have proposed modifications to the slipway to improve the problem of seaweed build up and the gradient of the slipway at the landward end.

ABP Marine Environmental Research Ltd (ABPmer) in association with Opus International Ltd (Opus) have been commissioned by the River Hamble Harbour Authority (RHHA) to undertake a detailed feasibility study of the slipway design and to evaluate its potential effectiveness, as well as provide cost estimates for the proposal should the works be undertaken.

1.1 Report Structure

This report is divided into the following sections:

Section 2: Existing site configuration and new slipway proposal;

Section 3: Consideration of the local estuary processes that give rise to the local build up of seaweed as well as affect the stability of the slipway;

Section 4: An assessment of the effectiveness of the proposed slipway modifications;

Section 5: Consideration of the engineering elements of the design and an approximate cost schedule for the works;

Section 6: Consent requirements; and

Section 7: Conclusions.

2. Shoreline Configuration

2.1 Existing Slipway

The existing public slipway at Warsash comprises a gravel hard which abuts a higher level concrete groin at its up estuary edge. The slipway is located between Fisherman's (floating) Jetty to the north and Warsash Sailing Club Pier to the south, seaward of Shore Road. The slipway is used for the launching and recovery of small pleasure craft by means of towed trailers from the shore down to the water, using the gravel slipway for access.

The gravel slipway is approximately 25m wide by 110m long with hard standing and concrete scrubbing grid of approximately 30m by 9.5m located towards the low water line. This concrete pad is oriented at an angle to the existing slipway at the shoreline, conforming more to the orientation of the shoreline prior to reclamation that currently forms the area of the car park. There are five piles on the concrete pad (also described as the scrubbing grid). The gravel surface of the upper slipway is presently uneven and is in filled with fine mud. The general location is shown in Figure 1, along with the 2012 bathymetry with respect to Chart Datum (CD).

Figure 1, clearly shows the upper part of the slipway forms a small indentation in the coastline where any flotsam or seaweed is easily trapped, particularly as it is sheltered from any ebb tide flows or wave disturbance down the estuary.

The existing slipway is about 110m long (down to CD) and slopes at a gradient of 1:8.5 reducing to 1:17.5 up to the angle of the concrete groin/Fisherman's Jetty. The slipway then flattens (1:75) for about 40m up to the offshore extremity of the car park, before steepening to about 1:40 in the upper 25m to the road. To the south of the slipway area the depth of the foreshore is about 0.5m deeper with a more uniform slope of about 1:45 across most of the foreshore. An analysis of surveys undertaken for RHHA between 2000 and 2012 indicate that the depths on the slipway and immediately to the south, between it and the Warsash Sailing Club Pier have been stable above 2m above CD. Below this level depths have varied about ±0.2m. This indicates that the gravel and mud matrix that forms the upper slipway is neither accreting nor eroding under the present day environmental conditions. Some small change in levels have been seen at the toe of the slipway, however no consistent trend for erosion or accretion has been apparent over the last ten years.

2.2 Proposed Slipway Modification

The concept developed by the client, has been communicated to both ABPmer and Opus International, both in a written document detailing the RHHA working groups recommendations and specification, as well as a plan view of the site reflecting these comments (Figure 2). The comments and recommendations of this report have been developed in line with the information provided.

The proposed modifications to the slipway are illustrated in Figures 2 and 3. These consist of:

- Creation of horizontal shingle beach head (Client Item 4);
- Taper shingle slipway between beach and pad and amend alignment of inner corner of concrete base (Client Item 1);
- Shutter and infill below pad to raise bed level (Client Item 7);
- Installation of hardwood gravel retaining boards (Client Item 3);
- Creation of swashway (replacing pontoon with gated steel walkway) (Client Item 5); Note swashway is referred to as Swingeway on Figure 3;
- Installation of depth markers (Client Item 2); and
- Installation of mooring cleats (Client Item 6).

The proposal, in essence, infill's the shoreline indentation at the top of the slipway, thus reducing the area where seaweed is presently trapped. No upper level has been proposed, however it would be logical to take the horizontal surface to at least Highest Astronomical Tide (HAT) i.e. 4.95m above CD (+2.21 Ordnance Datum Newlyn (ODN)) or the road level, whichever is the lower. Figure 4 shows the profile of the slipway as recorded in the 2012 bathymetric survey and the proposed infill to two levels; Mean High Water Springs (MHWS) and HAT. Based on the area of extent of infill to the gravel retaining board shown on Figure 2 and the profile, the approximate gravel infill requirement will be about 630m^3 and 1,670m^3 for the two finishing levels respectively. The actual requirement will be between the two and will depend on the level of Shore Road at the top of the slipway. Some additional gravel fill will be required to level out/fill 'holes' in the lower slipway. The bathymetric detail is, however, insufficient to clearly estimate this volume.

The modified slipway also includes a gravel retaining board which is not present on the existing slipway. The insertion of the retaining board would clearly demarcate the slipway and allow for the surface to be renovated either at the time of the works or in the future. It is suggested that the retaining board should be set 0.1m above the existing bed level indicated by the profile down the slipway. However, as indicated by the soundings on Figure 1, this would mean it 'standing proud' of the foreshore by between about 0.3 - 1m, but it would allow the slip to be levelled out over its full width. Should this levelling be undertaken a further *circa* 350m^3 of gravel fill would be required, above that needed for the re-grading at the top of the slipway.

3. Local Estuary Processes

3.1 Hydrodynamics

The location of the slipway at Warsash is subject to meso – range tides, with a mean spring tidal range of 3.7m, between +0.8m CD (Mean Low Water Springs - MLWS) and +4.5m CD (MHWS). No measurements of flows to ABPmer's knowledge have been undertaken near the location of the slipway, however, results from a 20m grid resolution numerical model are available from previous studies undertaken for RHHA. Plots of the flow vectors from this model are shown in Figures 5 to 8 for the period of maximum flood flows, the high water period and the main ebb flows over the upper part of the slipway.

Figure 5 shows that flows entering the Hamble are significantly influenced by the 'protrusion' of land on which the Harbour Masters office stands and the berths/jetties and structures in front. This indicates that flood flows at the top half of the slipway are for the most part very slow or slack with the predominant flow towards the right angled recesses of the shoreline at this location, including the top of the slipway. The plot also indicates that maximum flows across the middle and lower parts of the slipway are around 0.2m/s and 0.3m/s, respectively on spring tides, in depths of water of less than about 2m. These flows are relevant in determining the size of gravel fill and the ultimate stability of the slipway.

Over the long high water stand flows are completely slack (Figure 6), therefore any flotsam or seaweed that enters the area will accumulate over high water in the area of the slipway and the 'recess' in the shoreline in front of the car park.

On the ebb, Figures 7 and 8 show flows across the slipway are negligible except at the bottom around the level of CD. This shows why any seaweed/flotsam that accumulates in the area is not flushed on the falling tides.

3.2 Wind and Waves

The Warsash frontage (including the slipway) is directly exposed to winds and wave activity from the sector 189º - 220ºT, however, wave activity from south around to west (180º - 270ºT) would be diffracted and refracted towards Warsash, particularly over high water periods. The slipway area is predominantly sheltered from wave energy emanating from up the Hamble Estuary.

Figure 8 shows the wind rose for Lee-on-Solent for the period 1998 - 2007. This shows that the prevailing and strongest winds come from the south westerly sector, with over 40% of all winds having the potential to generate some wave activity towards Warsash. About 10% of all winds will blow towards Warsash, unobstructed. The maximum direct fetch to the Warsash site is about 4km at high water, although much of this is over shallow areas. Using the Coastal Engineering Manual (CEM) developed by the US Army Engineer Research and Development Center (Veri-Tech, 2003), significant wave heights (Hs) of about 0.3m with peak periods (Tp) 0f 1.5 seconds would be generated from 10m/s winds, and up to 1.2m could result from winds of 30m/s with a Tp of around 2.5 seconds, but only over high water conditions. This creates 'choppy' conditions over the area of the slipway.

3.3 Bed Shear Stress

Calculations to determine the scale of wave activity and modelling of flows has indicated the range in magnitude of the 'forcing' processes occurring at the Warsash Slipway. These wave heights and flows may combine and together create a bed shear stress maximum which acts on the bed. The maximum likely shear stress can therefore be compared to the thresholds for motion of different sized infill (gravel) material to ensure stability of any placed material under the natural forcing conditions and to provide design criteria for that material.

Based on the work of Soulsby (1997), Dynamics of Marine sands - A Manual for Practical Applications and the range of wave heights and flow speeds, for differing bed roughness, the shear stress the environmental conditions generate at Warsash is 0.3N/m² from the maximum flows alone. The maximum wind/wave combination at high water would cause a bed shear stress of 6.6N/m². Under similar environmental conditions gravels with a median particle size (D_{50}) of 10mm has a threshold for motion of 8.7N/m². This indicates that gravel of this approximate grading compacted on the slipway will be stable under the existing environmental conditions. This is consistent with the evidence from recent bathymetric surveys which indicate the present gravel and mud matrix on the existing slipway is stable. It is however noted that small shingle berms (often incorporating shell material) at times are evident to the top of the foreshore. This therefore indicates some movement of finer material does occur under maximum energy conditions.

3.4 Conceptual Understanding

This information shows that both winds and waves for much of the time will transport any floating materials and finer non cohesive material to the Warsash site but there is little energy from flows to move seaweed/flotsam away, thus whenever seaweed is present in Southampton Water a proportion will be moved to Warsash on all tides. On neap range tides the seaweed will deposit down the slipway/foreshore, but will not be removed. This will then be pushed to the high water mark on following spring tides and beyond high water springs due to wave activity where it becomes stranded. The maximum shear stress imparted by the existing environmental conditions is insufficient to cause erosion of the existing slipway.

4. Engineering Considerations

This section reviews the proposal from an engineering perspective and provides initial material quantities and construction costs for the proposed works. The full engineering report provided by Opus is presented in Appendix 1. All volumes, areas and quantities have been derived from the information provided, and are subject to change when more detailed site information becomes available.

4.1 Design Review

The following discussion addresses the separate items from the client's proposal, outlining the engineering aspects which the client may wish to consider in its final design. Separate discussion has been provided for each of the design items.

It is not believed that there are any engineering implications with respect to the installation of the depth markers or mooring cleats and handrails and therefore they have not been considered further. However, it should be noted that all fixings should be of suitable material for the marine environment and confirmation of capacity and fixing details should be sort from the pontoon manufacturer's original details.

4.1.1 Beach: Horizontal Infill (Client Item 4)

There are concerns that any form of placed shingle will not be suitable for trafficking with vehicle's and trailers. The likelihood will be that the vehicles will get stuck in the 'loose' material, sinking into ruts formed in the running surface. If a firm running surface for the slipway is the desired option then it is considered that the proposed option is unlikely to perform adequately.

It is almost impossible to create a slipway that will remain clear of shingle and seaweed with a gravel makeup. To achieve the required result it would be necessary to firstly raise the level of the slipway at the head above the adjacent beach to keep off any shingle that moves into the area, and secondly form it in such a way so as to provide a firm running surface. This could be achieved by laying something similar to Grasscrete, i.e. a concrete mattress block system that

is formed as a cellular structure to retain a shingle appearance but with a firm running surface. It is important to ensure that the Grasscrete is incorporated with the granular material, so that the granular material is encapsulated within the Grasscrete matrix.

In respect to the finished level of the beach berm, as noted Shore Road is inundated on high spring tides and so it will be difficult to get the slipway head level above the spring high tide level without introducing an incline to the landward edge of the beach, at the point of access. This will require consideration with regards to access and maintenance costs.

Irrespective of the beach head level, seaweed will continue to be deposited on the beach; the likely strand line being the mean high water springs level on the seaward incline should the head level be above this point.

The 1:15 (four degree) seaward incline of the beach, is geotechnically stable and the flow regime in the local area of the slipway is slow enough so as to ensure that with a suitable granular size, this material should remain *in situ*. A granular material with a D_{50} = 75mm is recommended but there remains a risk of the smaller sized particles in this material when subjected to wave action or washout/redistribution during trafficking. The 1:15 slope is acceptable for use with dinghies on trailers. Table 1 provides provisional quantities for item, developed in part by ABPmer:

Table 1. Quantities for Client Item 4

Client Item	Calculation	Result
Granular fill with D_{50} = 75mm	As per ABPmer recommendation	1670.00 m^3
Grasscrete or similar product	5.00m wide x 38.00m long	190.00 m^2

4.1.2 Taper Shingle Slipway Between Beach and Scrubbing Pad and Amend Alignment of Inner Corner of Concrete Base (Client Item 1)

The infill material should be reinforced using a base layer of geomembrane and then geogrids inserted into the granular matrix to help control any settlement which may be expected both from vehicular transport across the fill, and compression of the softer bearing strata of the foreshore. The stratigraphy of foreshore should be investigated so that this measure can be assessed. The same granular material used for filling the upper beach can be used (Client Item 4).

There are likely to be demolition costs associated with removing the inner corner of the concrete pad (grid base). The concrete pad is of unknown construction and therefore the costs cannot be provided at this time.

With dimensions extrapolated from the plan provided in Figure 2, the following approximate quantities in Table 2 have been calculated:

Table 2. Approximate Quantities

Item	Calculation	Result
Total volume of granular material for Client Item 1	40.0 m^3 + 24 m^3	64.0 m^3
Total area of geomembrane	201 m^2 + 25%	252.0 m^2
Total area of geogrid	201 m^2 - 25%	151.0 m^2

4.1.3 Shutter and Infill Below Scrubbing Pad to Raise Bed Level (Client Item 7)

There are concerns associated with this element of the works and at present, it is not possible to establish the extent to which it would be recommended to improve the slipway without first undertaking a topographical or bathymetric survey of the lower slipway in order to attain its profile and depth. It is therefore advised that a detailed survey of the lower slipway is undertaken prior to the detailed design to give an indication of the stratigraphy of the foreshore mud/sediments in this area.

This item of the scheme also presents a number of construction issues. The proposal requires for the transit of construction plant along the full length of the slipway. This raises an issue with regards to the safe bearing capacity of the slipway; when considering the soft nature of the foreshore. To mitigate for this, it is advisable for this item of the works to be programmed into the beginning of the construction sequence, should it be undertaken. This will allow for the placement of suitable material along the slipway so as to form a temporary construction roadway for the transit of plant. This roadway will also serve to allow access to the lower slipway for the surrounding fill and gravel retaining boards. If a “Grasscrete” or similar solution is used the formed base could be used to form the sub base for the finished surface.

The removal of boulders and other large items, along with the placement of the granular material could be achieved by a 360° excavator. The installation of the shuttering will require specialist piling equipment to install steel sheet piling or trench piling along the upstream and downstream boundaries of the site. Consideration of the self-weight loading imparted by the plant upon the slipway will govern the plant selection for this item.

This item also will have local effects on the intertidal and subtidal currents and change the nature of the bed at this location and may therefore be unacceptable to Natural England (NE).

A Marine Licence will be required and pre discussion with the Marine Management Organisation (MMO), NE and the Environment Agency (EA) is recommended before any detailed design work is undertaken. We consider that this element would be unacceptable to NE and the EA and would not be cost effective. As a result this item has not been costed.

4.1.4 Gravel Retaining Board (Client Item 3)

The proposed gravel retaining board is to retain a small volume of gravel on the upstream edge of the board, forming the southern boundary of the slipway. The same granular material for the beach and slipway infill is suitable.

The length of the proposed board structure will be sufficient for the desired improvement of the slipway in this area and it is recommended that marker posts are included as part of this item of the works in order to aid navigation. The design proposed for this item at this preliminary stage consists of:

- A/ 50mm x 100mm x 5500mm timber retaining boards of suitable hardwood species;
- B/ 75mm x 75mm x 450mm timber posts of suitable hardwood species at 1000mm centres; and
- C/ Granular fill to upstream side of the gravel retaining board with fall of 1:15.

The sizes of the elements which form the gravel retaining board, are preliminary and may change during the final design stage, once stratigraphic information becomes available.

Table 3. Approximate Quantities

Item	Calculation	Result
A/ 50mm x 100mm x 5500mm boards	2 x 70.00m	140.00m of boards
B/75mm x 75mm x 450mm timber posts	70.00m/1.00m	70 posts
C/Granular fill	0.10m x 1.50m x 70.00m	10.50m^3

As noted in Section 2.2 the foreshore is not level. Should a level slipway be required further boarding will be necessary and an additional *circa* 350m^3 of gravel infill. This has not been accounted for in the costing table in Section 4.2.

4.1.5 Creation of Swashway (Replacing Pontoon with Gated Steel Walkway) – (Client Item 5)

It is anticipated that the proposal to remove the near shore pontoon and its replacement with an eight metre steel brow can be achieved in a cost effective manner. The brow will be a propriety product. The pontoon will need checking for floatation but this is not considered to be a show stopper. It is not anticipated that the scope of this item of the works will require the analysis of the jetty piles.

However, it is not believed that the option will provide any significant benefit with respect to the problem of seaweed accumulation. The main benefit will be with respect to increasing the safety of access to Fisherman's Jetty particularly at lower states of the tide.

4.2 Engineering Costs

Table 4 below provides an estimate of the scheme costs (labour and materials).

Table 4. Schedule of Engineering Costs

Item	Description	Cost (£)
1	Infill of depression in slipway surrounding slip way: ▪ D_{50} = 75mm Granular Fill – 64.0 m³ ▪ Geomembrane – 252.0 m² ▪ Geogrid – 151.0 m²	£4,934.00
2	Fixing of depth markers to maintenance piles: ▪ 3 No/	£544.00
3	Construction of 70.0 m gravel retaining wall: ▪ 100mm x 50mm x 5000mm hardwood boards – 140.0 m ▪ 75mm x 75m x 450m hardwood posts – 70 posts ▪ $D5_0$ = 75mm Granular Fill – 10.5 m³	£5,223.00
4	Creation of gravel beach: ▪ D50 = 75mm Granular Fill – 16,70.0 m³ ▪ Grasscrete – 190.0 m²	£90,409.00
5	Creation of swashway: ▪ Removal of 1 No/ pontoon ▪ Installation of 1 No/ 8.0 m steel walkway	£24,706.00
6	Installation of mooring cleats and handrails to Fishermen's Jetty: ▪ Quantities to be confirmed	Rate: £65.00/m
	Total	£125,858.00

5. Effectiveness of Proposed Slipway

5.1 Horizontal Fill

There are concerns that any form of placed shingle will not be suitable for trafficking with vehicle's and trailers. The likelihood will be that the vehicles will get stuck in the 'loose' material, sinking into ruts formed in the running surface. If a firm running surface for the slipway is the desired option then it is considered that the proposed option is unlikely to perform adequately. To account for this a 'Grasscrete' solution has been provided and costed as defined in Section 4.1.1.

The assessment of the local physical processes and the conceptual understanding of the existing situation indicates that changes to the slipway will not reduce the general build up of seaweed or a low shingle berm in the general Warsash area. The levelling off of the top of the slipway will move the strand line, where the seaweed accumulates, further away from the road in a line at a similar shoreline angle as the new ramp as shown in Figure 1. The distance this will be from the road will depend on what level the area of the horizontal fill is taken to. For example, if this is to go to HAT then the strand line would be toward the top of the ramp section. For a level equivalent to MHWS it is likely to vary in position over the horizontal fill area depending on the recent wave activity and range of tide when a seaweed source is prevalent in the Solent and Southampton Water.

It is likely that the removal of the 'right angle recess' will cause the seaweed to be spread over a wider area (reducing the thickness) at any one location. In addition more would be 'pushed' towards Fishermans Jetty near the corner of the car park. This is likely to transfer more of the seaweed through the area of the swashway (see Figure 3) to accumulate along the face of the car park, predominantly adding to the seaweed accumulation in the corner by the Harbour Masters Office. This potential is most likely during periods of strong winds from the south westerly sector when wind and wave effects combine, but only at the higher states of the tide.

It should be noted that it is quite possible the seaweed accumulation at the top of the slipway was exacerbated by the introduction of the Fishermans Jetty. This would have reduced the amount of seaweed moving onto the foreshore fronting the car park, with the remainder being trapped along the edge of the jetty to be subsequently pushed up the slipway towards the road. The proposed slipway modifications have the potential to partially redress this effect.

Overall, however, the changes to the slipway are unlikely to reduce the amount of seaweed in the Warsash area, but there is some potential to spread it over a wider area generally between the slipway and the Harbour Masters office.

5.2 Gravel Retaining Board

The proposed plan as shown in Figure 2 does not indicate the existing difference in level between the location of the gravel retaining board and the existing slipway as shown in Figure 1. If re-grading (levelling across the width) of the lower slipway is not required then the 100mm protrusion of the gravel retaining board to hold the 'Grasscrete' and new surface gravel will have no significant physical effect. The inclusion of marker posts will benefit the users of the slipway.

As noted in Section 2.2 if the slipway is to be levelled throughout its length between the Fishermans Jetty and the gravel retaining board then this board would project 0.3 - 1m above the existing foreshore level immediately to the south. This would have little or no affect on the low ebb flows. During the flood, flows are likely to be deviated marginally towards the river at lower states of the tide with a small outward flow along the board edge. The flow speeds would be very locally increased at the edge of the slipway compared to the present conditions. The existing flows however are so low this change would be negligible and would quickly reduce as depths over the board increase.

As indicated by the shear stress calculations these changes in flow, compared to the wave effects would be insignificant in the area. With respect to waves, the board would tend to cause waves to break at the edge at lower tidal states and modify the waves locally when covered. This will not affect the usage of the slipway. Some increased potential for disturbance compared to present would occur at the base of the board. This may initially remove some of the finer sediment matrix creating a small amount of local scour, in the order of 0.1m maximum before the coarser and/or more dense material provided a new equilibrium with the flow conditions. Any shingle that is moved into the area from littoral drift (which is considered to be small) will build up against the protruding board, reducing the amount that would move over the slipway under existing conditions.

The protrusion of the board could, however, cause seaweed/flotsam to build up at its edge for the lower range tides. With larger tides and wave activity it is likely much would be removed to higher levels along the slipway although some may be retained at the base of the board.

5.3 Swashway

The addition of the walkway/gated bridge to form the swashway adjacent to the car park will only marginally benefit the seaweed problem on the slipway as the area dries out soon after the extended high water period. There will, however be significant benefit in the safe use of Fisherman's Jetty.

6. Consent Requirements

To undertake the modifications to the slipway a Marine Licence will be required from the MMO because the works involve deposits of substances (the gravel) and of objects (the components of gravel retaining structure) below MHWS. The application for the Marine Licence will be subject to an assessment under the Habitats Regulations (HRA) and Water Framework Directive (WFD) and may require an Environmental Impact Assessment (EIA).

With respect to the HRA the Department for Environment, Food and Rural Affairs (Defra) Multi-Agency Geographic Information for the Countryside (MAGIC) interactive map website shows that the area of the proposed works is not included in the International and National designations, namely Special Protection Area (SPA), Special Area of Conservation (SAC), Ramsar or Sites of Special Scientific Interest (SSSI). The works therefore have no direct effects on these designated areas. Figure 10, however, shows these designations are in close proximity to the designated areas and therefore an assessment will need to be made as to whether any indirect effects due to changes in the marine environmental conditions are likely to have a significant effect on the features for which the areas were designated. The initial review of the impacts included above indicate that any changes that could cause any indirect effects are minimal. In addition these changes are unlikely to have any negative effects on the water or sediment quality of the local designated waterbodies under the WFD. As part of the application process a request for a screening opinion with respect to the Marine Works Environment Impact Regulations would be required along with the information/detail of the proposal, required for the on-line Marine Licence application.

There is a charge for making an application and due to the nature of the works this is likely to be a fixed fee of £2,700 (see www.marinemanagement.org.uk/licensing/marine/fees.htm). As of April 2013 there will also be a charge for any consultation with NE.

The works will all be undertake on the foreshore predominantly between MHWS and MLWS, this is the area of overlap between terrestrial planning and marine regulation. A planning application will therefore be required to the local planning authority, however the decision may be deferred to the MMO. The planning requirements will need to be clarified at the outset of the project. In addition a works licence will be required from the RHHA under the local legislation. The works themselves will marginally improve the coastal defences, therefore there should be little problem with the EA, although they will require to be consulted.

7. Conclusion

The River Hamble Harbour Authority are considering modifications to the public slipway at Warsash in order to improve access for users and attempt to reduce the build up of seaweed that currently occurs in the area. An evaluation of the proposed design has indicated that:

- The proposal is likely to redistribute the seaweed to a level further from the road and potentially move more to the area between Fishermans Jetty and the Harbour Masters Office. The works in themselves will not reduce the amount of seaweed that reaches the general Warsash frontage;
- The proposal will have only very local effects on the physical processes occurring at the slipway and the Warsash frontage in general;
- The works are not directly in a European designated area and the indirect effects as a result of the works are not likely to affect the habitat designations, or water quality and sediment issues, related to the WFD;
- Compacted gravel infill on the slipway of the engineering proposed particle size of 75mm (D_{50}) will be stable under existing environmental conditions and future maintenance will be minimal;
- To provide the horizontal fill and ramp area to a level of MHWS will require a gravel fill volume of about 650m^3. An indicative volume for a horizontal level at HAT is about 1670m^3. The actual volume required is likely to be between the two estimates;
- Should the lower part of the slipway be levelled and widened to the location of the gravel retaining board then about a further 350m^3 of fill will be required. To retain this material the gravel retaining board would need to be set at varying levels of 0.3 to 1m above the surrounding mud level;
- The creation of the swashway is unlikely to reduce seaweed accumulation but it will improve access to Fisherman's Jetty; and
- The shuttering and infill seaward of the concrete pad is not recommended to be taken forward.

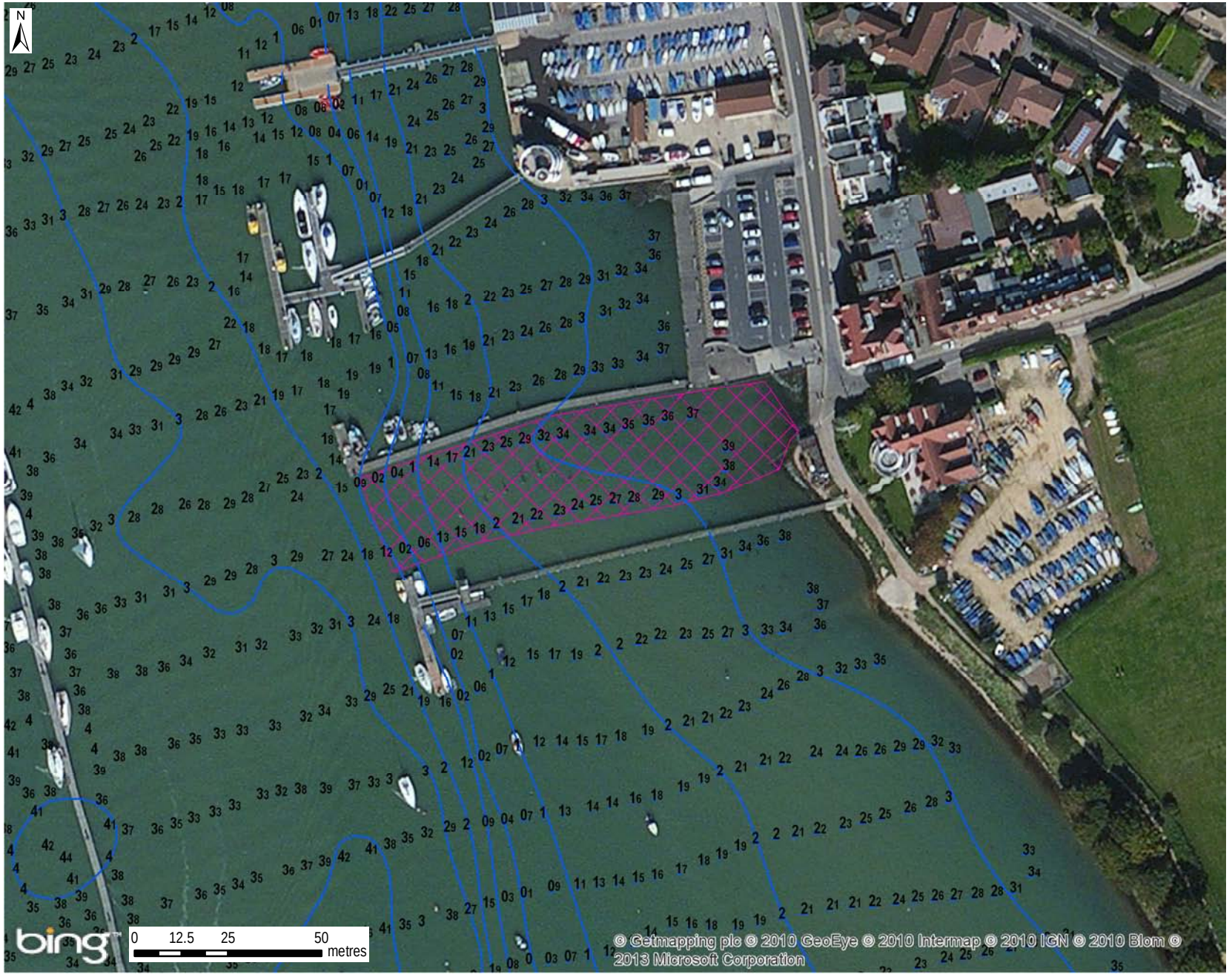
To undertake the works a Marine Licence from the MMO would be required and planning permission. With a detailed proposal description along with a request for a screening opinion it would be hoped that Environmental Impact Assessment or Habitats Regulation Assessment would not be required. The current marine licence cost would be £2,700 and it should be noted that NE is now charging for consent advice as of the April 2013.

8. References

Soulsby, 1997. Dynamics of Marine Sands. A manual for practical applications. Thomas Telford, London.

Veri-Tech, 2003. Coastal Engineering Manual Developed by the US Army Engineer Research and Development Center.

Figures



0_8 2012 Bathymetry Soundings

Contours

Approximate Area of Slipway

Date	By	Size	Version
Apr 13	AMB	A4	1
Projection		WGS 1984	
Scale		1:1,500	
QA		FMM	
4139 - Warsash Hamble.mxd			
Produced by ABPmer			

Bathymetry: River Hamble Harbour Authority
NOT TO BE USED FOR NAVIGATION

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marine environmental research

Warsash Slipway Location Plan

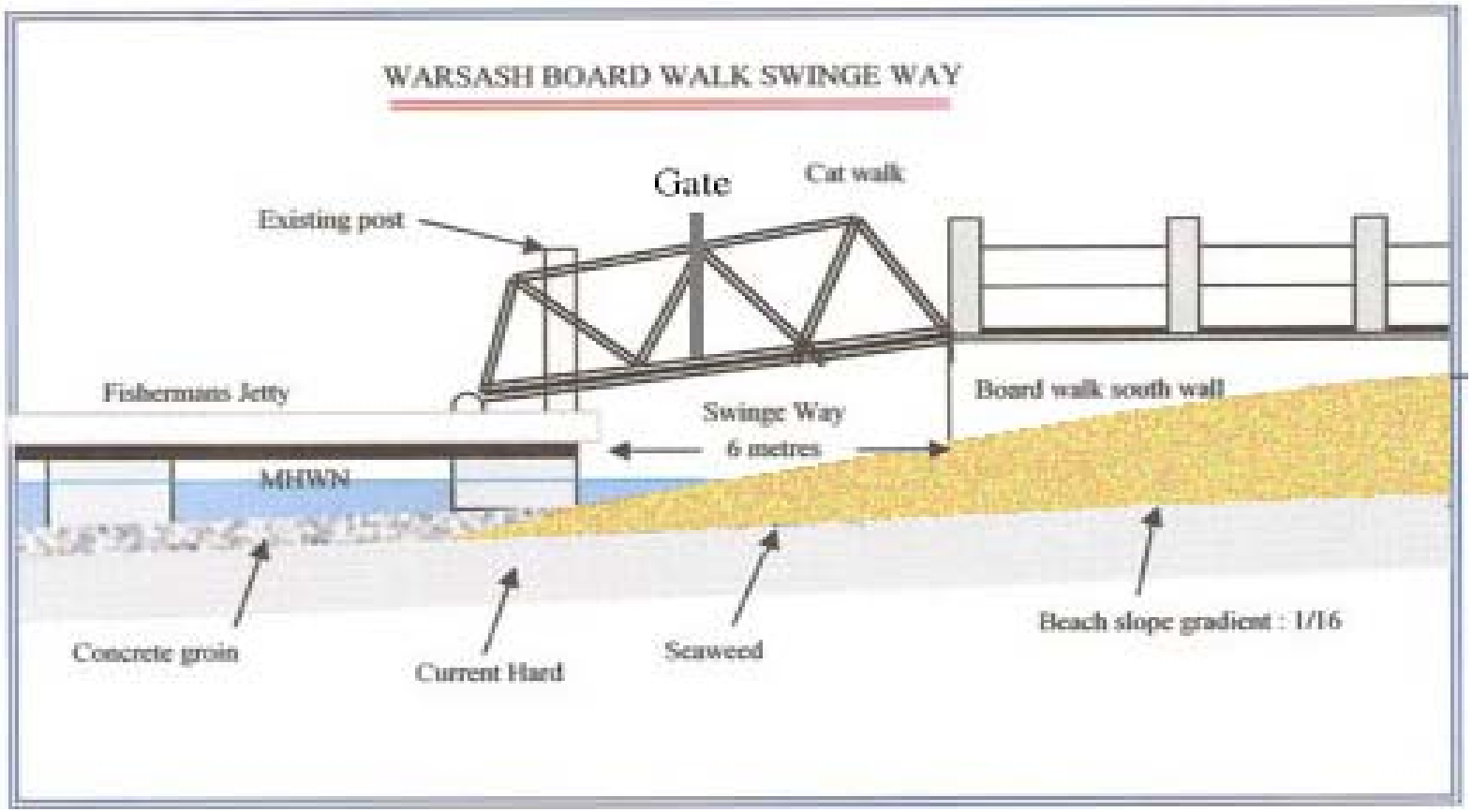
Figure 1

Date	By	Size	Version
Mar 13	BJC	A4	1
Projection		n/a	
Scale		n/a	
QA		PAW	
Figure 10-3-2.xls			
Produced by ABPmer			

ABP mer
marine environmental research

Warsash Slipway Proposal (Plan View)

Figure 2



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Scale		n/a	
QA		PAW	
Figure 10-3-2.xls			
Produced by ABPmer			

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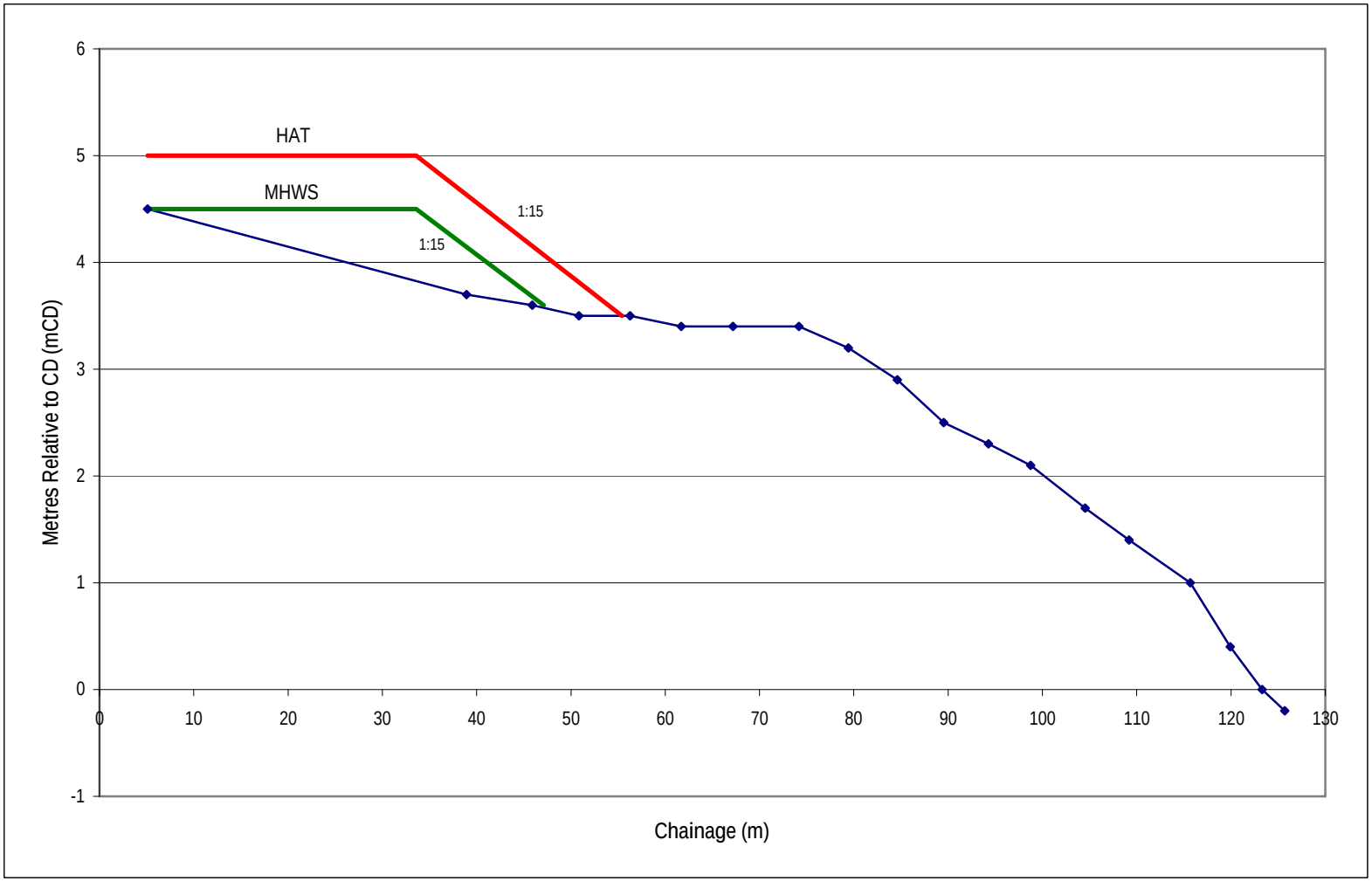
Warsash Slipway Proposal Cross-Section

Figure 3



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QA		PAW	
Figure 4.xls			
Produced by ABPmer			

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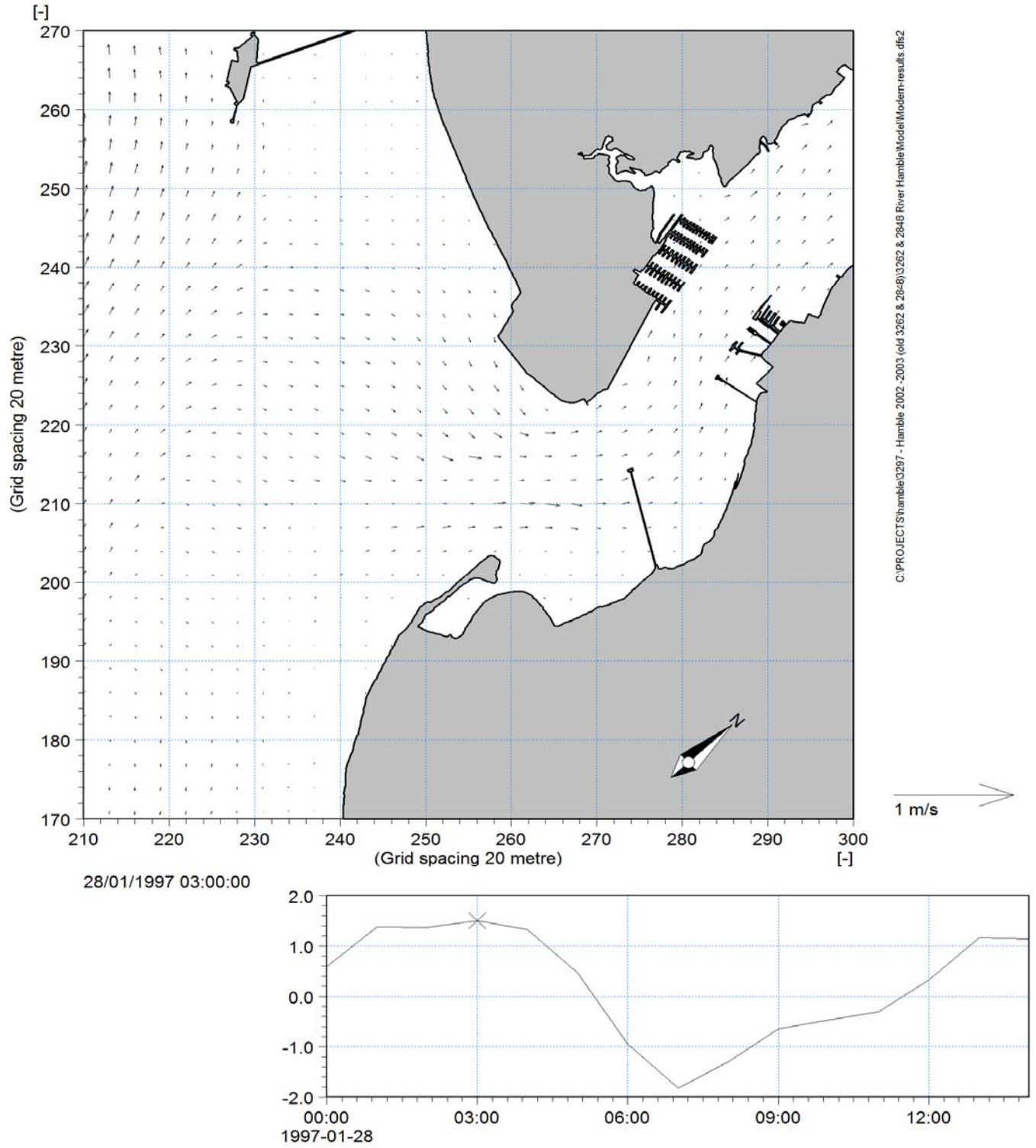
Profile Down Slipway from Road

Figure 4



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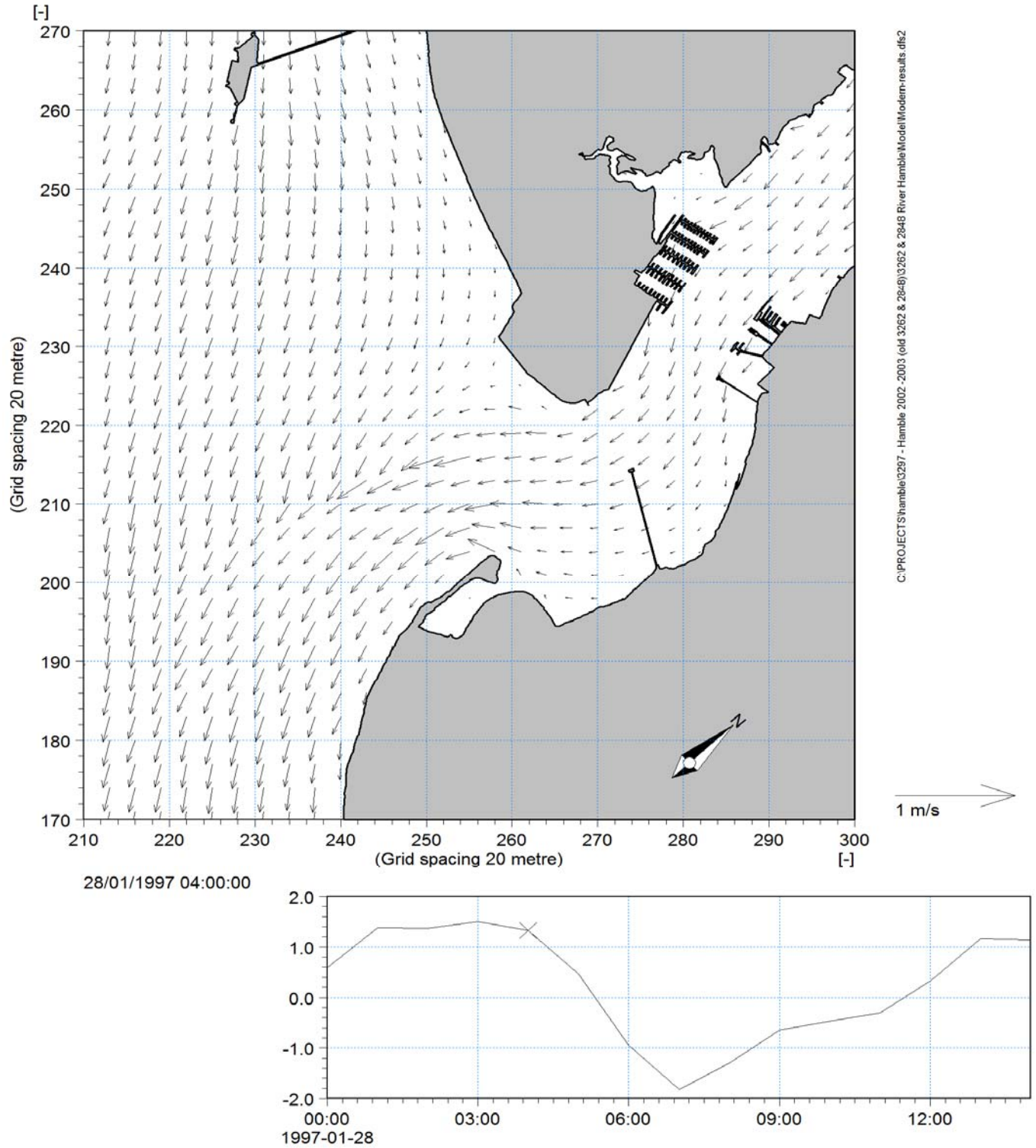
Scale		n/a	
QA		PAW	
Model Figures 5 - 8.xls			
Produced by ABPmer			

ABP mer marine environmental research

Spring Tide: First HW + 2 hours

Figure 5



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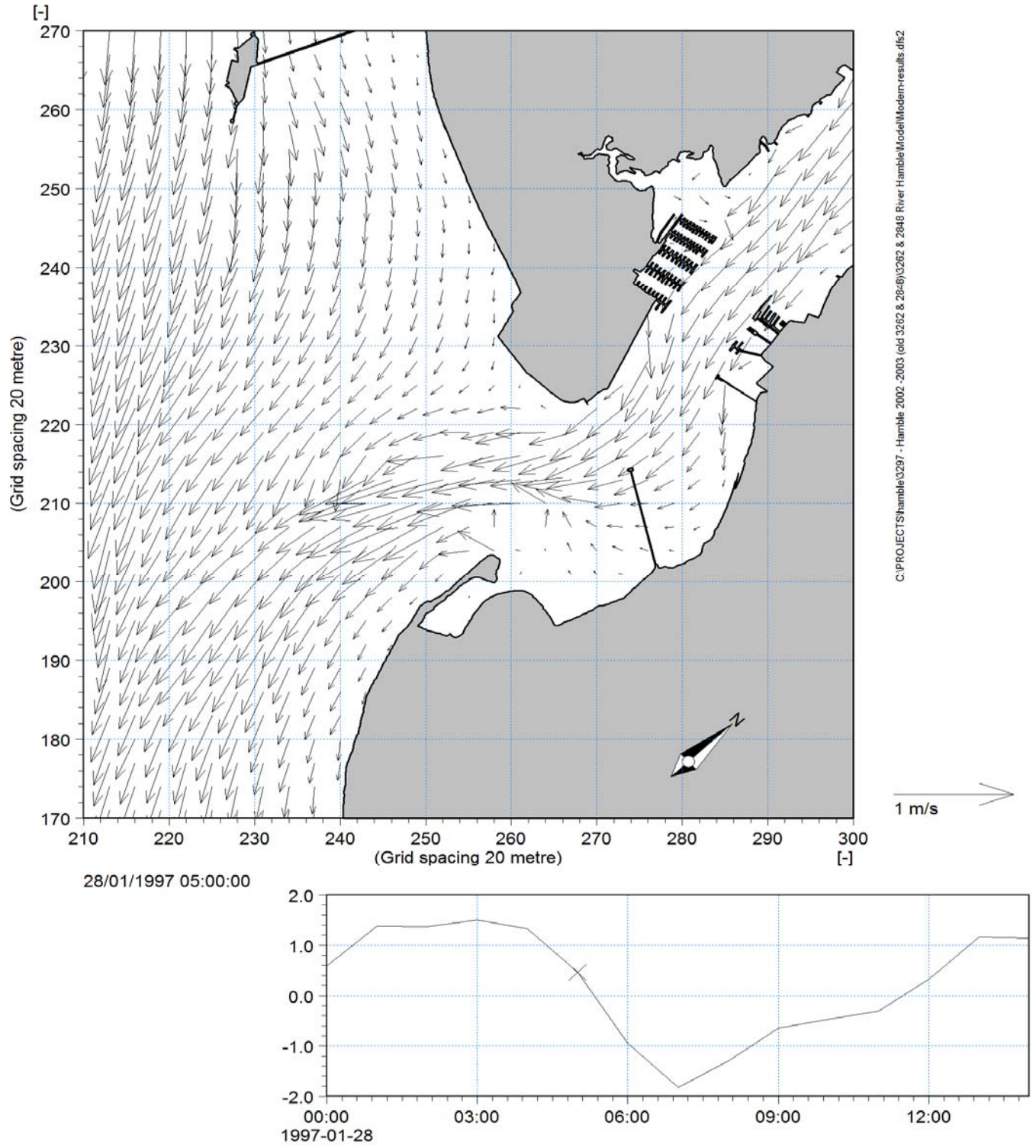
Model Figures 5 - 8.xls			
Produced by ABPmer			

ABP mer marine environmental research

Spring Tide: First HW + 3 hours

Figure 6



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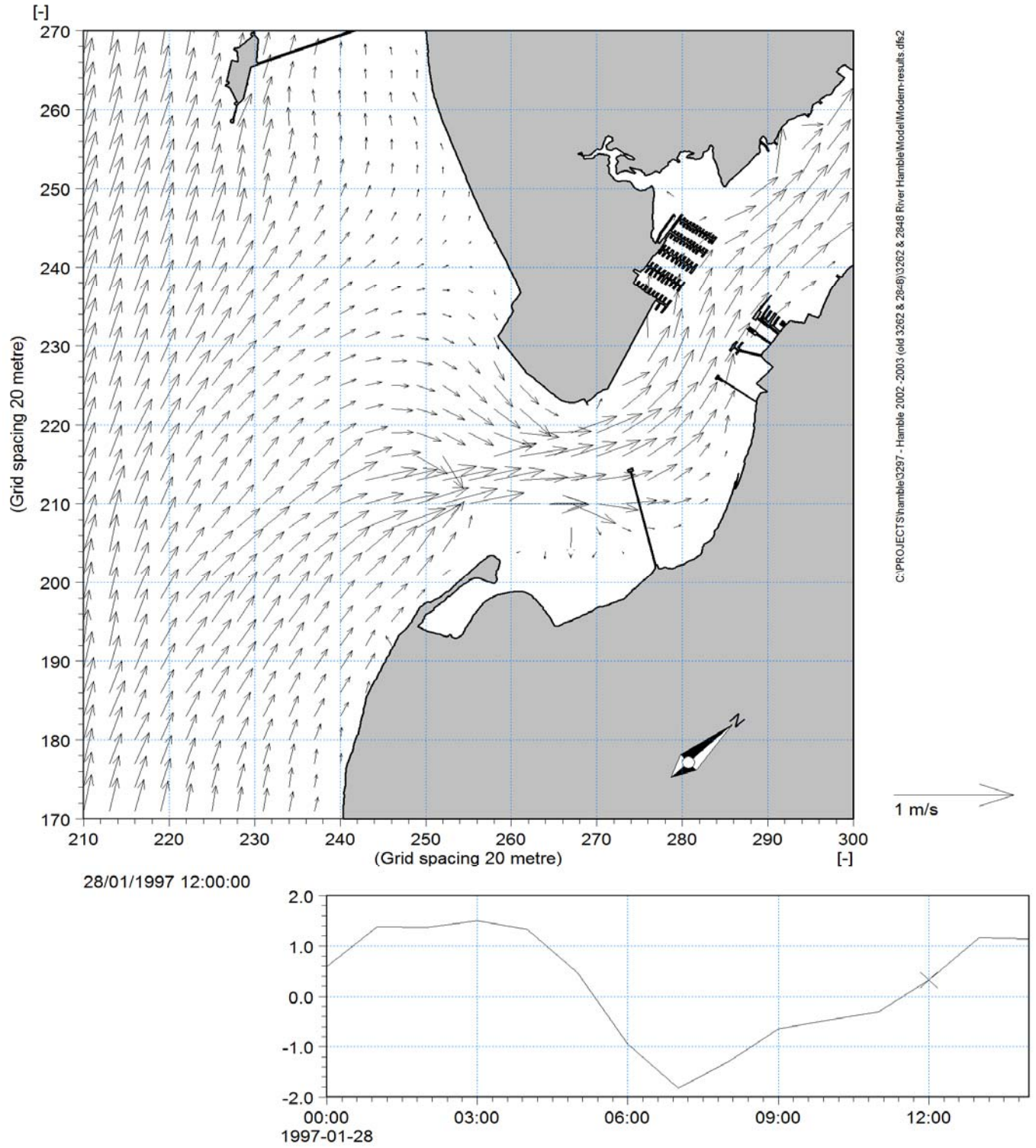
QA		PAW	
Model Figures 5 - 8.xls			
Produced by ABPmer			

Spring Tide: First HW + 4 hours

Figure 7



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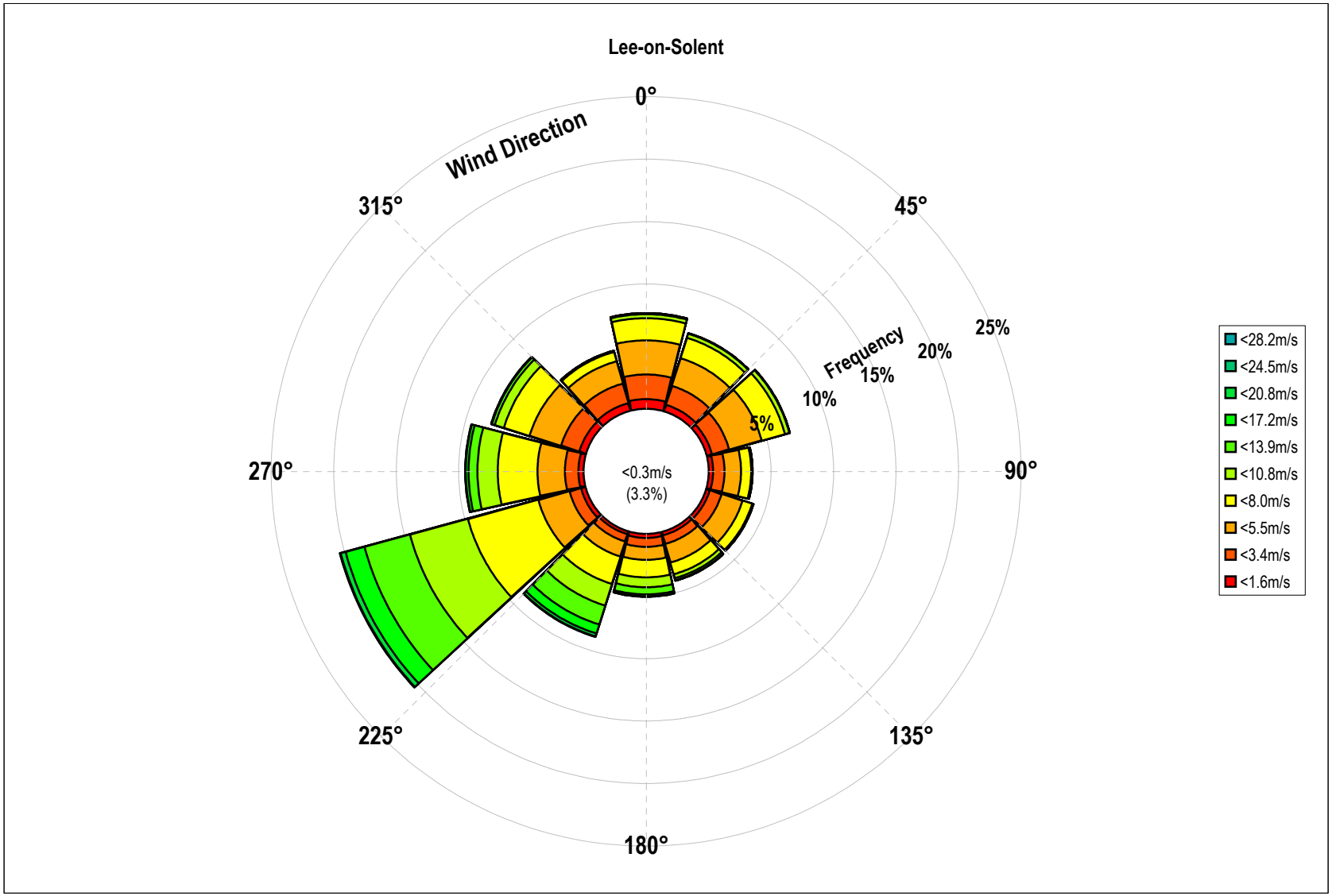
QA		PAW	
Model Figures 5 - 8.xls			
Produced by ABPmer			

ABP mer marine environmental research

Spring Tide: First HW + 11 hours

Figure 8



STATION: SOLENT MRSC
NGR: 4557E 1012N
ALT: 9 metres A.M.S.L
PERIOD: 1998 to 2007

Date	By	Size	Version
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Projection		n/a	
Scale		n/a	
QA		PAW	
Lee-on-Solent_wind_rose.xls			
Produced by ABPmer			

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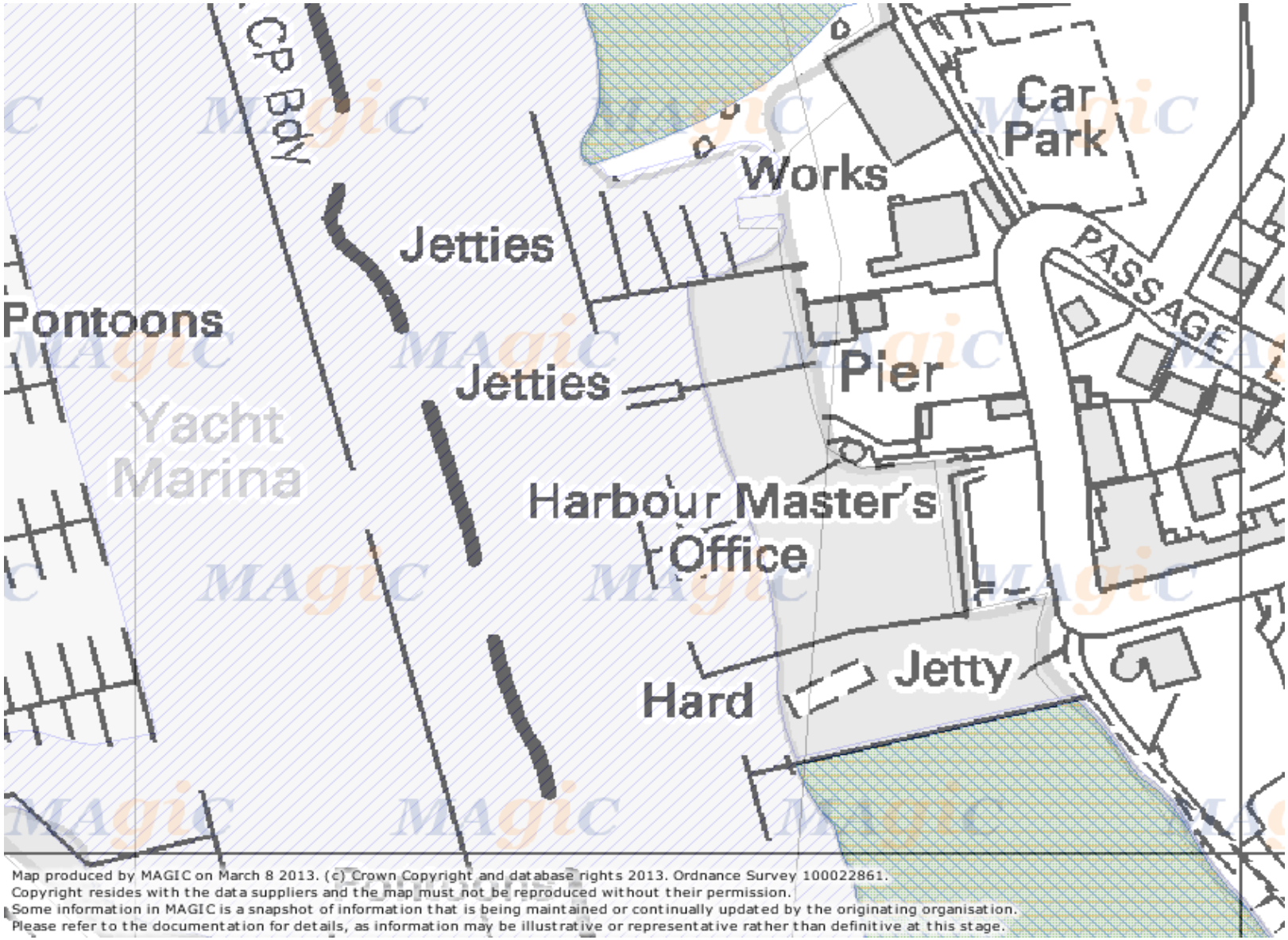
Wind Rose for Lee-on-Solent

Figure 9



Marine Conservation Zones (England)

Ramsar Sites (GB)

Special Areas of Conservation (GB)

Special Protection Areas (GB)

Sites of Special Scientific Interest (GB)

Date	By	Size	Version
Mar 13	BJC	A4	1
Projection		n/a	
Scale		n/a	
QA		PAW	
Figure 10-3-2.xls			
Produced by ABPmer			

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Habitat Designations

Figure 10

Appendix A

Opus Report (2013): Engineering Considerations - Warsash Slipway, River Hamble

Engineering Considerations

Warsash Slipway
River Hamble

Engineering Considerations

Warsash Slipway

River Hamble

Prepared By

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Date: 15/03/2013
Reference: E-F1168.00_R_WS_130315
Status: Draft 2

Acknowledgements

Opus would like to acknowledge the support and assistance provided by Peter Whitehead (ABP mer) and David Evans (River Hamble Management Committee) in the preparation of this report.

Contents

1 Introduction

The sub-committee to the River Hamble Management Committee (RHMC) have proposed a scheme of works in order to reduce the nuisance presented by seaweed and other marine detritus accumulating on the foreshore of the public slipway at Warsash, River Hamble, Hampshire.

The River Hamble Harbour Authority (RHHA) have commissioned ABP Marine Environment Research Ltd (ABPmer) to undertake a feasibility study of the proposed works, and to report their findings on the proposed slipway design and evaluate its effectiveness in reducing the seaweed problem. Opus International Consultants (UK) Ltd are to work in association with ABPmer in the undertaking of this feasibility study, and are to provide comments upon the engineering aspects of the proposed works, as well as provide cost estimates for the proposal should it be undertaken.

The concept developed by the client, has been communicated to both ABPmer and Opus International, both in a written document detailing the RHHA working groups recommendations and specification (Appendix A), as well as a plan view of the site reflecting these comments (figure 2). The comments and recommendations of this report have been developed in line with the information provided.

1.1 Report Structure

This report will be separated into the following sections for ease of use:

Section 2 – Executive Summary

Section 3 - Existing site configuration

Section 4 – Proposed site configuration

Section 5 – Engineering considerations of the proposed works

Section 6 – Cost estimates of the proposed works

Section 7 – Conclusion

Appendix A – RHHA Sub committee recommendations/specification

2. Executive Summary

This review has looked to investigate the wish list that has been provided by the client in respect to the Warsash Slipway to improve the access.

There are five distinct areas involved and our summary of this is as follows.

Area 1. Infill to area landward of the Scrubbing Pile Pad. The desire is to raise the general ground level up to the same level as the concrete pad to remove the pinch point and associated step. We would suggest that the area could be infilled with a suitably graded granular material laid to falls as required. The principle downside on this relates to the problems of achieving a suitably compacted surface so that vehicle's and trollies do not simply bog down as they move over the surface. Ideally this material needs to be bound to form a 'hard' running surface. We consider that a more detailed discussion with the regulatory authorities and stakeholders i.e. Natural England (NE) and the Marine Management Organisation (MMO), will be required as any material placed on the foreshore will impact the intertidal area.

Area 2. This related to the proposal depth markers. We have no comment to make in relation to this item.

Area 3. The proposal is to widen the slipway by the introduction of a granular surface running to the south west to be contained by a gravel board. In itself the installation of the edging is a simple matter our concern is that a 100mm layer of gravels, whilst it my be stable under current flows will be completely inadequate if trafficked by vehicle's or trolleys.

As with the points above a loose shingle of only 100mm thick, even if laid on a geo grid will not support being used as a slipway, together with the associated matter of the impact on the intertidal foreshore on which the thoughts of NE need to be sort.

Area 4. and 5. The concept of building a new 'beach' at the head of the existing slipway, whilst possible, creates a number of issues:-

- The level of Shore Road is such that the road is inundated on high spring tides;
- The existing granular 'beach' / slipway suffers from loose shingle build up due to wave action;
- Build-up of seaweed on the slip at the high water mark. Note this varies over the Neap / Spring cycles; and
- Creation of a new shingle structure will create problems of compaction. I.e. the effects of wave action will still re arrange the loose beach material at the crest and seaweed will still be deposited on the tidal cycle.

The consideration has therefore been to form a 'firm' running surface which will allow trafficking by vehicle's and trailers whilst not looking like a formed surface. To this end we would suggest the use of a tied block system such as 'grasscrete' which will provide a firm running surface but be less visible.

Again as with the other points this work will require consenting and early discussions with NE is advised to ensure it will accept the alterations to the intertidal foreshore.

In respect to levels there seems little point in looking to take the proposed new slipway above the level of Shore Road.

Section 5 concerns the alterations to the root of Fisherman's Jetty. In essence this top area dries out soon after high water and the removal of the end pontoon will not create much of a cross current flow.

Area 6. There are considered to be no particular issues with the alterations proposed to the pontoons.

Area 7. The concern here relates again to the proposed alterations to the lower intertidal / sub tidal foreshore. NE is concerned with the loss of any areas of intertidal foreshore and we would suggest that it is engaged in dialogue before any further work is carried out in relation to this element.

Section 3 - Existing site configuration

The site is located off Shore road on the eastern shore of the River Hamble, in the village of Warsash; providing access to both the River Hamble and Southampton Water (1.50km downstream). To the north of the site, running along the upstream edge is a concrete groyne to which abuts the Fishermen's Jetty. The jetty is formed of floating pontoons connecting the jetty head to the shore by means of a stepped access. Extending from Fishermen's Jetty is a quay structure with a public car park behind. Shore road along with an access road to Warsash Sailing Club forms the north eastern (landward) boundary to the site. The southern, downstream edge of the site extends from an existing stone groyne towards the low water line. The southern (seaward) boundary of the site extends beyond the low water line along the foreshore.

Figure 1 – Existing site arrangement

The site consists of an approximately twenty five metres wide by one hundred ten metres long gravel slipway with hard standing and five piles on the scrubbing grid out towards the low water line of the slipway. The site slopes on a shallow gradient towards the low water line from the shore on a south west alignment. The south eastern (downstream) edge of the slipway is formed of soft muds which extend from the low water line up towards the shore of the slipway.

The slipway is used for the launching and recovery of small pleasure craft by means of towed trailers from the shore down to the water, using the gravel slipway for access. As previously mentioned a concrete scrubbing grid of approximately thirty metres by nine and a half metres is located towards the low water line of the site. At the time of writing it is not possible to comment upon the local geology or of any existing buried structures.

4 Proposed site configuration

The client proposal for modifications to the site have been illustrated in the site plan shown in figure 2, and descriptions provided in the documented recommendations and specifications of the RHHA working group (Appendix A).

Figure 2 – Clients proposed modifications to the existing public slipway, Warsash

The modifications consist of the following, with numerical reference to items indicated in Figure 2:

1 – Taper up the shingle slipway on the upstream, downstream and outer edge of the concrete pad, to eliminate step between slipway and pad (which varies between two hundred and five hundred millimetres). As indicated in figure 2, the upstream inner corner of the concrete grid base is to be removed, so as to increase the width of the slipway, which is currently restricted by the raised section of the concrete scrubbing pile base.

2 – Install depth markers to the outer edge of maintenance piles 1, 3 and 5.

3 – Construction of hardwood gravel retaining boards to the downstream boundary of the slipway, extending from the existing masonry groyne to the lower downstream corner of the concrete pad. Granular material is to be placed on the upstream face of the retaining boards, level with the tops of the boards to improve the bearing capacity of the slipway in this area. The boards are to protrude approximately one hundred millimetres above the bed level, following the profile of the foreshore.

4 – Creation of horizontal shingle beach-head over the upper section of the slipway, with a one in fifteen slope down to the current slipway . The original proposal does not indicate the beach crest level, however, the optimum arrangement would be to merge the slipway with the level of Shore Road. The road is known to be overtopped on the highest astronomical tide (HAT), therefore the level is most probably not much above MHWS, approximately +4.5m CD (+1.7m ODN). For the purpose of averaging volumes of fill both this level and that of HAT (+4.95m CD; +2.21m ODN) have been used in this analysis. This is to improve both the space available for vehicles launching and recovering craft, but also to mitigate the current nuisance of seaweed and other detritus stranding on the slipway

5 – Creation of swashway between the newly created beach and upstream shoreline by the removal of one pontoon abutting the quayside from Fishermen's Jetty and installation of a gated steel walkway to form the new access to the jetty. The objective being to improve the flow regime around the slipway and assist the removal of seaweed and other detritus.

6 – Install several mooring cleats/rings to the downstream face of the jetty and fit handrails along the length of the upstream side of the jetty.

7 – Removal of boulders and other large objects from the low water line of the slipway foreshore. Shutter along the lower length of the slipway and infill with shingle, in effect raising the bed level, while mirroring the existing bed profile. This is to improve the bearing capacity of the slipway at this location, aiding in the launching and recovery of craft at times of very low tide.

5 Engineering considerations of the proposed works

The following discussion addresses the separate items from the client's proposal, outlining the engineering aspects which the client may wish to consider in their final project brief. This has been produced to supplement the wider estuarine assessment undertaken by ABP Marine Environmental Research Ltd (ABPmer).

All volumes, areas and quantities have been derived from the information provided, and are subject to change when more detailed site information becomes available. They have been offered in order develop a basic schedule of principle items, to allow for budget costs of the works to be developed.

1 – The reasons for removal of the corner of the scrubbing pad are understood however we are concerned as to the possible effects this might have. This is based upon the unknown construction of the concrete pad, and as a consequence there may be un-economic demolition costs associated with this sequence of the works.

Removal of the difference in level between the surface of the concrete pad and foreshore is still desired in order to improve the safety of launching and recovery of craft from the slipway. We would therefore propose to reduce the difference in level through the placement of granular material in the zone surrounding the concrete pad. The material used for item 4 of the scope of works will be suitable for this purpose.

We also consider that the infill material should be reinforced using a base layer of geomembrane and then geogrids inserted into the granular matrix to help control any settlement which may be expected both from vehicular transport across the fill, and compression of the soft bearing strata of the foreshore. The stratigraphy of foreshore should be investigated so that this measure can be assessed.

With dimensions extrapolated from the plan provided in figure 2, the following approximate quantities in table 1 have been calculated:

Table 1 – Approximate Quantities for item 1

Item	Calculation	Result
Total volume of granular material for item 1/.	40.0 m^3 + 24 m^3	**64.0 m^3**
Total area of geomembrane	201 m^2 + 25%	**252.0 m^2**
Total area of geogrid	201 m^2 - 25%	**151.0 m^2**

2 – We consider that the fixing of the depth marker boards to the existing maintenance piles will have little impact upon engineering practicality of the proposed works. We would like to raise to the clients attention that all fixings should be of suitable material for the marine environment.

3 – The proposed gravel retaining board is to retain a small volume of gravel on the upstream edge of the board, forming the southern boundary of the slipway. The granular material, similar to that specified in item four will perform adequately. The length of the proposed board structure will be sufficient for the desired improvement of the slipway in this area.

We would recommend that marker posts are included as part of this item of the works in order to aid navigation.

The design proposed for this item at this preliminary stage consists of:

A/ 50mm x 100mm x 5500mm timber retaining boards of suitable hardwood species.

B/ 75mm x 75mm x 450mm timber posts of suitable hardwood species at 1000mm centres.

C/ Granular fill to upstream side of the gravel retaining board with fall of 1:15.

The sizes of the elements which form the gravel retaining board, are preliminary and may change during the final design stage, once stratigraphic information becomes available.

Table 2 – Approximate Quantities for item 3

Item	Calculation	Result
A/ 50mm x 100mm x 5500mm boards	2 x 70.00m	**140.00m of boards**
B/75mm x 75mm x 450mm timber posts	70.00m/1.00m	**70 posts**
C/Granular fill	0.10m x 1.50m x 70.00m	**10.50m^3**

4 – It is quite clear that the frontage to both the slipway adjacent to the Harbour Masters office, the car park and the area that is the subject of this appraisal attracts quantities of seaweed that is in suspension, and build-up of shingle due to wave action. The volume of both shingle and seaweed depends on the prevailing weather.

This is an 'enclosed' area which is both shallow and restricted by the sea wall to the upstream area adjacent to the Harbour Masters office, i.e. there is limited tidal flows across these mud flats during the tidal cycle (Refer to main ABPmer Assessment).

Also it is known on spring tides the water regularly tops the level of the car park and impinges onto Shore Road. During these periods of increased water depths, the effects of wave action are greater than lower levels and cause: -

- Deposition of sea weed at the high water mark; and
- Increase of movement and cresting of the shingle at the top of the slipway.

The deposition of seaweed driven by wave action is not affected by long shore water movement, indeed in this location both on flood and ebb tides the cross shore water velocities are small which will effectively eliminate the likelihood of any self-cleansing of the shingle or the collected seaweed.

Also the shingle base is a rough surface and uneven which aids the trapping of seaweed, due to wave action at the high water mark.

Turning to the proposed slipway itself, there are concerns that any form of placed shingle will not be suitable for trafficking with vehicle's and trailers. The likelihood will be that the vehicles will get stuck in the 'loose' material, sinking into ruts formed in the running surface.

If a firm running surface for the slipway is the desired option then we consider that the currently proposed option is unlikely to perform adequately.

It is almost impossible to create a slipway that will remain clear of shingle and seaweed with a gravel makeup. To achieve the required result it would be necessary to firstly raise the level of the slipway at the head above the adjacent beach to keep the shingle off, and secondly form it in such a way so as to provide a firm running surface. This could be achieved by laying something similar to Grasscrete, ie a concrete mattress block system that is formed as a cellular structure to retain a shingle appearance but with a firm running surface. It is important to ensure that the Grasscrete is incorporated with the granular material, so that the granular material is encapsulated within the Grasscrete matrix.

In respect to the finished level of the beach berm, as noted Shore Road is inundated on high spring tides and so it will be difficult to get the slipway head level above the spring high tide level without introducing an incline to the landward edge of the beach, at the point of access. This will require the client's consideration with regards to access, and the costs of maintenance that may result. It must be realised, that irrespective of the beach head level, seaweed will continue to be deposited on the beach; the likely strand line being the mean high water springs level on the seaward incline should the head level be above this point.

With respect to the one in fifteen (four degree) seaward incline of the beach, we see this structure as geotechnically stable, and we understand from liaison with ABPmer representative Peter Whitehead the water flow regime in the local area of the slipway is slow enough so as to ensure that with a suitable granular size, this material should remain in situ. We would consider use of a granular material with a D50 = 75mm to be suitable in this respect, however we have concerns as noted previously as to the stability of the smaller sized particles in this material when subjected to wave action, as it may be subject to washout or redistribution during trafficking.

With respect to the proposed incline of the slipway, a 1:15 slope is acceptable for use with dinghies on trailers.

Table 3 provides provisional quantities for item, developed in part by ABPmer:

Table 3 – Quantities for item 4

Item	Calculation	Result
Granular fill with D_{50} = 75mm	As per ABPmer recommendation	**1670.00 m³**
Grasscrete or similar product	5.00m wide x 38.00m long	**190.00 m²**

5- It is anticipated that the proposal to remove the near shore pontoon and its replacement with an eight metre steel brow can be achieved in a cost effective manner. The brow will be a propriety product. The pontoon will need checking for floatation but this is not considered to be a show stopper. It is not anticipated that the scope of this item of the works will require the analysis of the jetty piles. We do not however consider that this will improve the 'washing' of the beach, as the area dries soon after high tide.

6 - We consider that the fixing of additional mooring cleats and handrails to the pontoons of Fishermen's Jetty will have little impact upon the engineering practicality of the proposed works. All fixings should be of suitable material for the marine environment and confirmation of capacity and fixing details should be sort from the pontoon manufacturer's original details.

7 – The client's proposal to improve the bearing capacity of the lower slipway towards the low water mark requires further information before a complete assessment of this item can be made. At present, it is not possible to establish the extent to which it would be recommended to improve the slipway without first undertaking a topographical or bathymetric survey of the lower slipway in order to attain its profile and depth. It is therefore advised that a detailed survey of the lower slipway is undertaken prior to the detailed design to give an indication of the stratigraphy of the foreshore mud/sediments in this area.

This item of the scheme also presents a number of construction issues. The proposal requires for the transit of construction plant along the full length of the slipway. This raises an issue with regards to the safe bearing capacity of the slipway; when considering the soft nature of the foreshore. To mitigate against this, it is advisable for this item of the works to be programmed into the beginning of the construction sequence. This will allow for the placement of suitable material along the slipway so as to form a temporary construction roadway for the transit of plant. This roadway will also serve to allow access to the lower slipway for works to proceed for items 1 and 3. If a "Grasscrete" or similar solution is used the formed base could be used to form the sub base for the finished surface.

The removal of boulders and other large items, along with the placement of the granular material could be achieved by a 360° excavator. The installation of the shuttering will require specialist piling equipment to install steel sheet piling or trench piling along the upstream and downstream boundaries of the site. Consideration of the self-weight loading imparted by the plant upon the slipway will govern the plant selection for this item.

This item also will have local effects on the intertidal and sub tidal currents and change the nature of the bed at this location and may therefore be unacceptable to Natural England (NE).

A Marine Licence will be required and pre discussion with the MMO, NE and the Environment Agency (EA) is recommended before any detailed design work is undertaken.

We consider that this element would be unacceptable to NE and the EA and would not be cost effective. As a result this item has not been costed.

6 Schedule of Approximate Items

Table 4– Schedule of Approximate Items		
Item	**Description**	**Cost (£)**
1	*Infill of depression in slipway surrounding slip way:* D_{50} = 75mm Granular Fill – 64.0 m^3 Geomembrane – 252.0 m^2 Geogrid – 151.0 m^2	**£4 934.00**
2	*Fixing of depth markers to maintenance piles:* 3 No/	**£544.00**
3	*Construction of 70.0 m gravel retaining wall:* 100mm x 50mm x 5000mm hardwood boards – 140.0 m 75mm x 75m x 450m hardwood posts – 70 posts D_{50} = 75mm Granular Fill – 10.5 m^3	**£5 223.00**
4	*Creation of gravel beach:* D_{50} = 75mm Granular Fill – 1670.0 m^3 Grasscrete – 190.0 m^2	**£90 409.00**
5	*Creation of swashway:* Removal of 1 No/ pontoon Installation of 1 No/ 8.0 m steel walkway	**£24 706.00**
6	*Installation of mooring cleats and handrails to Fishermen's Jetty:* Quantities to be confirmed	**Rate: £65.00/m**
	Total	**£125 858.00**

7 Conclusion

The scheme prepared by the RHHA to improve the public slipway at Warsash has two primary facets. The first is to improve access on the slipway, with particular consideration for the launching and retrieval of small craft. The second is to reduce the amount of seaweed and other marine detritus which is stranded on the slipway. The descriptions of the RHHA proposals have been outlined in section three and discussed in section four of this report; with considerations made to the engineering aspects of the scheme.

Drawing conclusions from section four of this report we would consider the following:

» Items 1-3 are primarily concerned with the improvement of vehicular access to the slipway. These proposals represent a general improvement in the accessibility of the slipway, and should be possible, however discussion with the regulatory bodies will be required. It can be anticipated that through implementing the proposed measures, vehicular access to areas one and six would be improved (Figure 2). It is recommended that Item 1 as discussed in section four is amended, leaving the concrete scrubbing grid unaltered, thereby limiting the complexity and cost of this part of the works.

» Item 4 is intended to improve both access to the slipway and reduce the nuisance caused by the stranding of seaweed and other detritus on the upper slipway. We have concerns as to the likelihood of achieving this due to the nature and location of the slipway.

  If the current level of the slipway head were to be raised this will simply move the seaweed line further down the slipway and is likely to create access problems for vehicles and trailers. The seaweed and other detritus will continue to be stranded on the incline of the slipway as this is driven by prevailing weather conditions rather than the tides. Also due to the low tidal flow on the flood and ebb tides this material is unlikely to be removed, as it is expected to be caught on the granular material of the beach.

  With regards to the improvement of access down the slipway, then the proposed item raises a number of complications. It is clear that a hard engineering solution would be the preferred choice when seeking to improve the accessibility of the slipway for vehicles; however this is likely to be unacceptable to the regulatory bodies as there are few examples of a hard engineered slipway on this section of the River Hamble. This limits the scope of available options. A soft engineered solution such as that proposed by the RHHA, while being in line with other slipways on the river is not typically suitable for the reasons which have been raised in section four, ie disturbance of the granular material resulting in rutting as vehicles transit across the beach. To overcome this issue, we feel it prudent consider a solution which includes measures taken to improve the stability and bearing capacity of the granular material. This forms the rationale for our proposal to incorporate Grasscrete or similar running surface into this item of the scheme, which will assist in improving both the stability and bearing capacity of the granular material when subject to traffic movement. This running surface of granular material and “Grasscrete” is recommended to run from the road down to the landward edge of the concrete pad for completeness.

» Item 5 is proposed in order to improve the local flow regime in order to aid the ‘washing’ of the slipway, hence reduce the amount of stranded seaweed and other detritus. This item of

the scheme is unlikely to improve the tidal flow in the local area to the slipway and hence is unlikely to result in 'washing' of the slipway.

As the proposed works are to undertaken below the mean high water springs tide mark a Marine Licence will be required, before any works may commence. Early consultation with the MMO is advised to identify any show stoppers at an early stage. The EA should also be consulted with regard to Flood Defence Consent.

Appendix A

HRRA working group – Recommendations and specification

The Working Group's slipway recommendations/specification are as follows:

a) Carry out modest surfacing, fill in the few pot holes/shallow puddles

b) Currently there is an 8 metre gap between the top corner of the concrete pad of the maintenance piles and the Fishermen's Jetty. Cropping 3m off this corner parallel to the Fishermen's Jetty would create an 11 metre gap enabling launching of five dinghies abreast. This would not adversely affect the facility for yachts.

c) Taper up the shingle Slipway on the upstream side of the concrete pad to avoid a 200mm step.

d) Add depth marker boards on the outer edge of Nos. 1,3 and 5 piles to enable approaching yacht helmsmen to calculate their grounding times.

e) Insert a treated hard wood gravel-retaining board on the downstream (muddy) side of the Slipway from the top downstream corner of the concrete pad up to the end of the existing stone groin, with an infill layer of shingle to harden up the Slipway surface upstream of the gravel board. These measures will reduce the ingress of silt/mud, and will also clearly define the southern boundary of the Slipway.

f) Construct a 32m long level natural compacted shingle beach-head 700mm depth (to just above the height of MHWS tides), out over the upper section of the Slipway, south of Warsash's lower car park wall, finishing with a 1 in 15 natural compacted shingle slope down to the current Slipway level (see attached drawing showing the proposals). Also to create a 6m swash-way between the car park and the Fishermen's Jetty by shortening the pontoon and fitting a metal bridge to span the gap. There should be a gate fitted to this bridge similar to that fitted on the Harbour Master's Jetty - see attached diagram. By installing an uninterrupted continuous beach-line, it is anticipated that there will be a reduction in the amount of seaweed/flotsam deposited on the slipway.

g) On the Fishermen's Jetty, add several more mooring cleats/rings on the downstream side and fit handrails along its length on the upstream side, for Health and Safety purposes.

h) At the bottom of the slipway at low water mark, remove the existing boulders and rocks and shutter either side of the slipway and infill with shingle.

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