

Note / Memo

**HaskoningDHV UK Ltd.
Water**

To: Consultation Feedback
From: Thomas Green
Date: 12 July 2017
Copy:
Our reference: WATPB3800N001D0.1
Classification: Project related

Subject: Selsey Haven - Key Issues Study – Consultation Feedback

Environment Agency

From: Dornbusch, Uwe [mailto:uwe.dornbusch@environment-agency.gov.uk]
Sent: 11 May 2017 14:00
To: Tom Green <Thomas.Green@rhdhv.com>
Subject: FW: Selsey Haven Key Technical Issues Study - Consultation

Dear Tom,

Thanks for the documents. Below comments aligned with the topic headings suggested in your email:

1. overall content of the consultation material (reports and drawings),

- a. The maps state that "BATHYMETRY CONTOURS CREATED FROM CHANNEL COAST OBSERVATORY DATA." It would be useful to be a bit more specific as to the type and date of the survey used.
- b. The location plan contains wind and wave roses. It would be helpful if the time period for which these were generated would be given.
- c. A reference section would be useful
- d. Number of ramps, visual impact with 2.5 m high walls landwards and 8 m wall at low tide on the seaward side. Assuming the ramps are for vehicular access to transport the catch and maintenance / service vehicles, together with any gear storage this would add at least another 2 m in visual height. The cross section with different vertical and horizontal scales is making it difficult to see that the keywalls will be ~8 m wide. This consultation should be accompanied by some 3D scenes – easily done as a 3D pdf for example (for the look from the seaward side both at high and low spring tides) to make sure that everyone gets as good as possible an idea about what it will look like. A simple overlay

onto an aerial photo like below might also help with visualisation.



2. Our understanding on coastal processes in the area of interest and the potential impacts of the harbour on sediment transport.

- a. It is disappointing that previous comments about the 'too seaward' position of option 1 in the preliminary consultation voiced by EA have not been considered and found their way into the Key Technical Issues Study. There is almost no difference between option 1 and this proposal (certainly not in the seaward position) and hence all the concerns raised in relation to option 1 remain valid.
- b. In the discussion about longshore transport rates a reference to more recent rates calculated on survey data is missing (see http://www.se-coastalgroup.org.uk/wp-content/uploads/2013/10/Regional_sediment_budget_report%20-%20Selsey%20Bill%20to%20Brighton.pdf , and updated version should become available in the next few weeks).
- c. Unfortunately, information on the seaward face of the harbour wall is vague. Page 3 has "Where intermittent piles occur, armourstone fill will be used". From the description I would imagine a harbour facing sheet pile wall fronted by rock armour. From this inner wall a deck would extend for a width of ~8 m to seaward where it would be supported by piles. So in the simplest case the rock would start just seaward of the inner sheet pile line and given a height of at least 8 m (from 5 mOD to -3 mOD) and a slope of 1 in 2 this would extend another ~8 m seaward of the position of the vertical outer wall shown in the cross section. This simple triangular shape would risk lifting the deck so that the rock slope should probably start more seaward. In the extreme, the rock toe would extend some 20 m seaward of the outer vertical wall as illustrated in the cross section (including a berm). Fundamentally, this would increase the negative impact on coastal processes and visual appeal.
- d. Page 3 has "For the seaward face the intention is to encourage the build-up of beach material in front of the harbour in order to promote natural by-passing." This sentence does not make much sense.
 - i. Advancing the line seaward will on its own reduce the potential of beach build up.

- ii. Assuming the rock is also used to reduce overtopping into The Haven, then filling the interstices with beach sediment is counterproductive as it reduces the permeability of the rock structure
- iii. Natural sediment transport is from south to north so once sediment is north of the harbour mouth, ie in front of the harbour wall, it is already bypassed so how this would 'promote natural by-passing' is not clear.
- e. Together with comments under point 4 there is a real danger that in further design refinements the proposed sketched structure will be even more disruptive to coastal processes and will require additional / larger structures including further up- and/or downdrift to manage the sediment accumulation and scour. Alternatively / additionally, requirements for additional structures may only become apparent after construction and operation due to changes in sea level and/or sediment dynamics

3. Comment on the acceptability of beach by-passing as an ongoing means of compensating for any interruption in the natural longshore sediment transport to the north of the harbour.

- a. The cover email makes a comparison with the by-passing at Shoreham "In essence, the process will copy that currently undertaken at Shoreham Port which we understand is acceptable to all parties involved.", however, there are some fundamental differences
 - i. The longshore transport boundary is natural and has 'always' existed owing to the Adur river.
 - ii. There is 'near unlimited' accommodation space on the western side of Shoreham Port which allows for substantial volumes to accumulate before they have to be moved. This space is not available south of the Haven unless the southern Harbour is extended. In that case, the beach sediment will accumulate subtidally from which it will be more difficult to recover.
 - iii. At the eastern side of Shoreham there is equally near unlimited accommodation space to deposit the annual by-passing volume. North of the Haven there is less space unless one spreads out the bypassing volume which would have a higher impact on a larger part of the beach; or unless one introduces new / larger structures as anticipated in 2e.
 - iv. Acceptability is probably the wrong word as Shoreham Port operates the bypassing under the Harbour Act on its own land.
 - v. Infilling of the harbour mouth with sediment from updrift would eventually increase fluvial flood risk inland, which is not the case at The Haven.
 - vi. There are significant additional structures behind the beach on the downdrift side.
 - vii. Overall Shoreham Port sits more toward the end of sediment cell while Selsey sits at the start.
 - viii. Bypassing increases burial pressures on the Southern Water outfall west of Brighton Marian
 - ix. The actual recycling activities with lorries doing the trip around the harbour is not much appreciated by the Shoreham residents due to traffic and associated noise, congestion and air pollution.
- b. Longshore transport is a near continuous process driven by moderate waves under oblique incidence. As such (together with the previous points) the frequency and magnitude of by-passing will be important to mitigate as much as possible against this new artificial transport boundary. Given that LST rates updrift can be different from those downdrift (e.g. through the hydrodynamic impact of the harbour wall generating reflection, edge waves or other scour enhancing mechanisms) there will be occasions when the downdrift beach requires sediment but the updrift beach does not provide it.
- c. Inevitably, some shingle will enter the harbour mouth. There it will be mixed with finer sediments, making it much less useful as a source of material to be placed on the downdrift beach.

- d. Given points b and c the question has to be asked whether the assumption of simply bypassing without the need of e.g. a stockpile or occasional small scale recharge is valid; together with the associated cost implications.
- e. Recovery of material on the updrift end is best carried out during spring low tides which at Selsey – like most of the rest of the Southcoast – occur over weekends either early morning or late afternoon with the former having a particular impact on residents behind the beach.

4. What would be required by the Environment Agency in subsequent studies to gain full acceptance of this concept?

- a. As a regulator, the EA comments on Water Framework Directive and Flood risk. As the Haven is well within the frontage managed by Chichester DC they would bear most of any negative consequences arising from the Haven. However, flood risk to downdrift frontages managed by the EA may increase. If The Haven were found to be causing issues for FdGiA funded defences either side, contributions would have to be sought from the operator.
- b. From a WFD perspective, East Selsey has a more or less natural appearance with a continuous beach and exposed seawall restricted to the southern end. Rock and continuous structures protruding seawards beyond the beach are absent and as such the proposal would introduce new materials (and replace beach with these) into what is already a Heavily Modified coastal waterbody. A WFD compliance assessment screening exercise using the process outlined in the new Clearing the Waters For All guidance available on GOV.UK (<https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters>) should be carried out in particular in relation to hydromorphology and potentially also for biology – habitats impacts. As the site falls within 2km of a WFD protected site (the Pagham Harbour SPA), any potential impacts to the SPA will also need to be considered in the impact assessment. This may require detailed studies and data collection on nearshore sediment transport processes.

5. Impacts on wider coastal management.

- a. Much will depend on the specifics of the harbour entrance (e.g. seaward extent and impact on tidal currents and subtidal sediment transport) and the details of the outer seawall (e.g. in relation to shape [sharp northern corner] and wave reflection). Groynes up- or downdrift may need to be modified to increase storage capacity for bypassing or to increase volume updrift to allow for larger losses (granted, raising of the land behind this frontage will reduce flood risk and may lower the FCERM requirements of the beach, but as this beach also has a high amenity value, narrowing of the beach may be undesirable).
- b. In the long term (e.g. sea level rise, changes in sediment dynamics), the Haven is unlikely to provide a sustainable flood defence solution as is, but also prevents future adaptation that could include a more landward alignment of the coast for the location of the Haven as well as over a considerable distance up- and downdrift.
- c. In the medium to long term, boat sizes will increase which may reduce the Haven's viability due to lack of expansion space
- d. There is so far no 'decommissioning' plan which ties into point b about long term sustainability of a hard structure so close to the present coast line.

In summary, the proposal presented for The Haven

- introduces a significant disturbance to sediment transport processes along the eastern side of Selsey Peninsula and into the downdrift frontages including Pagham Harbour with the effectiveness of bypassing as a mitigation measure being uncertain,
- closes down a range of options for future FCERM management of much of the eastern side of the Selsey Peninsula and is thus not a sustainable option
- contains a large number of uncertainties in relation to future changes in e.g. sea level, sediment dynamics, additional / enlarged structures, decommissioning.

Uwe

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Dr Uwe Dornbusch CGeog (geomorph), FRGS

Senior Specialist - Coast

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"Although both the magnitude of future sea level rise and the magnitude of consequent shoreline change remain open questions, the basic behavior of future shoreline change due to sea level rise alone is well understood: shorelines retreat."

Vitousek, S., Barnard, P.L., Limber, P., 2017. Can beaches survive climate change? J. Geophys. Res. Earth Surf. 122, 2017JF004308. Page 1060

From: Dornbusch, Uwe [mailto:uwe.dornbusch@environment-agency.gov.uk]

Sent: 05 July 2017 08:33

To: Tom Green <Thomas.Green@rhdhv.com>

Subject: FW: Selsey to Climping BMP

Dear Tom,

Sorry for keeping you hanging.

A draft sediment budget (just the maps) have just been produced. This will be discussed at a meeting on Friday so I would expect it to change.

The main uncertainty is obviously the location(s) at which the sediment comes on-shore.

The maps suggest it all arrives north of the proposed Haven location, but we do know that Kirk Arrow spit provides ephemeral feed. So while the map shows a LST rate of >7,000 m³ this could easily be higher, all based on assumptions.

The only way to find out is probably a sediment tracer study, though they have their difficulty in use of quantification of movement.

I will let you know once the update version becomes available but thought I share this draft with you anyway.

Uwe

--

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From: Dornbusch, Uwe [mailto:uwe.dornbusch@environment-agency.gov.uk]

Sent: 07 June 2017 09:21

To: Tom Green <Thomas.Green@rhdhv.com>

Subject: RE: Selsey Haven Key Technical Issues Study - Consultation

Thanks Tom.

Yes happy to look at any further materials.

I guess many of the comments are very cautious because details are not that well known (e.g. the seaward face of the harbour wall).

Also, obviously, the design tries to minimise any impacts, but the problem is that there remains uncertainty and Pagham serves as an example for how little we know about what might happen in the next few decades in relation to sediment dynamics in this particular corner of the coast.

All the best, Uwe

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Chichester District Council

From: Stephen Oates [mailto:soates@chichester.gov.uk]
Sent: 12 May 2017 18:22
To: Tom Green <Thomas.Green@rhdhv.com>
Subject: RE: Selsey Haven Key Technical Issues Study - Consultation

Hello Tom ...

As Economic Development Manager I am not 'qualified' to provide any technical assessment of the proposals, so my comments are limited to broader economic and planning points:

- Acceptability of constructing the harbour close to a residential area – Any planning application would have to include an assessment of the level of activity currently at the site, so the impact on the residential properties and surrounding the site can be assessed
- Number of berths – It certainly makes sense to have the fishing berths closer to the entrance area as they will be the frequent users. The leisure berths will need to be sufficient in number to ensure that the harbour is economically viable. The District, Town and County Councils are very unlikely to be able to subsidise the operation of the harbour so sufficient income streams will be essential
- Location of the fishermen's compound close to the residential area – No issues with this, as the activity on this site will generally remain relatively unchanged. This does, however, appear to be a clear opportunity to significantly tidy-up the area and improve operational safety
- Whether the quaysides and pier structures should be kept clear of any significant buildings in order to maintain access for vehicles and reduce visual impact – This makes sense, although this should not be at the expense of any proposals for well-planned commercial and visitor facilities to serve the harbour, tourists and local residents. (e.g. wet fish shop, restaurant, etc.). Residential users of this area are likely to have strong views
- The use of the area immediately to the north for harbour and public facilities – This is important to maximise associated commercial activities and facilities to enhance and strengthen the visitor economy in the area

I hope this is helpful – please let me know if you need anything else

Kind regards



Stephen Oates

Economic Development Manager
Economic Development
Chichester District Council

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From: Dominic Henly [mailto:dhenly@chichester.gov.uk]
Sent: 26 May 2017 09:17
To: Tom Green <Thomas.Green@rhdhv.com>
Cc: Jane Cunningham <JCunningham@chichester.gov.uk>
Subject: RE: Selsey Haven Key Technical Issues Study - Consultation

Hi Tom

Apologies that these comments are a little late.. hopefully not too late.

Although the layout is helpful some 3d scenes would be very helpful, there will be a significant change especially the potentially 8m high wall at low tide and I think it would be useful for people to be able to visualise the proposals.

Our understanding on coastal processes in the area of interest and the potential impacts of the harbour on sediment transport.

The understanding of coastal processes is probably as good as they can be, but I share concerns raised by UWE about the landward extension of the training wall in excess of the existing groyne field and the unknown impacts this may have.

We have observed significant variation in shingle movement along this frontage, with rates increasing after significant on-shore supplies from Kirk Karrow and reducing in times of low supply. Based on this I think any bypassing will need to be linked to regular monitoring data i.e. any recorded deposition, be it 1000m³ or 10000m³ in the up-drift bay(s) of the harbour is bypassed.

There will almost certainly be some natural bypassing and the further seaward the harbour arm the more this will be restricted.

Comment on the acceptability of beach by-passing as an on-going means of compensating for any interruption in the natural longshore sediment transport to the north of the harbour.

This will be a necessary process to compensate for lost natural sediment transport, again the shorter the harbour arms the more natural bypassing should occur.

I would expect Natural England and EA to have further comments on the acceptability of any affects on the various designated sites.

Impacts on wider coastal management.

Positives- A length of sea wall which will not need any works in the short-medium term, and removal of possibly 7 groynes which have an estimated life of 5-10yrs

Negatives – additional management will be required (beach recycling) , without which the sea wall to the north would be at increased risk of undermining.

Neutral – The location of the proposed harbour should not significantly impact our access to the beach for R&M and Capital works, and may in fact improve it given the new ramps for shingle recycling.

Any foreseen issues associated with the artificial by-passing operation.

I question whether we need the new road along the back of the sea wall, on that point this is the first time I have noticed the proposed raising of the green areas to the North, although I understand the approach there will need to be some detailed consideration of wave overtopping, which currently is retained on the green area before draining back out to sea at east beach outfall via a series of gulley's and pipework. Perhaps there is also an opportunity for beach huts in the future ☺

Potential impact on adjacent homeowners (noise) etc. where they pass in relative close proximity.

What if there is no shingle to bypass, for example if a large volume is lost just off-shore?

Hopefully my thoughts are helpful and make sense but please just give me a call if you wish to discuss any of them,

Kind regards



Dominic Henly

Senior Engineer
Environment
Chichester District Council

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<http://www.chichester.gov.uk>



From: Stephen Oates [<mailto:soates@chichester.gov.uk>]
Sent: 12 May 2017 18:22
To: Tom Green <Thomas.Green@rhdhv.com>
Subject: RE: Selsey Haven Key Technical Issues Study - Consultation

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- Whether the quaysides and pier structures should be kept clear of any significant buildings in order to maintain access for vehicles and reduce visual impact – This makes sense, although this should not be at the expense of any proposals for well-planned commercial and visitor facilities to serve the harbour, tourists and local residents. (e.g. wet fish shop, restaurant, etc.). Residential users of this area are likely to have strong views
- The use of the area immediately to the north for harbour and public facilities – This is important to maximise associated commercial activities and facilities to enhance and strengthen the visitor economy in the area

I hope this is helpful – please let me know if you need anything else

Kind regards



Stephen Oates

Economic Development Manager
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Arun District Council

From: Roger Spencer [mailto:Roger.Spencer@arun.gov.uk]
Sent: 12 May 2017 17:23
To: Tom Green <Thomas.Green@rhdhv.com>
Cc: Dornbusch, (Uwe) - Environment Agency <uwe.dornbusch@environment-agency.gov.uk>
Subject: RE: Selsey Haven Key Technical Issues Study - Consultation

Dear Tom,

Thank you for the opportunity to comment on the Project at the current stage; sorry the response is a bit last minute.

I note that Uwe Dornbusch has commented and I concur with all of his points. I believe that all of the following is additional to, and not contrary to, Uwe's thoughts.

I also understand that there has been a further option drawing issued but I have not had sight of this – my comments are therefore based on documents issued with your email of 26 April.

Option 1 (from the 2016 list), with a revised entrance arrangement, now seems to be the preferred option but the comments voiced at the workshop i.e. could it be even narrower and longer (to provide the same plan area with less protrusion seaward) seem not to have been considered.

I accept that there will probably have to be bypassing but my main concern is the 'day to day' effect. Whilst the updrift beaches are getting to a point where bypassing is necessary, there will be a tendency for the shingle pathways to be deflected offshore – this may be a slight deviation; or it may be significant; it may even happen in the 'empty' condition with an interaction with the vertical face of the harbour arm. Any changes could have an effect at Pagham although I note that you assert that the drift volumes are small off the Kirk Arrow Spit compared with the Inner Owers and so the Inner Owers will be the predominant system. I would note that anecdotal evidence puts a large input to the system at Kirk Arrow may have been the catalyst for the changes at Pagham.

The changes in the entrance arrangements have, I assume been, brought about by the input from users or potential users?

The front face being hit & miss piling with an infill of rock also gives me some concern a) regarding the interstices filling up b) lack of beach in front of the wall leading to accelerated abrasion and again due to the lack of shingle in front whether the levels are suitable – there is almost certainly going to be overtopping into the basin and whether there will be induced wave activity that will get over the 5.0m inner wall.

In Section 4 you mention that some of the arisings will be used to raised levels in the green area - is this currently functional floodplain and as such required to be kept 'as is'?

I understand the bathymetry may be somewhat out of date – you will be aware of the newly gathered multi-beam data on the CCO website (there is a lot of 'topo' data there too to help with beach evolution analysis). Anyway assuming that the data shown is not much different today, I wonder whether there is scope to take advantage of the natural channel that would seem to exist immediately

offshore half-way along the basin for a revised channel location – this would only be in the order of a few hundred millimetres but it might reduce dredging volumes (initial and maintenance) and also reduce wave forces on the front face of the basin. I accept that this would need to change the overall layout and probably involve greater land-take to provide calm water inside the basin.

Regards,
Roger

Selsey Fishermen Association

From: Robert Greenwood [mailto:robert@rockallmarine.co.uk]

Sent: 02 May 2017 10:20

To: Jane Cunningham <JCunningham@chichester.gov.uk>

Cc: Ian Froome <ifroome@vailwilliams.com>; Tom Green <Thomas.Green@rhdhv.com>

Subject: Re: Chris Russell suggestions

Thanks Jane / Ian

The main issue surrounding the success of the harbour is also in the genesis of the harbour project in that it is to keep Selsey's fishing fleet in business, and to do this is important for the boats to be profitable and the harbour to be profitable. The restrictions on boats is not necessarily about reducing competition as it would remain as it is now where vessels come to Selsey and the owners / crew and families move to the village.

The harbour should not be built on a business model that relies on increasing the number of Fishing vessels to be economically viable as this is not an environmentally sustainable approach. Increasing of landings by visiting boats would also be extremely unlikely to occur due to our geographic location and the Selsey road would not be best suited to increased heavy haulage.

The harbour will hopefully allow the existing fleet to work in a safer and more secure way and may shrink or expand due to political and stock opportunities but the harbour would need to be profitable in either case. There will likely be many grand ideas but for a successful harbour we would need to concentrate on Charter boats, Dive boats and commercial lettings like restaurants and services if possible to create a resilient income.

I doubt whether any harbour was conceived purely as a tourist attraction – the attraction is a working harbour and this is what is needed, a place where residents of Selsey can find work and enjoy themselves.

However I think that there will be a chance that we could make the harbour an extension of the Solent as it would be a great weekend destination for the plethora of sailing vessels as long as there are showers and restaurants to visit. It is an interesting sail that I think many people would be attracted to but perhaps not for annual berthing - however winter berthing is quite popular in the remoter harbours of the Solent.

Regards

Robert

Chris Russell

From: Chris Russell [<mailto:chrusrussell@outlook.com>]

Sent: 20 April 2017 10:22

To: Jane Cunningham

Subject: Re: Selsey Haven Steering Group - next meeting

Tuesday 30 May at CDC is OK for me and I have no comments on the draft minutes

I have a couple of thoughts which can be considered at future meetings when we have received Haskoning sketch plans:

Charlestown harbour, nr St Austell is a small locked harbour and accommodates two square riggers. Bearing in mind that Selsey will be predominantly for fishing with education facilities etc could be worth considering offering space (free?) for a traditional fishing boat/sailing ship as a visitor attraction.

24/7 tidal fishing loading/unloading adjacent entrance for local fishermen only (see Bridport harbour) as set out in my draft layout plans with a cill to the main harbour might help to restrict non-Selsey fishing boats access.

Regards
Chris

Chichester Harbour Conservancy

From: Richard Craven [mailto:richard@conservancy.co.uk]
Sent: 11 May 2017 09:44
To: Tom Green <Thomas.Green@rhdhv.com>
Cc: Richard Austin <richard.austin@conservancy.co.uk>
Subject: RE: Selsey Haven Key Technical Issues Study - Consultation

Dear Tom

Thank you for consulting Chichester Harbour Conservancy on these proposals we have reviewed your preliminary consultation document and on the understand that Option 1 is the preferred option we have no comments to make on the technical aspects at this stage.

Yours sincerely

Richard Craven
Director & Harbour Master
01243 510987 / 512301

| Chichester Harbour Conservancy
| Harbour Office, Itchenor, Chichester PO20 7AW
| www.conservancy.co.uk

Natural England

See below documents.

Date: 25 May 2017
Our ref: DAS/12088/213953
Your ref: [Click here to enter text.](#)



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Customer Services
Hornbeam House
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BY EMAIL ONLY

0300 060 3900

Dear Tom Green,

Discretionary Advice Service (Charged Advice)

DAS/12088/213953 Selsey East Beach Harbour (Selsey Haven), West Sussex

Thank you for your consultation on the above dated 25 April 2017, which was received on 26 April 2017.

This advice is being provided as part of Natural England's Discretionary Advice Service. Royal Haskoning DHV has asked Natural England to provide advice upon:

The overall content of the Selsey Haven Key Issues consultation material (report and drawings) Apr 2017, along with specific comments on the following:

- Our understanding on coastal processes in the area of interest and the potential impacts of the harbour on sediment transport;
- Comment on the acceptability of beach by-passing as an ongoing means of compensating for any interruption in the natural longshore sediment transport to the north of the harbour;
- What would be required by Natural England in subsequent studies to gain full acceptance of this concept?

This advice is provided in accordance with the Quotation and Agreement dated 4th May 2017.

The following advice is based upon the information within the Selsey Haven Key Issues Consultation documents:

1. Consultation Document: Selsey Haven Key Issues Consultation Apr 2017
2. Site Plan: Selsey Haven Key Issues Consultation Apr 2017
3. Location Plan: Selsey Haven Key Issues Consultation Apr 2017
4. Cross Section: Selsey Haven Key Issues Consultation Apr 2017

1. Overall content of the Selsey Haven Key Issues consultation material (report and drawings) Apr 2017.

- It is unclear if the latest available bathymetry / lidar data has been used in the analysis of sediment transport within this report, for example, [Channel Coastal Observatory](#) autumn 2016 survey data. The most up to date information should be used in making the assessment;

- Information about the designated sites and the potential impacts of this proposal upon them is absent, and has been outlined in response to your question 4, and should be included within this document;
- A reference section would be useful.

2. The understanding on coastal processes in the area of interest and the potential impacts of the harbour on sediment transport.

The following is Natural England's understanding of the coastal process in the area of interest and the potential impacts of the harbour on sediment transport is that there is a clear sediment pathway from Selsey Bill along the coast to Pagham Harbour and Bognor Reef, however, less is understood about the movement of shingle that resulted in the recent rapid extension of Church Norton Spit at Pagham which is likely to have come from the re-activation of shingle in offshore banks that had previously not been available to the onshore system. Maintaining the natural sediment transport system between Selsey Bill and Pagham Harbour/ Bognor Reef is paramount to the conservation of the features in the associated designated sites.

Any alteration to the natural movement of material along the coastline; specifically halting, altering or removing the alongshore, as well as, across shore movement is likely to have an impact on the geomorphology interest feature at Pagham Harbour. This would also impact on the associated features of the designated sites, Special Protection Areas (SPAs), Ramsar site, Site of Special Scientific Interest (SSSI) and Marine Conservation Zone (MCZ) that depend on these underlying processes and these features would not be maintained nor enhanced. In addition this sediment feeds the frontage at Pagham providing protection for the houses located there.

Sediment changes may also impact the exposure of fossils in the other geological SSSI sites, Selsey, East Beach and Bognor Reef. The extent of this would need to be understood, specifically, the build-up of shingle on the western side of the proposed haven and how far these changes would impact to the east on Bognor Reef.

In addition inlets, such as the entrance to a harbour, cause a change or break in the sediment transport system. A dredged channel would also effectively become a sediment sink also creating a loss of sediment from the system. The effect of this at this location is unknown.

3. Comment on the acceptability of beach by-passing as an ongoing means of compensating for any interruption in the natural longshore sediment transport to the north of the harbour.

Natural England's main concern is that the proposed structure protrudes onto the beach, crossing the upper beach, swash zone and into intertidal areas, which would therefore interrupt the natural coastal processes. Periodic by-passing would not facilitate a natural functioning of the system and would be unlikely to have the flexibility in approach to act as the natural system does.

The natural processes are not completely understood and the dynamic nature of this sediment supply would be difficult, if not impossible, to replicate by the by-pass of sediment.

The geomorphological interest of Pagham Harbour SSSI would not, therefore, be maintained by any changes to this sediment supply and the habitats and species that result and depend on the geomorphological shingle features (spit, saline lagoon etc.) would be adversely affected.

4. What would be required by Natural England in subsequent studies to gain full acceptance of this concept?

The main concern about this proposal comes from the interruption of coastal processes that affect the sediment supply within the area. These coastal processes are dynamic in nature, which in turn drives the dynamic nature of the coastal geomorphology, geology and ecology, which is fundamental to the conservation interest of Pagham Harbour. Pagham Harbour is designated as a Special Protection Area (SPA), Ramsar site, Site of Special Scientific Interest (SSSI) and a Marine

Conservation Zone (MCZ). The geomorphological interest of Pagham Harbour SSSI is reliant on the fresh input of sediment and, therefore, is linked to the important wider coastal system. Sediment is supplied to the SSSI from a combination of onshore movement of sediment as well as, more importantly, material moving west to east from Selsey Bill to Church Norton Spit.

This up-drift system (from Selsey Bill) effectively feeds Pagham Harbour SSSI and, therefore, maintaining this conveyor belt of material is highly important when considering the notified geomorphological interest of the SSSI, as well as, the function the geomorphology plays in maintaining the other conservation features for which Pagham Harbour is designated. A separate internal technical advice note by NE's Geomorphology Senior Specialist has been included which clearly sets out our current understanding of the site and the concerns regarding the proposal.

A greater understanding of how these systems behave would help to better understand the processes involved i.e. what caused the recent re-activation of sediment that produced the rapid expansion at Pagham Harbour. Further modelling work will need to be undertaken to acquire this understanding in order to make a full assessment of the potential impacts of the proposed development.

Potential impacts on designated sites

The information given below lists the specific designated sites that may be impacted by any alterations to the sediment transport as a result of the proposed development. Within this section there is a description of each designated site, their conservation features and an indication of the potential impacts.

Many of the conservation interest features of these coastal sites are underpinned by the natural functioning of coastal processes.

Wildlife and Countryside Act 1981 (as amended)

The proposed Haven is located adjacent to the following Sites of Special Scientific Interest (SSSIs): Pagham Harbour, Selsey East Beach and Bognor Reef.

Pagham Harbour SSSI is designated for features including geomorphology and geological outcrops, nationally rare vegetated shingle, over wintering and breeding birds, a wide variety of wetland habitats and sand invertebrates.

The main potential impact of the Haven on the SSSI is on the coastal geomorphology feature ([designated internationally under the Geological Conservation Review series](#)). The interest is significant both as a classic shingle spit landform and for the links that have been demonstrated between the coastal near shore and offshore forms and sediments.

The spit system at Pagham Harbour is one of the most rapidly accreting sedimentary systems in England. The accretionary (accumulating additional material) system is evolving over very short timescales, which is not only in stark contrast to other systems in the rest of Great Britain but is unique under current climatic conditions. The scientific knowledge gained through study of this phenomenon is important as barrier systems are extremely sensitive and respond extremely quickly to changes in physical forcing factors, such as, sea level rise, wind, waves and tides. The knowledge gained at Pagham Harbour is applicable to other locations, as well as, acting as an indicator of the active coastal processes at this location due to its natural evolution. For more information please refer to [NE's views about the management of Pagham Harbour SSSI](#) and the attached internal technical advice note.

The habitats and species of the SSSI, vegetated shingle, wetland habitats, over wintering and breeding birds, and sand invertebrates will also be potentially impacted.

The following potential impacts on the Pagham Harbour SSSI should be considered in relation to the proposed development:

- Maintaining the supporting coastal processes is integral to maintaining the favourable condition of a number of features designated at this site; the interruption of coastal processes and sediment supply would impact the geomorphological spit system at Pagham Harbour and the resulting shingle habitats and species that rely on these habitats including vegetated shingle, nesting / roosting birds, and invertebrates.
- A change in sediment transportation, therefore, may lead to adverse impacts on these sites and so an understanding of sediment movement and how it may impact these SSSIs needs to be considered.

Selsey, East Beach SSSI is designated for geological features including rock outcrops and rare fossils. For more information please refer to [NE's views about the management of Selsey, East Beach SSSI](#).

Bognor Reef SSSI is designated for a variety of geological, geomorphological, and biological features. These include vegetated shingle, vegetated sand dune, London clay outcrop, and outstanding fossils. For more information please refer to [NE's views about the management of Bognor Reef SSSI](#).

The following potential impacts on the Selsey, East Beach SSSI and Bognor Reef SSSI should be considered in relation to the proposed development:

- Construction of harbour arms or breakwaters may form a barrier to the west-east migration of shingle;
- The key management principle for coastal geological designated sites Bognor Reef and Selsey, East Beach is to maintain exposure of the geological interest by allowing natural processes to proceed freely. Any development that prevents or slows natural erosion can have a damaging effect. A change in sediment transportation, therefore, may lead to adverse impacts on these sites and so an understanding of sediment movement and how it may impact these SSSIs needs to be considered.

The Conservation of Habitats and Species Regulations 2010 (as amended) and The Offshore Marine Conservation (Natural Habitats, & c.) Regulations 2007 (as amended)

Pagham Harbour SPA and Ramsar site

We can also confirm that the proposed works are located adjacent to Pagham Harbour SPA and Ramsar site. These sites are designated for internationally important bird species: breeding common and little terns (*Sterna hirundo* and *Sterna albifrons*), over wintering dark-bellied brent geese (*Branta bernicla bernicla*) and ruff (*Philomachus pugnax*). Please refer to [Natural England's Conservation Advice for Pagham Harbour SPA](#) and Ramsar site for further information about the features, advice on conservation objectives and operations.

The conservation objectives for the SPA state a requirement to maintain or restore supporting processes that maintain site integrity.

The following potential impacts on Pagham Harbour SPA and Ramsar site should be considered in relation to the proposed development:

- The potential changes in sediment transportation may lead to the reduction in freshly accreted shingle at Pagham Harbour which provides an important habitat for nesting and roosting common and little terns;
- Changes in sediment budgets may also impact on the supporting habitats: lagoons, mudflats, and marshes which are found inside Pagham Harbour, along with the associated designated feature species of the SPA and Ramsar sites;
- Little terns use the shallow shingle banks around Pagham Harbour at low tide to feed e.g. the Inner Owers. Changes in sediment budget should also consider any offshore feeding areas for these species.

Proposed Solent and Dorset Coast SPA

The proposed development is located within the proposed Solent and Dorset Coast Special Protection Area (pSPA). The site is proposed for foraging habitat used by internationally important bird species, for the area around the Haven the relevant species is the Sandwich tern (*Sterna sandvicensis*). As a pSPA the features of the site should be treated as a material consideration for any development proposals. Please refer to the [Solent and Dorset Coast pSPA](#) for further information.

The following potential impacts on Solent and Dorset Coast pSPA should be considered in relation to the proposed development:

- Sandwich terns may use the shallow shingle banks around Pagham Harbour at low tide to feed e.g. the Inner Owers. Changes in sediment budget should also consider any offshore feeding areas for these species.

Marine and Coastal Access Act 2009

Pagham Harbour MCZ

The proposed works are adjacent to the Pagham Harbour Marine Conservation Zone (MCZ) which is designated due to the presence of Defolin's lagoon snail (*Caecum armoricum*), intertidal seagrass habitat and lagoon sand shrimp (*Gammarus insensibilis*). Please refer to [Natural England's Conservation Advice for Pagham Harbour MCZ for further information](#) about the features, and advice on conservation objectives and operations. Natural England advises that only the Defolin's lagoon snail would be potentially impacted by the proposed development. The conservation objectives state that to achieve favourable condition for the Defolin's lagoon snail the quantity and quality of its habitat should be maintained, subject to natural change.

The following potential impacts on Pagham Harbour MCZ should be considered in relation to the proposed development:

- The Defolin's lagoon snail is located in the shingle sediment of Church Norton Spit and the coastal lagoons and is vulnerable to habitat loss. Changes in sediment supply from the proposal may reduce the availability of habitat, although the conservation objectives are subject to natural change;
- Sediment movement should not be significantly altered or constrained in order that favourable condition of the Defolin's lagoon snail is maintained.

Selsey Bill and The Hounds rMCZ

It should be noted that the proposed boundary of the recommended Marine Conservation Zone (rMCZ) Selsey Bill and The Hounds has been revised and the location of the proposed development is now within this recommended site. Please refer to the attached map showing the proposed new boundary. This rMCZ site has been recommended for designation for its peat and clay exposures, infralittoral rock, circalittoral rock, subtidal sand, subtidal mixed sediments, Bracklesham Bay geology and the presence of the short-snouted seahorse (*Hippocampus hippocampus*). Seahorses have been recorded in the shallow waters in the vicinity of the proposed development.

This rMCZ may or may not be put forward by Government in the Tranche 3 MCZ consultation / designation process early next year. However, given the potentially long time frame for the proposed development, and potential future routine maintenance works, it is advised that this site and its features are considered in preliminary assessments.

The following potential impacts on Selsey Bill and The Hounds rMCZ should be considered in relation to the proposed development:

- Direct loss of habitat could have an adverse impact on short-snouted seahorses;
- Alterations to sedimentation and turbidity can have an adverse impact on short-snouted seahorses;

- Sediment movement should not be significantly altered or constrained in order that favourable condition of the short-snouted seahorse is maintained, subject to natural change.

5. Comments on the alternative plan of the harbour concept design received on the 5th May, showing a revised footprint of the Haven.

It is thought that the revised angle and length of the harbour arms would not have a significantly different impact to the original design on the coastal processes and the potential implications for the associated designated sites as laid out in the paragraphs above.

This letter concludes Natural England's Advice within the Quotation and Agreement dated 4th May 2017.

The advice provided in this letter has been through Natural England's Quality Assurance process.

The advice provided within the Discretionary Advice Service is the professional advice of the Natural England adviser named below. It is the best advice that can be given based on the information provided so far. Its quality and detail is dependent upon the quality and depth of the information which has been provided. It does not constitute a statutory response or decision, which will be made by Natural England acting corporately in its role as statutory consultee to the competent authority after an application has been submitted. The advice given is therefore not binding in any way and is provided without prejudice to the consideration of any statutory consultation response or decision which may be made by Natural England in due course. The final judgement on any proposals by Natural England is reserved until an application is made and will be made on the information then available, including any modifications to the proposal made after receipt of discretionary advice. All pre-application advice is subject to review and revision in the light of changes in relevant considerations, including changes in relation to the facts, scientific knowledge/evidence, policy, guidance or law. Natural England will not accept any liability for the accuracy, adequacy or completeness of, nor will any express or implied warranty be given for, the advice. This exclusion does not extend to any fraudulent misrepresentation made by or on behalf of Natural England.

Yours sincerely,



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Enc:

Proposed new boundary map for Selsey Bill and The Hounds rMCZ
NE Internal technical advice note – Coastal processes and geomorphology

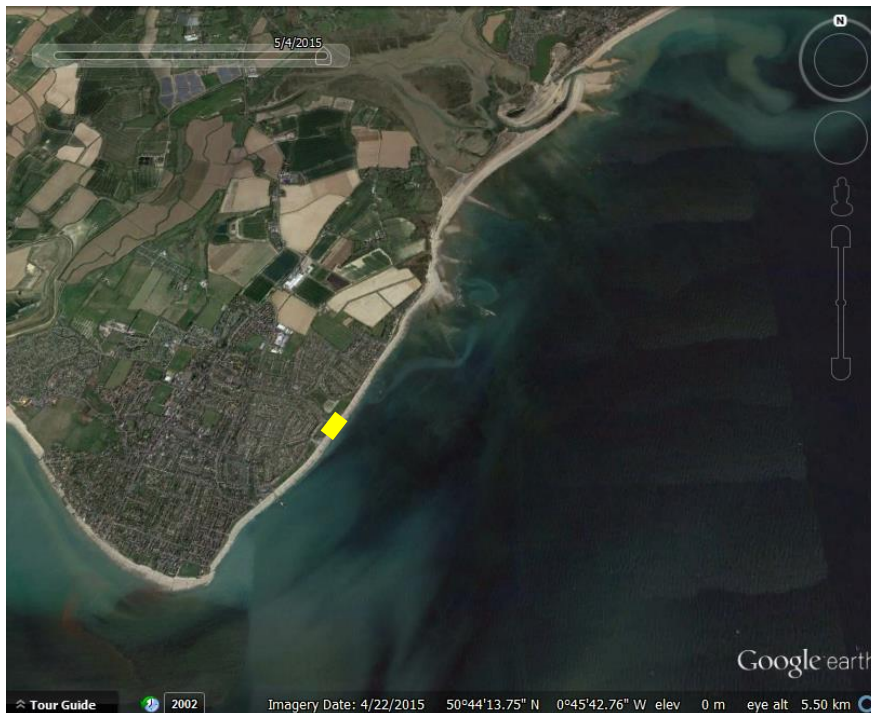
Coastal processes and geomorphology

Natural England internal technical note May 2017

Nick Williams – Senior Coastal Geomorphologist

Selsey Haven Consultation

Pagham Harbour SSSI (Geological Conservation Review series)



Summary of Geomorphological Interest

1. The notified geomorphological interest of the SSSI comprises the spits (both Pagham Spit and Church Norton Spit), the ebb and flood tide delta and the tidal channel in/out of Pagham Harbour. Pagham Harbour SSSI is reliant on fresh input of sediment and therefore is linked to the important wider coastal system. Sediment is supplied to the SSSI from a combination of onshore movement of sediment as well as, more importantly, material moving west to east from Selsey Bill to Church Norton Spit (Pagham Harbour SSSI). This up-drift system (from Selsey Bill) effectively feeds Pagham Harbour SSSI and, therefore, maintaining this conveyor belt of material is highly important when considering the notified geomorphological interest of the SSSI, as well as, the function the geomorphology plays in maintaining the other conservation features for which Pagham Harbour is designated.
2. The SSSI interest comprises both fossil (ridges and recurves) and active features (the on-going evolution of the spits and deltas). The fossil features provide evidence of how the spit has developed over time which enables us to understand how this feature has formed and developed. In terms of the active processes Pagham Harbour SSSI (Church Norton Spit) currently shows a truly exceptional rapid extension of its western spit that has not been seen elsewhere in England in recent decades (and possibly longer) which illustrates the geomorphological importance of this site in a national context.
3. This rapid extension has been triggered by the onshore arrival of a pulse of sediment between Pagham Harbour and Selsey Bill. The natural functioning of this stretch specifically the movement of material west to east (Selsey to Pagham) as well as on-shore movement is paramount to the evolution of the nationally important geomorphology interest of Pagham Harbour SSSI.

Geomorphological interest in detail

4. The importance of the site is explained in the Coastal Geomorphology Geological Conservation Review (GCR) volume which has been summarised in the SSSI citation. The GCR was a major initiative aimed at identifying and describing the most important geological and geomorphological sites in Great Britain. The link to the electronic GCR volume is available at <http://www.incc.defra.gov.uk/pdf/gcrdb/GCRsiteaccount1851.pdf>

5. The site SSSI citation for the geomorphological interest is as follows;

“Pagham Harbour is a key site for coastal geomorphology. It is significant both as a classic shingle spit landform and for the links that have been demonstrated between the coastal near shore and offshore forms and sediments. The shingle spit system comprises a series of sub-parallel ridges and recurves, marking different phases of extension and frontal accretion. Shingle reaches the beach via the intertidal zone, and the so-called “Pagham delta” and the behaviour of the spits and delta are intimately linked with water and sediment circulation around the Selsey peninsula. The area also provides an excellent example of the role of weed rafting of shingle in coastal sediment budgets.”

6. In essence the citation and GCR confirm that the spit is a key example of a shingle spit system. The spit has a number of features (ridges and recurves) which provide evidence of how the spit has developed over time which enables us to understand how this feature has formed and developed. The citation and GCR also confirm that a key interest of the site is the link between the coastal area (including the deltas) and the area offshore and how the sediment moves between these areas. The spit is an excellent example of spit growth associated with both longshore and offshore sources of sediment. In terms of this latter point the citation refers to “weed rafting” which is when kelp becomes attached to sea-bed gravels which are then transported by currents acting upon the kelp frond.

7. The GCR volume also provides some additional context on the importance of the site. It notes that;

“Pagham spit is the best-documented member of small paired spits in southern England, which together enhance our understanding of estuary-mouth sediment dynamics. In contrast to other double spits in England and Wales where sand is the main sediment, Pagham spit is formed predominantly of shingle. The development of shingle ridges has allowed the extension, breaching and repositioning of the detached ridges to be traced with greater certainty than is possible with sandy structures. Pagham Harbour thus adds considerably to the understanding of spit development.”

8. The recent interest (c.10 years) of the GCR feature is how Pagham Harbour is one of the most rapidly accreting sedimentary systems in England. The accretionary (accumulating additional material) system is evolving over very short timescales, which is not only in stark contrast to other systems in the rest of Great Britain and England but is unique under current climatic conditions (isostatic and eustatic sea level rise (sinking of southern England and rising sea level globally)). The scientific knowledge gained is important as barrier systems are extremely sensitive and respond extremely quickly to changes in physical forcing factors such as sea level rise, wind, waves and tides. The knowledge gained at Pagham is applicable to other locations, as well as acting as an indicator of the active coastal processes at this location due to the natural evolution of this set of features.

Sediment movement

9. *‘Shingle reaches the beach via the intertidal zone. The behaviour of the spit and the so called Pagham delta are intimately linked with water and sediment circulation around the Selsey Bill peninsular. The area also provides an excellent example of the role of weed rafting of shingle in coastal sediment budgets.’ ‘The supply of shingle to the spit has been and continues to be dominated by transport from the direction of Selsey Bill, supplemented by kelp rafted pebbles’* (Taken from the GCR Series Chapter).
10. The spit and the delta as well as the material that feeds these features are all of importance to the site. *‘The recent changes to Church Norton Spit should be regarded by Natural England as being exceptional... and therefore nationally important to scientific investigation for following natural evolution of this feature.’* (Julian Orford, 2015).
11. *The most modern interest of the site to science is primarily focused on the rapid phase of spit growth and the associated expansion of the delta* (Julian Orford, 2015). It is postulated that the material feeding the system is from marine sources (Inner Owers and Kirk Arrows) offshore (and then driven onshore between Church Norton and Selsey Bill) as well as the longshore drift coming from around and along the Selsey Peninsula.
- 12. To summarise the above it can be concluded that there is a clear sediment pathway from Selsey Bill (to the west) along the coast to Pagham Harbour (to the East). The Sediment transport system between these two localities is paramount to the conservation of Pagham Harbour SSSI.**

Installing a structure across the beach

13. Installing a structure within the intertidal of the beach east of Selsey Bill is likely to change the natural functioning and movement of sediments from within the cell (west to east).
- 14. The ability of the geomorphology interest of Pagham Harbour SSSI (including the two spits and delta) to evolve unhindered will be compromised. We should conserve as far as reasonably possible the feed of sediment to down drift areas (Inner Owers) and beyond to Church Norton Spit (Pagham Harbour SSSI).**

15. **Any alteration to the natural movement of material along the coastline; specifically halting, altering or removing the alongshore (as well as across shore) movement of material is likely to have an impact on the GCR site (compromising the rapid extension of the spit) and therefore the conservation status of the SSSI.**
16. The proposed 'Selsey Haven' is likely not to conserve and advance the SSSI interest features. As a result of the 'Selsey Haven' the worst case scenario would be a depletion of material reaching Inner Owers and subsequently the Pagham System (Pagham Harbour SSSI), potentially compromising the ability of particularly the Church Norton Spit to rapidly extend. It is highly likely material would build up on the up-drift end of the structure.
17. On the other hand the down drift end would either suffer from chronic sediment loss as material would not pass round the obstacle. This would be accelerated by cannibalisation in future as the longshore supply of sediment is cut off. Alternatively under wind and wave conditions where waves approach from the south-east there could be a build-up of material and the material become trapped and unable to become re-mobilised and re-enter the active system.
18. The comparatively flat (reflective) outer hard wall will cause beach draw down (potential lowering of the beach profile) and more reflective wave conditions, what this would do to sediment movement and the potential for material to be encouraged offshore is uncertain.

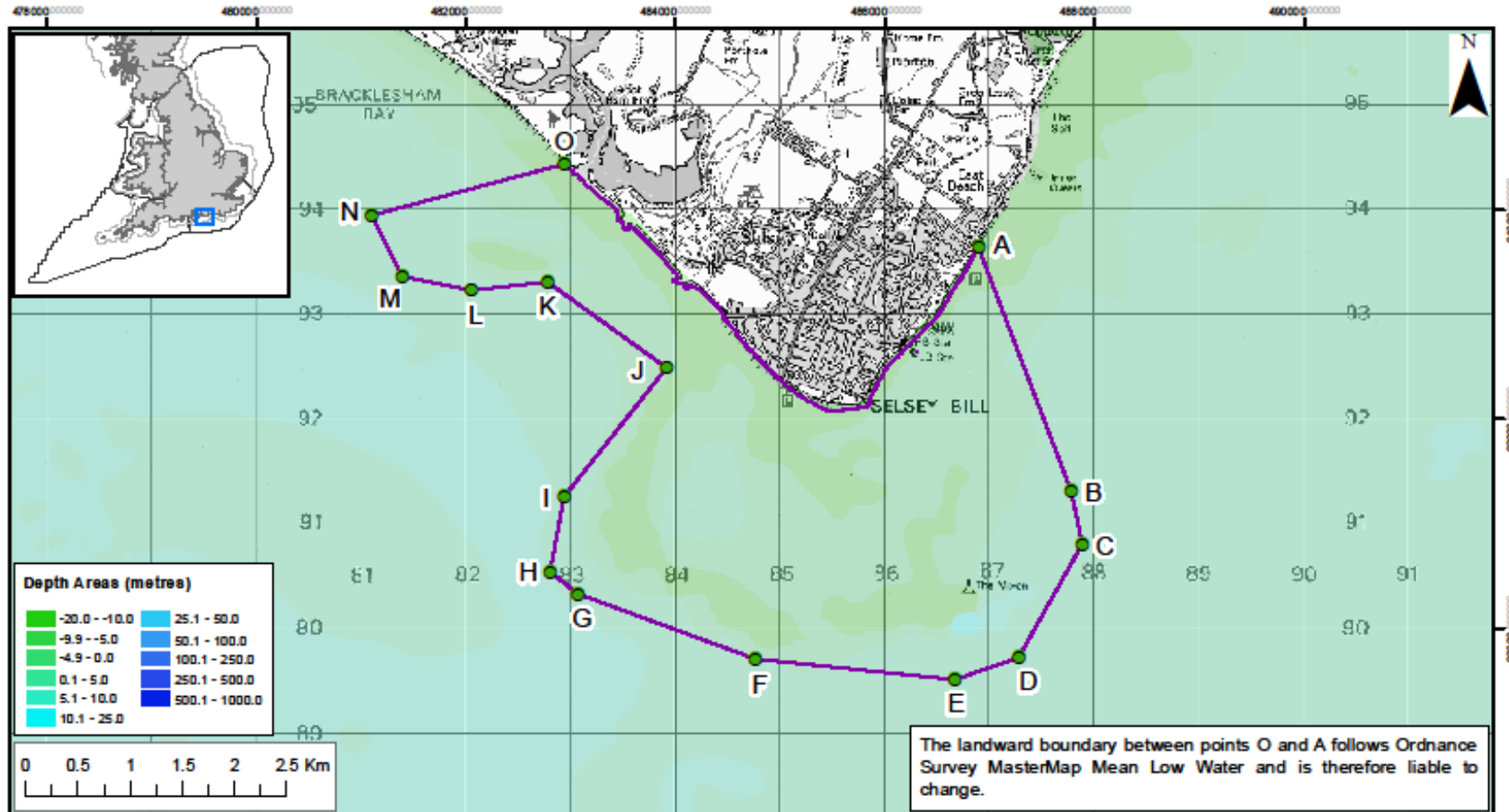
Potential mitigation measures

19. Periodic by-passing would not facilitate a natural functioning of the system and would be unlikely to have the flexibility in approach to act as the natural system does.
20. **The major issue is the structure protrudes onto the beach, crossing the upper beach, swash zone and into intertidal areas.**
21. Inlets (artificial or natural) cause a change or break in the sediment transport system, the effect of this at this location is unknown. Additionally a dredged channel effectively becomes a sediment sink (loss of sediment out of the system).

References

Orford, J. 2015. *Geomorphological advice in respect of ABPmer's proposal for the breaching of Pagham Spit, Sussex*. Internal report.

Selsey Bill and the Hounds rMCZ proposed new boundary



Selsey Bill and the Hounds rMCZ Boundary

- Recommended MCZ
- Regional MCZ project area
- rMCZ boundary co-ordinates
- 12nM Territorial Seas Limit
- Land

Point	Lat	Long	Point	Lat	Long
A	50° 44' 9.321" N	0° 46' 12.283" W	I	50° 42' 54.145" N	0° 49' 35.581" W
B	50° 42' 53.121" N	0° 45' 29.012" W	J	50° 43' 33.547" N	0° 48' 44.922" W
C	50° 42' 37.111" N	0° 45' 23.401" W	K	50° 44' 0.491" N	0° 49' 42.549" W
D	50° 42' 22.70" N	0° 45' 55.797" W	L	50° 43' 58.558" N	0° 50' 19.171" W
E	50° 41' 55.400" N	0° 46' 26.801" W	M	50° 44' 3.203" N	0° 50' 53.283" W
F	50° 42' 2.854" N	0° 48' 4.116" W	N	50° 44' 22.247" N	0° 51' 7.166" W
G	50° 42' 24.024" N	0° 49' 29.523" W	O	50° 44' 36.850" N	0° 49' 32.878" W
H	50° 42' 31.101" N	0° 49' 42.973" W			

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