



ABLE MARINE ENERGY PARK

THE INFRASTRUCTURE PLANNING (EXAMINATION PROCEDURE)

RULES 2010

RULE 17 REQUEST FOR FURTHER INFORMATION

RECEIVED ON 1 NOVEMBER 2012

APPLICANT'S RESPONSE



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RULE 17 FURTHER INFORMATION
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By:
Date: 08-11-2012

CONTENTS

UPDATE ON LAND ACQUISITION 3
CONTRIBUTIONS FOR CYCLEWAYS 3
DEVELOPMENT OF TRAVEL PLANS 5
ENVIRONMENTAL MONITORING AND MANAGEMENT PLANS (EMMPS) 6
MANAGEMENT OF THE REGULATED TIDAL EXCHANGE SCHEME..... 13
NEW CHANNEL TO CHERRY COBB SANDS 15
NORTH KILLINGHOLME MARSH FORESHORE 17
ANNEX 1
ANNEX 2
ANNEX 3
ANNEX 4



AMEP
RULE 17 FURTHER INFORMATION
APPLICANT'S RESPONSE

By:
Date: 08-11-2012

UPDATE ON LAND ACQUISITION

Q1 *Please provide details of any further changes in land sought for compulsory acquisition.*

Response

1. Refer to Table 1 at the end of these responses.

CONTRIBUTIONS FOR CYCLEWAYS

Q2 *At the Specific Issue Hearing on Road Transport and Access on 22 October the applicant stated that it was not committed to making a (circa) £150,000 contribution to improving cycle access to the proposed development and its environs, but would keep this under review.*

2. The issue of proposed cycleways is a relatively minor issue in the context of travel planning for the AMEP site.
3. Paragraph 2.1 of the DfT's Good Practice Guidelines, '*Delivering Travel Plans through the Planning Process*' describes a **travel plan** as a 'long-term management strategy for an occupier or site that seeks to deliver sustainable transport objectives through positive action and is articulated in a document that is regularly reviewed. It involves the development of agreed explicit outcomes linked to an appropriate package of measures aimed at encouraging more sustainable travel, with an emphasis on reducing single occupancy car use. **Each travel plan should be unique to a site.** Travel planning should be developed as one of the means of delivering an area's sustainable transport strategy', (bold emphasis added)
4. The preferred approach for the applicant's travel plan, as identified in current DfT guidance, is to adopt an 'outcomes' approach as distinct to a 'measures' approach. The Applicant has stated that the real benefits, in terms of reducing single occupancy vehicles, for this site will be made through the provision of shuttle buses or through car sharing (refer to The ES, Annex 15.2, paragraph 5.3.5)
5. The Applicant's Summary of Case in respect of highway issues (22nd October 2012) explained that, on the basis of average cycle journeys of 5 km, the populations of East Halton, North and South Killingholme, Habrough and Immingham were within cycling distance of the site. However, based upon the evidence available, the best informed estimate is that only six individuals are calculated to be likely to commute to the site by bicycle. This should also be understood in the context of CTC - the national cycling charity -targeting a doubling of cycle use every 10 years.
6. Of further relevance is that the existing infrastructure - within a highly industrialised area generating high volumes of HGVs onto congested roads (regardless of its favourable topography) - is not conducive to significant cycle use. Indeed there are no continuous cycle paths between the settlements and



AMEP
RULE 17 FURTHER INFORMATION
APPLICANT'S RESPONSE

By:
Date: 08-11-2012

the application site. Also relevant is the fact that the existing infrastructure, in the light of the proposed improvements to the A160, is likely to change. Any adaptations today – even with a significantly increased demand from cyclists – are likely to be subsumed in the near future and this applies specifically to any **'temporary' improvements** to both the Humber Road/Rosper Road junction and the Manby Road roundabout.

7. NELC has not provided any details of where, on the network, the £150 000 cycleway improvements would be undertaken and it is not therefore clear how any such improvements would in themselves benefit AMEP. It is in fact obvious that a joint approach is required on this matter involving NLC, NELC and the Highways Agency as well as other employers on the South Humber Bank. In the absence of any clear plan, the Applicant is happy to clarify that if, or when, a real demand is established it will respond accordingly, as set out below.

(a) What arrangements does the applicant propose for carrying out such a review or reviews?

Response

8. The Applicant has submitted its Framework Travel Plan that has the specific action of seeking to achieve the lowest practical level of single occupancy trips to or from the site and to widen the use of other travel modes. More generally it seeks to assist in the wider aims of encouraging sustainable travel, improving health and reducing congestion, energy consumption and pollution. Clearly increased cycle usage falls into these categories and this is supported by a wide variety of national and local policy statements. It is also reasonable to assume that, within **the overarching remit of the site's occupiers who, after all, are** engaged within the renewable energy sector, they too would share a similar aspiration.
9. The Applicant will have appointed a Travel Plan Coordinator within three months of any Consent and will submit the Travel Plan for formal approval shortly thereafter. The travel plan will be a live document that is subject to change throughout the lifecycle of the development. Measures to encourage alternative modes of transport will be monitored and developed. Measures that do not yield any benefits will be adapted, or possibly even discontinued. Each site occupier/tenant will have their own Travel Plan Manager and they will join the Steering Group on appointment.
10. The DCO requires the Travel Plan to be reviewed, as a minimum, on an annual basis and the Steering Group will undertake that task and any subsequent action required. The need to develop cycling infrastructure and any measures to be introduced will be considered, with particular reference to the A160 improvements and the strategic cycling and pedestrian network, as part of these reviews.

(b) With whom would the review(s) be carried out?

Response

11. The Steering Group will have representation from the two relevant planning authorities, the Highways Agency, the Applicant and the site occupiers – these are seen as the relevant participants and those best placed to lead, advise and implement.

(c) *Under what criteria would all or part of the funds be released?*

Response

12. This would be determined by the Steering Group and in accord with the annual reviews and the extent of likely (increasing) demand

(d) *How are these arrangements to be secured?*

Response

13. The Applicant will submit a Unilateral Undertaking to the Examining Authority before the end of the examination that will commit the Applicant to provide an appropriate funding contribution up to a maximum value of £150,000 in the event that a coherent cycleway scheme is brought forward, approved by a majority of the Steering Group and a contractor is appointed to carry out the works.

DEVELOPMENT OF TRAVEL PLANS

Q3 *Does the applicant intend to reach agreement with local authorities and other appropriate parties on the main components of the framework travel plans and the means by which they will be enforced before the end of the examination?*

Response

14. Whilst the question refers to '*framework travel plans*' (plural), and the means by which '*they*' will be enforced, there is just one Framework Travel Plan (FTP) for the site. Occupiers will be required to produce separate Occupier's Travel Plans, which are based upon the FTP and to include a requirement to achieve the same '*outcomes*' as the FTP. The relationship between the FTP and the OTPs is illustrated in Figure 1 of the FTP (ES, Annex 15.2).
15. It is noted at paragraph 5.1.4 of the FTP that, '*occupiers will be obligated to achieve the targets set out in the FTP through their lease agreements which will incentivise compliance with travel plan targets*'.
16. The applicant has already reached agreement with North Lincolnshire Council, North East Lincolnshire Council and the Highways Agency on the main components of the FTP as evidenced in the Statements of Common Ground with each of those bodies.



AMEP
RULE 17 FURTHER INFORMATION
APPLICANT'S RESPONSE

By:
Date: 08-11-2012

17. Enforcement of the FTP would be ensured by the operation of sections 161 and 171 of the Planning Act 2008. By virtue of section 161 it is an offence for a person to fail to comply with the terms of a DCO, which would include the requirements in Schedule 11 of the AMEP DCO. This applies to any person, not just the applicant. Thus if targets in the FTP were not being met, for example, this would be an offence for which both the applicant and relevant tenants would be responsible. Through prosecution an unlimited fine can be levied and the local planning authority can also seek an injunction under section 171.
18. An additional section has been added to the FTP to limit development on the site, in the event that the specific objectives of the Travel plan are not being met, or are not likely to be met within a realistic timescale, by the previous development phases. A revised document, Revision E, is submitted with this response.

ENVIRONMENTAL MONITORING AND MANAGEMENT PLANS (EMMPS)

Q4 (a) *What if any guidance on the production of EMMPs has been drawn on in the drafting of the EMMP reports for the AMEP project?*

Response

19. The Applicant has appointed the Institute of Estuarine and Coastal Studies (IECS) from the University of Hull to prepare the three EMMPs covering ecological issues. A statement of their capability is reproduced in Annex 1. It is particularly noted that IECS have appropriate experience including that gained from monitoring other habitat creation sites on the Humber Estuary.
20. None of the three DEFRA public bodies (the EA, NE and MMO) has identified any specific relevant guidance to the Applicant. However reference has been made to the Environment Agency's 2008 document, *'Managed Re-alignment – Moving Towards Water Framework Directive Objectives: Analysis of Best Practice Monitoring for Managed Realignment Sites around Europe'*.
21. The drafting of the EMMPs followed initial guidance provided by Natural England who forwarded 'skeleton' EMMPs to the Applicant. These 'skeleton' documents detailed broad requirements for document layout (e.g. table of contents), as well as some of the topic and detail level expected. The development of the EMMPs has also benefited from face-to-face meetings with staff from Natural England, the Environment Agency and the MMO.

(b) *In drawing up the EMMP reports for the AMEP project, what regard has been had to existing EMMPs produced in relation to port and harbour developments in the Humber Estuary and what if any lessons have been learnt from the operation of such EMMPs?*

Response

22. The Environment Agency has produced an Environmental Action Plan for their managed realignment site at Paull Holme Strays and the Applicant is in the process of obtaining a copy of that document. However, it is of note that IECS were involved in the development of the ecological target setting and associated monitoring programme design for the Paull Holme Strays site (e.g. physical and biological requirements).
23. Through contact with the three DEFRA public bodies, the development of the EMMPs will draw upon experience associated not only with other EMMPs relating to port and harbour developments in the Humber Estuary but also with the management and monitoring of estuarine sites in the wider context. However, it is noted that whilst there are a number of similar plans available for managed realignment (MR) sites around the UK, on the Continent and in the US, the Humber presents some relatively unique challenges for MR, hence the development of the RTE approach for this project.
24. Further experience gained by IECS from the ongoing EU Interreg TIDE project has therefore also been applied where possible. This trans-national project looks at the provision of integrated management tools for port development and operation in Natura 2000 estuaries, including the application and operation of compensation sites to address functional Natura 2000 losses from port activities and the associated development of RTE and MR methods to assist this process.

(c) *The European Commission services document of January 2011 "Guidelines on the implementation of the Birds and Habitats Directives in estuaries and coastal zones with particular attention to port development and dredging" includes the following as one of two "Guidelines for adaptive management":*

'In case of any remaining scientific uncertainty with regard to the effects of mitigation or compensatory measures, the measures must include a pre-defined and validated scheme to monitor the actual impacts and a framework, such as a Natura 2000 management plan, integral plan or a programme of measures, to adapt mitigation and compensation measures to the actual impacts.'

In what ways if any will the EMMPs being produced for the AMEP project incorporate aspects of adaptive management and reflect this advice?

Response

25. The EMMPs each include monitoring schemes by which the impacts of the development, and the performance of agreed compensation measures, can be assessed. These monitoring schemes have been (and will continue to be) developed with input from the DEFRA bodies. It is recognised that adaptive management of both mitigation areas and compensation sites (including the intertidal area, the wet grassland and the roost) has a significant role to play. In addition to management, monitoring should also be adaptive, with programmes being open to modification (for example, as regards timescales or spatial extent) where it is deemed necessary or appropriate. In particular the timeframe for monitoring needs to be flexible and, in view of this, provision will exist for the extension of agreed monitoring periods where it is felt to be appropriate (the default programme period being 10 years). The EMMPs describe a regular reporting process (6 monthly meetings and annual reports) and includes review of reports by an Environmental Steering Committee (although future drafts of the EMMP will refer instead to an Ecological Advisory Group (EAG)).
26. Where circumstances arise such that adaptive measures are required, these will be identified through the monitoring programme and implemented by the Applicant. The EMMPs therefore contain an inherent iterative process, which ensures that the necessary degree of flexibility and response to both monitoring and management can be secured in order to fully address any scenarios that may develop.
- (d) *The three documents (EX10.9, EX11.32 and EX28.3 Part 7) are all designated 'draft reports'. Would the applicant confirm or clarify –*
- (i) *what is the timetable for the production of the final monitoring and management plans;*

Response

27. The Environmental Management and Monitoring Plans for the ecological aspects of the Project will comprise the three subject specific EMMPs noted above. Natural England has stated in response to the Q69 of the 2nd Set of Examiner's Questions that:
- 'In view of the importance of the EMMPs to the successful delivery of the environmental mitigation and compensation measures of the proposed project, Natural England advises that it will be of the utmost importance to finalise and agree all 3 EMMPs before the end of the Examination period',* (paragraph 81)
28. The applicant reviewed the three draft Ecological EMMPs with Natural England and the Environment Agency on 30 October 2012; a record of the discussion and agreed actions is included in Annex 2 of this response.
29. In accordance with public notices published by the Applicant in the press, other consultees have been requested to comment on the draft EMMPs by 9 November 2012. The applicant will review those comments and have regard to them before preparing a second draft document that will be issued to Natural England, the MMO and the EA on 12 November.



AMEP
RULE 17 FURTHER INFORMATION
APPLICANT'S RESPONSE

By:
Date: 08-11-2012

30. Any further comments received from the three regulators will be incorporated into a final draft that will be issued to the Examining Authority on 23 November.
31. It is emphasised that the final approval of the three EMMPs and any future revisions to them will rest with the following bodies, post consent:
- a) Terrestrial EMMP: Natural England (DCO, Schedule 11, paragraph 17(3))
 - b) Marine EMMP: Marine Management Organisation (DCO, Schedule 11, paragraph 17(2))
 - c) Compensation EMMP: Natural England (DCO, Schedule 11, paragraph 17(1))
32. Accordingly the EMMPs cannot be formally approved until after a consent is issued.

(ii) what process is proposed for the final agreement and adoption of the EMMPs;

Response

33. The three EMMPs are subject to final approval after the granting of a Development Consent Order by virtue of Schedule 11, paragraph 17 of the draft DCO. In accordance with the draft DCO, it is for Natural England to approve the Terrestrial and Compensation EMMPs following consultation with the EA and the relevant planning authority, whilst the Marine EMMP is to be approved by the MMO following consultation with Natural England, the EA and the relevant planning authority.
34. Accordingly, the applicant will submit the three EMMPs for formal approval by the relevant bodies following the grant of any Consent. The Applicant will implement the approved Plans following their approval and works will commence in accordance with any relevant constraints within the Plans.

(iii) what mechanism is proposed to ensure the adoption and implementation of the EMMPs before works commence;

Response

35. Approval of the three EMMPs, before commencement of the authorised development is a specific requirement of the DCO, at Schedule 11, paragraph 17.
36. Implementation of the Plans will be ensured by the operation of sections 161 and 171 of the Planning Act 2008. By virtue of section 161 it is an offence for a person to fail to comply with the terms of a DCO, which would include the requirements in Schedule 11 of the AMEP DCO. Thus if the works were commenced before the Plans had been implemented this would be an offence for which the applicant would be responsible. Through prosecution, an unlimited fine can be levied and the local planning authority can also seek an injunction under section 171.



AMEP
RULE 17 FURTHER INFORMATION
APPLICANT'S RESPONSE

By:
Date: 08-11-2012

37. Notwithstanding the above, at least three months prior to the works commencement date, the applicant will call a meeting of the Ecological Advisory Group to obtain agreement on the start date for the works. This procedure will be incorporated into each of the Ecological EMMPs.

(iv) what risk review and risk management measures will be adopted and applied in the final EMMPs;

Response

38. The EIA process has made a precautionary assessment of the likely impacts of the project on ecological receptors during both the construction and operation phases. Notwithstanding this, it is acknowledged that ecological impacts are uncertain and residual risks remain, and it is the primary purpose of the EMMPs to provide monitoring data to determine, quantitatively, that mitigation is functional and sufficient and that impacts are no more widespread than anticipated. Where this is not the case, they provide a mechanism for agreeing adaptive measures.
39. Accordingly, the EMMP for the Project will include the appointment of a suitably qualified and experienced Environmental Manager who will be appointed by AHPL and who will, amongst other duties: coordinate all ecological survey work; receive and review all survey work; **review Contractor's Construction Environmental Management Plans (CEMPs)**; liaise with members of the EAG and produce an annual report which will compare Plan objectives to survey results. The Environmental Manager will be responsible for reviewing environmental monitoring reports on a rolling basis and identifying any trends that are beyond those that have been reasonably anticipated. Where such adverse environmental trends are identified, the Environmental Manager will be responsible for investigating the causes of those adverse trends and issuing instructions to contractors as appropriate. In this way the risks of any permanent adverse effects of the development exceeding what has been assessed, will be as low as reasonably practicable.

(v) how the objectives of the EMMPs will be set, whether and how the EMMPs will be cross-referred to any Appropriate Assessment made by the Secretary of State, and whether and how the EMMPs objectives might be related to the protecting the integrity of the Humber Estuary European Sites;

Response

40. The objectives of the EMMPs will be established quantitatively from the baseline surveys for each habitat type or species. The objectives will generally be based upon no net loss of protected habitat or no reduction in species population within a specified location and ultimately within the Humber SPA context. These quantitative objectives will be included in final draft documents to be submitted on 23 November.



AMEP
RULE 17 FURTHER INFORMATION
APPLICANT'S RESPONSE

By:
Date: 08-11-2012

41. As the final EMMPs are subject to a post-consent approval process, in accordance with the requirements of the draft DCO, the opportunity will exist for the approved EMMP to have regard to the appropriate assessment made by the Secretary of State.
42. It is a matter of common ground between the Applicant and the Regulators that the development of AMEP will have an adverse effect on the integrity of the Humber Estuary European Sites. However, the compensation is designed to provide sufficient habitat to replace what is to be lost on a like for like basis and for it to have sufficient functional value to maintain the populations of species on **the site. Accordingly, the habitat and species objectives of the EMMP's will include the development of functional habitat that is equivalent to that found in the Middle Estuary, and the use of that habitat by a substantial proportion of the bird species displaced by AMEP.**

(vi) whether the Environmental Steering Committee is to be advisory (EX28.3 part 7, paragraph 76) or executive (paragraphs 140-141); if advisory, where final executive responsibility will lie;

Response

43. The Ecological Advisory Group, as its name suggests, it will be advisory.
44. Responsibility for implementing the plans, and any approved revisions thereof will rest with the Applicant following their approval in accordance with the process set out in the draft DCO

(vii) how specific actions will be identified and implemented if and when desired outcomes are not achieved (e.g. EX 11.32, paragraph 82, the grazing regime);

Response

45. The species and habitat monitoring reports will be prepared by the Applicant in accordance with the approved EMMPs and provided to the Ecological Advisory Group and will provide the evidential basis for decision-making. Where monitoring reports show that the quantitative objectives of the EMMPs are not being achieved, and there are no extenuating circumstances to be taken into account (such as a particularly harsh winter), the Applicant will consider the advice of the Ecological Advisory Group and submit a revised EMMP for approval by the relevant approving authority.



AMEP
RULE 17 FURTHER INFORMATION
APPLICANT'S RESPONSE

By:
Date: 08-11-2012

(viii) the intended lifespan of the EMMPs and the provision and mechanisms, if any, for rolling them forward;

Response

46. The EMMPs will initially cover a period of 10 years. At the end of that period the Ecological Advisory Group will consider the need for extending the EMMP periods and the applicant will be bound by its recommendation insofar as it is reasonable. This obligation on the applicant will be included in the final draft EMMPs to be submitted on 23 November.

(ix) the provisions for updating the EMMPs, and specifically with regard to the progress on habitat creation and monitoring of effects on individual species;

Response

47. An annual reporting and review period is considered appropriate. Habitat and species monitoring reports that are specified in the EMMPs will be submitted to each member of the Advisory Group as they are completed, with a bi-annual meeting held in the March and September of each year to review the findings, update the EMMPs and agree on-going management practices. The reports will additionally be made available on an FTP site to facilitate wider dissemination.

(x) how the baseline situation against which monitoring would be carried out will be established and agreed;

Response

48. The baseline conditions of the site have already been established as part of the EIA process. Agreement on the baseline is recorded within the Statement of Common Ground between the Applicant and the NE/EA/MMO in respect of the Environmental Statement; refer to Table 15.1 and 16.1 therein.

(xi) what provision might be made for calling for and commissioning further baseline surveys if these became necessary;

Response

49. The Applicant accepts that baseline ecological surveys may become invalid if the time period between them and the start of the works becomes significant for a particular species or habitat. As **'significance' will be species and habitat specific**, the validity period of each baseline survey will be stated in the final draft EMMP and there will be a requirement within the Plan to undertake a new baseline survey if the EIA baseline does become invalid through time.



AMEP
RULE 17 FURTHER INFORMATION
APPLICANT'S RESPONSE

By:
Date: 08-11-2012

(xii) *how specific instructions to contractors or construction workers are to be expressed;*

Response

50. Contractors will be required to prepare and maintain an appropriately detailed Construction Environmental Management Plan (CEMP) to be approved by the Applicant. Contractors will also be required to prepare a method statement specifying how their CEMP is to be implemented.
51. The EMMPs produced by the applicant to discharge construction precedent requirements, together with the Code of Construction Practice (Annex 4.2 of the ES, final version to be approved by the relevant planning authority (draft DCO, Schedule 11, Requirement 18)) will provide appointed contractors with sufficient information for them to produce their CEMPs and detailed method statements. These Contractor generated documents will set out details of the practical execution of the construction works and the implementation of the associated environmental mitigation measures.

(xiii) *what the reporting mechanism for each EMMP will be?*

Response

52. The applicant will arrange a meeting of the EAG every 6 months.
53. The Applicant will provide a written annual report on each EMMP to the Ecological Advisory Group in January of each year. The report will include:
- Review of construction activity in the previous year.
 - Environmental incidents on the site and corrective actions
 - Monitoring results for the previous year
 - Discussion of population and habitat site impacts.
 - Comparison of survey results to objectives within the context of the development phase and also within the context of any national trends or unusual events.
 - Statement of Plan Compliance over the previous year.
 - Proposals for management actions.
 - Programme of construction works for the following year and future monitoring programme.

MANAGEMENT OF THE REGULATED TIDAL EXCHANGE SCHEME

Q5 (a) *What active management regime is proposed to monitor, calibrate and if necessary adjust the operation of the sluice gates?*

Response

54. The applicant will install automatic recorders to monitor the water level within each RTE field as proposed in paragraph 7.6.2 of EX28.3 part 3. In addition a



AMEP
RULE 17 FURTHER INFORMATION
APPLICANT'S RESPONSE

By:
Date: 08-11-2012

similar water level monitor will be placed in the open part of the managed realignment to provide a reference level to assess how water levels inside and outside the RTE fields are related.

55. Sluice operations will be gradually modified as the fields accrete to maintain similar amounts of inundation into the fields. Sediment levels will be monitored by stakes as proposed in paragraph 7.6.1 of EX28.3 part 3, supported by occasional use of LiDAR remote sensing (Paragraph 7.6.2).
56. Marks will be placed on the rising stem of each sluice to provide a simple direct reading of the opening of each sluice. The sluice settings used will be recorded. This will be to confirm the relationship between sluice settings and the depth of water in each RTE field for a range of tidal conditions.
57. No specific calibration of the sluice structures will be required once the local datum level for each sluice is established during construction, apart from establishing the sluice settings required to give the required inundation as discussed above.
58. Initial operation will be based on the model results but this would be reviewed in light of operational experience during the warping up period and, if necessary, modified to ensure the sluice opening provides the required water depth in each RTE field.
59. All the sluices will be regularly used to prevent siltation in the passageways. If only one or two sluices need to be used at a time, those being used should be changed each successive spring tide period.
60. At this time it is anticipated that two full time employees will be employed by the Applicant (with provision for holiday and sickness cover) for day-to-day operation, maintenance and management of the RTE fields and their sluices. Their duties will include, routine operation of the sluices to meet the management objectives of the site, maintaining the water level records, the readings of sediment levels and the records of sluice operations.

(b) How often will it be necessary to operate the sluice gates (para 4.6.20 et seq of EX28.3 Part 3)?

Response

61. The number of times sluice settings need to be changed will be minimised. It is therefore expected that sluice settings would not be changed during spring tide periods. However, settings will need to be changed several times each fortnight and frequently during neap tide periods to ensure that all the RTE fields remain wet when the natural tides are not high enough to inundate the RTE fields as described in Section 7 of EX28.3 part 3.
62. Each fortnight as tides reduce from springs to neaps, the outlet sluices will be closed. Based on Table 6.2 and Figure 6.2 of EX28.3 part 3 there is a 4 to 6 hour period when water levels are within 10mm of the minimum. The outlet sluices will be closed during this time. In addition, some of the 3 inlet sluices on

each structure may also be closed. On the following high tide the remaining inlet sluices for each field will be open to allow around 100mm of water onto the fields. These sluices will be closed at high tide in the RTE in three of the four fields. The sluices in the fourth control structure would have been closed several days earlier to provide neap tide storage (discussed below).

63. As tides increase from neaps to springs the process will be reversed with all sluices opened to the amounts required for normal operation during the 4-6 hour low tide period preceding the first high tide that is expected to flood the RTE fields.
64. At the time of peak spring tides, the sluices on the RTE field being used for storage will also be closed in the same manner as described above for the other three fields. As this field is required to store 600 to 800mm of water, probably all 3 inlet sluices will need to be opened on the rising tide and then progressively shut as levels approach the desired storage level.
65. During bed levelling and dredging operations when RTE field water depths have to be deep enough to allow the necessary plant to float, a tide with a high enough high water level will first need to be selected. If needed, the flaps on one or more of the outlet sluices could be raised to allow up to six sluices, if necessary, to be used to fill the RTE. Any remaining outlet sluices will be closed during the preceding low water period. All the sluices being used for inflow will be progressively closed as water levels in the RTE approach the required level.
66. During neap tide periods when the main sluices will normally be closed, one of these sluices will be opened on those tides when the impounded water is 'Drained' as shown on tables numbered 9.1, 9.3 and 9.4 in EX28.3 part 3 and found at the end of Section 7. During these periods, the transfer sluices on the field connection culverts shown on Figure 4.4 of EX28.3 Part 3 will also be **operated to transfer flows between RTE fields to provide the 'Refill' shown on the tables numbered 9.1, 9.3 and 9.4.** In view of the frequency of operation of the sluices in the inlet/outlet structures, further consideration of operational modes of the structures will be carried out during detailed design as foreshadowed in paragraph 4.6.25 of EX28.3 part 3 to determine an Operational Regime. The optimum type of equipment and methods of operation for the control structures will be determined taking account of safety and effectiveness of operations, manpower requirements, most suitable types of local power sources (mobile or static) and siltation management.

NEW CHANNEL TO CHERRY COBB SANDS

- Q6 (a) *How critical is the design of the new channel through the salt-marsh to the proposed breach site?*

Response

67. The channel through the existing foreshore is an essential component of the Regulated Tidal Exchange scheme as it allows the four RTE fields to drain. The breach in the ES was proposed to have an invert level of 2.0 ± 0.2 mAOD (paragraph 28.2.22 of the ES). This level is too high to allow the proposed RTE

fields to fully drain. These fields are proposed initially to be at a level of 1.9 to 2.0 mAOD.

68. The critical features of the New Channel design are that its level, width and slope should allow the fields to freely drain and that the channel should not silt up. The invert level of Cherry Cobb Sands Creek at the breach location is close to 0.0 mAOD (see Figure 12.7 of EX28.3 Part 3 and Figure 12.6 for the location of the three cross sections). The 2012 ground truth survey shows minimum levels of 0.06, 0.02 and -0.01 mAOD at cross sections O, P and Q respectively, with O being the most upstream section.
69. The proposed New Channel outfall into Cherry Cobb sands Creek is expected to have an invert level of 0.5 ± 0.3 mAOD. This level range is above the present invert level of Cherry Cobb Sands Creek.
70. Sections 5 and 6 of EX28.3 part 3 assumed an invert for the New Channel outfall at the upper end of this range, which allowed all RTE fields to drain. However, with the lower ground levels for Fields 1 and 2 suggested in section 8.2 of EX28.3: Part 3, the outfall level will need to be lower to maintain free drainage of these fields. This reduction in level is expected to bring the proposed new channel outfall level close to the middle of the range proposed above. The dimensions and level of this channel will be finally determined at detailed design stage.

(b) Is it the intention that all water egress from the RTE should use this channel?

Response

71. When the tide starts to ebb, the whole of the breach area will be used to evacuate water from the site. As water levels in the estuary fall towards the breach invert level, an increasing proportion of the outflow from the site will be through the New Channel.

(c) Will the channel be subject to maintenance dredging?

Response

72. The proposed New Channel tested in sections 5 and 6 is predicted to be erosion dominant because of the strong fairly shallow flow in the second half of the ebb tide when the outflow from the four RTE fields is confined within this channel as reported in paragraph 8.1.8 of EX28.3 part 3.
73. At the present time there is no indication that maintenance dredging will be required, and the detailed design will seek to minimise this risk.

(d) How will possible interaction with Stone Creek be monitored and managed?

Response

74. The development of the RTE scheme within the Compensation Site does not change the proposals for monitoring and managing any interaction with Stone Creek. The findings in relation to Stone Creek are summarised in paragraph 8.1.7 of EX28.3 part 3.
75. In the initial warping phase which is expected to last 1-2 years, the outflows from the Compensation Site down Cherry Cobb Sands Creek are expected to be similar to but slightly greater than those considered in the ES. These findings are reported in Paragraphs 5.3.9 to 5.3.11 of EX28.3 Part 3.
76. When the operational phase starts, the outflows from the Compensation Site into Cherry Cobb Sands Creek will be significantly smaller than during the warping phase, and smaller than those anticipated in the ES as reported in paragraphs 6.4.1 to 6.4.3 of EX28.3 part 3, though they are expected to remain greater than those experienced at present.
77. During periods of removal of material from the RTE fields by bed levelling and or dredging the bed levels in the entrance to Stone Creek will be observed prior to, during and after the removal operations. Should bed levels be observed to rise in the entrance to Stone Creek during this period, consideration will be given to the need to remove any build up using bed levelling.

NORTH KILLINGHOLME MARSH FORESHORE

- Q7 *Paragraph 1.2.1 of the Non-Technical Summary of the Final Compensation Proposals (EX 28.3), amplified in Section 1.4 of EX28.3 Part 2, states that since the construction of the Humber International Terminal (HIT) the trend of erosion at North Killingholme Marsh Foreshore has been reversed, to the extent of a 3.5m rise in the foreshore level over a ten- year period.*

Accepting the uncertainty associated with this 'dynamic foreshore', if the AMEP quay development were not to proceed, what is the best estimate as to how much of the current inter-tidal mudflat in the quay site would be likely to become salt marsh, and over what period?

Response

78. Evidence with respect to the historic erosion of the foreshore over the last 50 years is reported by the Environment Agency in, '*Humber Estuary Shoreline Management Plan Phase 2 - Geomorphology Addendum*', (Black and Veatch/Halcrow 2005) which is included in Annex 2 of this response.
79. EX8.9 explains the evolution of the Killingholme foreshore over the last 10 years, using LIDAR data obtained from the Environment Agency. In essence, the foreshore is accreting and the foreshore slope '**flattening**' due the impact of the reclamation for Humber International Terminal.



AMEP
RULE 17 FURTHER INFORMATION
APPLICANT'S RESPONSE

By:
Date: 08-11-2012

80. EX11.24 explains the potential long-term evolution of the foreshore over the medium (0-30 years) and long term (0-100 years); in the absence of AMEP the foreshore is likely to continue to accrete as it has done over the last 10 years (EX8.9). Figure 2 shows the possible location of the 2.5m OD contour along the NKM foreshore in 2030. Whilst saltmarsh development is dependent on a number of factors, and not simply on elevation within the tidal range, allowing for 50 per cent of the postulated area above the 2.5m contour to develop as saltmarsh would result in around 20 ha of this habitat developing in the medium term.
81. It should be noted however that accretion is not the only process that currently affecting the NKM foreshore. As also explained in EX11.24, rising sea levels that are predicted to occur over the coming decades will also lead to a reduction in the intertidal area within the Humber Estuary. This results from a rise in the low water **mark, which 'squeezes' the intertidal** habitat that is constrained from natural evolution by existing flood defences. **In the EA's written summary of** their oral case in respect of the Issue Specific Hearings held on 11th – 13th September, they agreed that rising sea levels are likely to result in the loss of c.4.8 ha (+/- 1.8ha) of intertidal habitat from the NKM foreshore.
82. Taking these two processes into account therefore a total loss of mudflat from the NKM foreshore might reasonably be estimated to be 25 ha over the next 20 - 50 years. An uncertainty factor of 50 per cent might be appropriate in this case, giving a possible range of 12.5 – 37.5 ha of natural mudflat loss.



AMEP
RULE 17 FURTHER INFORMATION
APPLICANT'S RESPONSE

By:
Date: 08-11-2012

Table 1: Status of Land Acquisition as of 8 November 2012

Land Parcel	Description	Current Status of Negotiations for Compulsory Acquisition
RESIDENTIAL		
03024	The Lighthouse	<p>The owner – Mrs Harper – attended the Compulsory Acquisition Hearing on Tuesday 16th October 12. At the Hearing the Applicant explained that Mrs Harper was receiving further professional advice and had understood that a refreshed valuation was being obtained.</p> <p>At the Hearing Mrs Harper commented that, <i>'I don't think there is anything I need to say....I have heard what the pollution is going to be and I think that's appropriate to what I needed to know. Neil is absolutely right....we are in negotiations....'</i></p> <p>Since that time Mrs Harper has stopped using her appointed agent, the surveyor, Mr Bill Cuff. The applicant was advised (29th September 12) that Andrea Park, a solicitor with Beetenson Gibbon, was her representative but that situation has apparently changed and we understand that Marian Griffiths, a solicitor with Leeds based solicitors Cobbetts, has taken over that role. Ms Griffiths however has yet to receive specific instructions from her client and the refreshed valuation has not materialised – the process of negotiation has therefore been frustrated.</p>
03025	The Lookout	<p>The owner - Mr Revill- did not attend the Compulsory Acquisition Hearing on Tuesday 16th October 12. At the Hearing the Applicant reported on the status of the extensive discussions that had taken place and that the Applicant anticipated receipt of a valuation obtained by Mr Revill. To date that valuation has not materialised. Whilst Mr Revill has suggested that he has appointed a solicitor, no detail or contact has emerged. In the meantime the Applicant was informed (2 November 12) that Mr Revill is <i>'going on holiday for two weeks'</i>. The Applicant remains frustrated by the lack of progress.</p>



AMEP
RULE 17 FURTHER INFORMATION
APPLICANT'S RESPONSE

By:
Date: 08-11-2012

Table 1: Status of Land Acquisition as of 8 November 2012

Land Parcel	Description	Current Status of Negotiations for Compulsory Acquisition
SOUTH BANK		
03009, 03010	Bethany Jayne Land	<p>Bethany Jayne was not represented at the Compulsory Acquisition Hearing on Tuesday 16th October 12. The Applicant was however able to report on the progress that had been made in respect of proposed Protective Provisions for a circumstance in which a sale was not agreed. To this end those Provisions have been formally agreed (22 October 12) and will be contained within the DCO.</p> <p>As far as the acquisition process is concerned the Applicant – in seeking a final resolution - submitted an improved offer (29 October 12) but this was rejected four days later. In a subsequent conversation Mr Andrew Clark, of Surveyors Clark Weightman (5 November 12) - acting on behalf of Bethany Jayne Limited – explained that his client would negotiate at such a time as a CPO was granted.</p>
03014, 03015, 04004, 04014, 04024, 04025, 05023, 05024, 05025, 05026, 05027, 05028, 07001	Network Rail	Discussions between the Applicant and Network Rail are continuing and both parties are hoping for a successful conclusion - by week ending 16 November – that may remove the need for a CPO.
04017, 04018, 04021, 05039, 05040, 05041	E.ON	The Applicant has reached an agreement to purchase, from E.ON, the land parcels: 04017, 04018 and 04021. Completion is anticipated imminently. The land parcels 05039, 05040 and 05041 can now be removed and require no further action.
03020, 03021	ABP Port of Immingham	The Applicant still requires the compulsory acquisition of the ABP triangle and does not expect any progress towards acquiring the land by agreement due to ABP's overall position with regard to the application.



AMEP
RULE 17 FURTHER INFORMATION
APPLICANT'S RESPONSE

By:
Date: 08-11-2012

Table 1: Status of Land Acquisition as of 8 November 2012

Land Parcel	Description	Current Status of Negotiations for Compulsory Acquisition
THE ESTUARY 08001, 09001	ABP Harbourmaster	<p>The Applicant finally received a draft lease (copy of lease and the plan is attached annex 4) from ABP late on Friday 26 October. The applicant was willing to consider a lease but this does not appear to be an option due to the following observations on the draft.</p> <ul style="list-style-type: none">• The lease plan omits the section of the quay in front of the ABP triangle and so would not be practicable or workable.• The lease is from ABP rather than the Harbour Master, who is not legally separate for these purposes it also restricts uses of the quays.• The draft has important omissions such as term and costs.• The draft lease contains onerous provisions not signalled at the hearing, such as: - access at all times for ABP; all approvals are to be sought from ABP rather than from the Harbour Master; all applications for planning etc. must be approved in writing by ABP before they can be submitted to the relevant authorities; financial security must be provided to ABP before planning conditions are complied with. <p>The proposed draft lease does not reflect the obligations of an independent Harbour Master and would not allow the development to succeed in a commercial environment therefore the applicant maintains its application for compulsory purchase powers.</p>

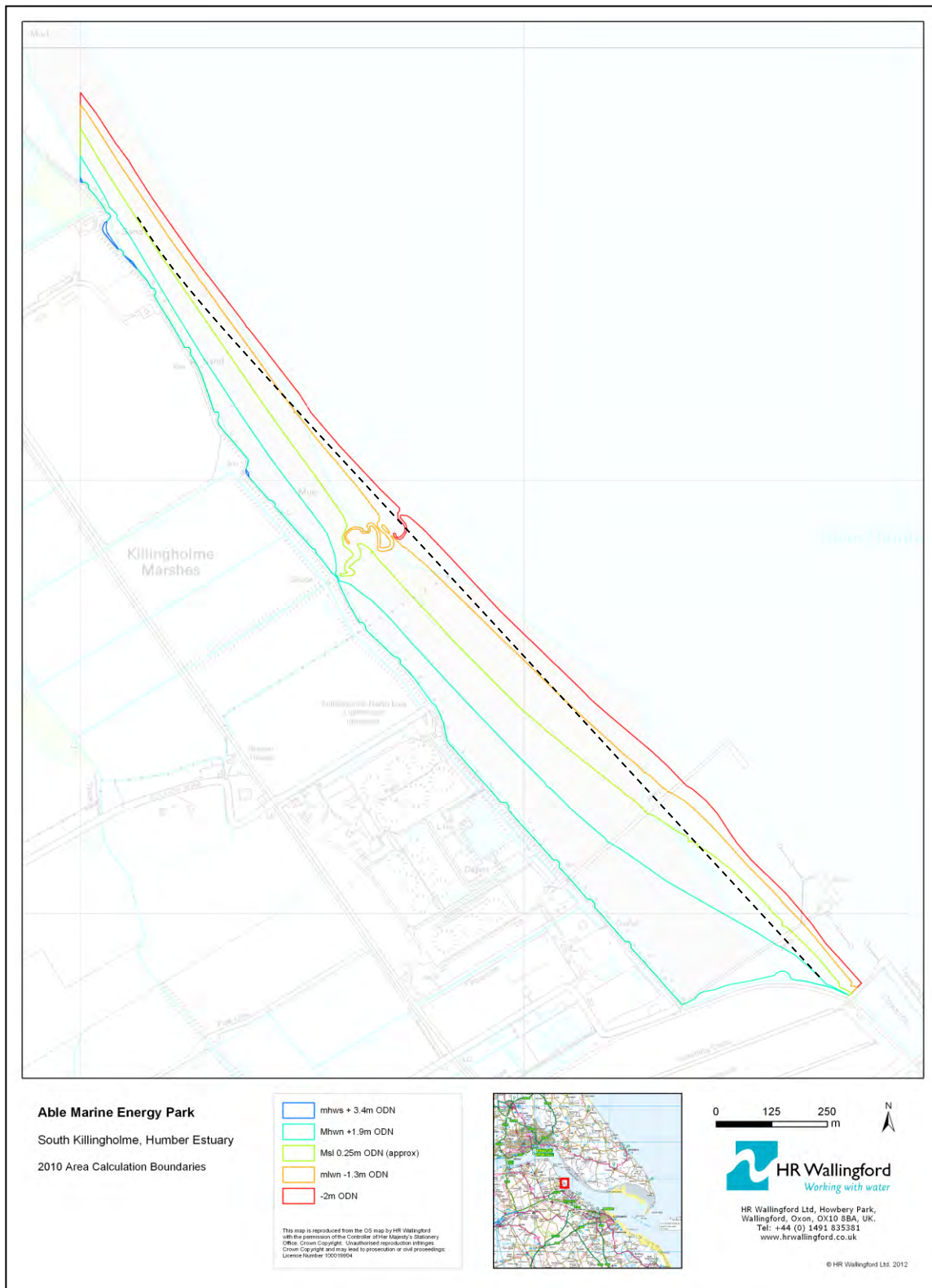


Figure 1: 2010 Foreshore Contours with Medium Term 2.5m OD Contour Added
 (Key: ----- = projected 2.5m OD contour in 2030)



AMEP
RULE 17 FURTHER INFORMATION
APPLICANT'S RESPONSE

By:
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ANNEX 1

IECS Capability Statement

the
INSTITUTE
of
ESTUARINE
and
COASTAL
STUDIES

**Provision of Environmental Management
and Monitoring Plans**
The Able UK Ltd AMEP Development

Capability Statement

Prepared by the
Institute of Estuarine and Coastal Studies,
University of Hull

7th September 2012

For and on behalf of the Institute of Estuarine and
Coastal Studies

Approved by: N Cutts

Signed:



Position: Deputy Director

Date: 7th September 2012




UNIVERSITY OF Hull
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Table of Contents

Table of Contents.....	i
1. IECS Information.....	2
1.1 Background	2
2. Relevant Experience.....	3
2.1 Project Brief and Experience	3
2.1.1 Management Plans	3
2.1.2 Monitoring Plans	4
2.2 Selection of Relevant Project Examples	4
2.3 IECS Staff with Relevant Experience	6
Appendix 1: Quality Assurance.....	10
Appendix 2: Health & Safety.....	13
Appendix 3: Environmental Issues.....	14
Sustainability Policy	14
University of Hull Strategic Plan	15
Appendix 4: Insurance Cover.....	16
Insurance Policies	16

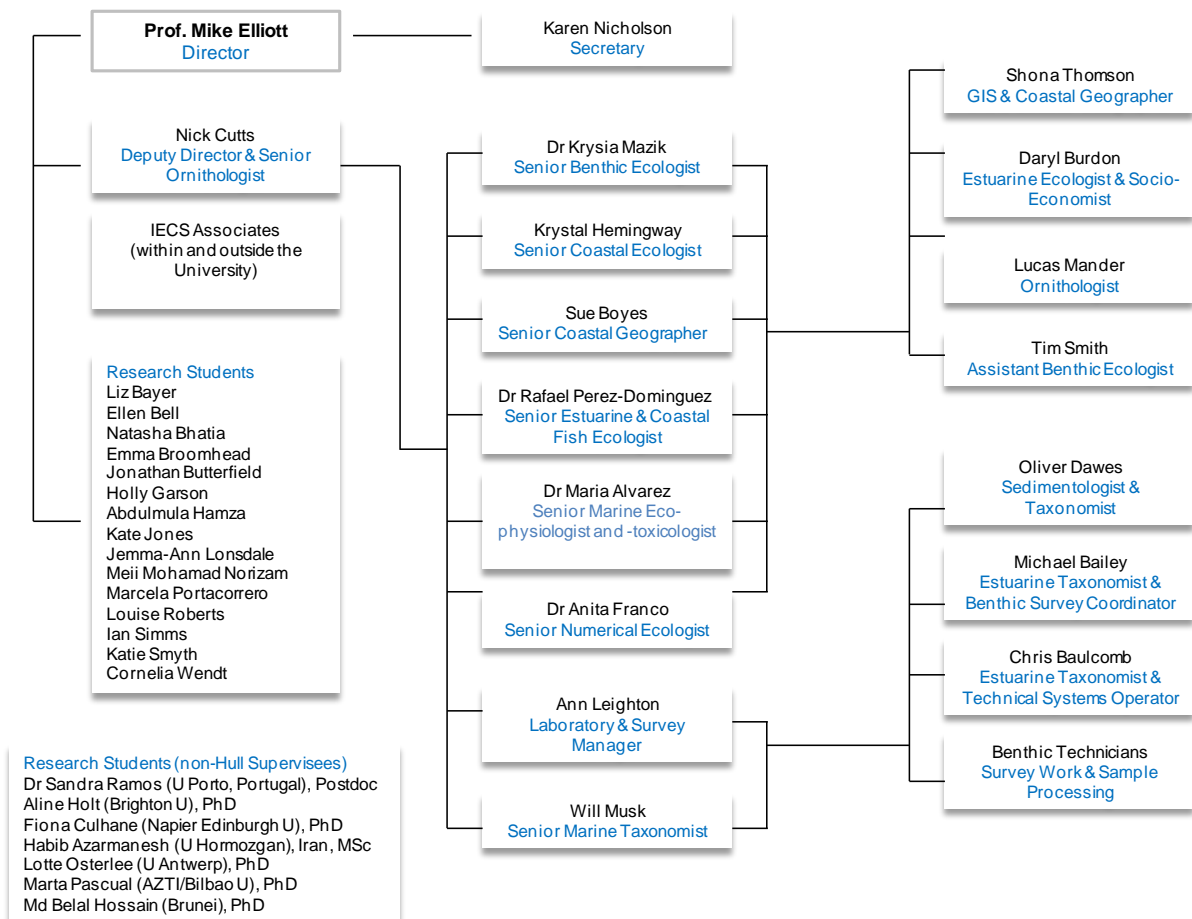
1. IECS Information

1.1 Background

The Institute of Estuarine and Coastal Studies (IECS) is a multi-disciplinary research and consultancy organisation set up to utilise the facilities and expertise in coastal margin science and management within the University of Hull. IECS covers a wide range of specialisms within the coastal environment ranging from the biological and physical environments (topography, vegetation, ornithology, benthic and pelagic fauna) to coastal planning, environmental quality, marine law and environmental impact assessment.

The Institute has been undertaking research and consultancy work in the estuarine and marine environment for over 30 years, and has both extensive survey and analysis facilities, together with a range of expertise within our professional staff and Associates.

Whilst we undertake work around the UK and in Europe, given our location, we have considerable Humber specific experience in terms of ecosystem monitoring and management. Further details of the Institute's capabilities and experience are given in subsequent sections, and additional information can be found at www.hull.ac.uk/iecs.



2. Relevant Experience

2.1 Project Brief and Experience

It is understood that Able UK Ltd are seeking an organisation to provide expertise to undertake the development of Environmental Management and Monitoring Plans (EMMPs) for the AMEP site on the Humber Estuary, these EMMPs being for the terrestrial; marine; and compensation habitats.

The IECS team has carried out extensive research and consultancy work in the coastal environment, with much of this focussing on the Humber ecosystem as well as wider marine spatial planning.

It is considered of key importance by IECS that in order to assess the development and delivery success of habitat compensation schemes, it is necessary to have derived a series of management aims and objectives for the said schemes in advance of any works. Such management aims need to be based around the requirements of the relevant consultee bodies but importantly, need to be achievable within the physico-chemical context of the scheme's location.

Furthermore, it is necessary at the outset to that the context of the compensation scheme is understood by all parties e.g. like for like provision or functional sustainability. There is a need acknowledge that it is unlikely that compensatory habitat will be a complete 'like for like' match of habitat lost in terms of composition, as there are a series of complex physico-chemical drivers which will dictate such provision on an almost site for site basis. Similarly there is a need for the consenting process and integration of compensatory schemes within the wider estuarine designation to be addressed more fully and pragmatically, and linked to this are issues associated with habitat provision sign-off whereby a habitat loss from a plan or project will effectively occur throughout the future, whilst the compensatory provision may have lost its functional value within a relatively short timescale.

2.1.1 Management Plans

Based on the above introductory text, IECS have had considerable experience in deriving guidelines for Environmental Management Plans. This includes work at an EU level through a series of EU funded projects (HARBASINS, WISER, TIDE and DEVOTES). These projects have developed a range of themes centring around the provision of functional management targets for compensatory habitats in relation to key ecological groups, and in particular fish and birds.

As part of this work, there has been the development of a series of functional 'Conservation Goals' for these groups, as well as the development of associated 'Habitat Needs' s that for an estuarine habitat, depending on broad physico-chemical and assemblage criteria, it is possible to apply a series of broad management goals which have specific habitat needs attached to them, creating a transparent framework for onward auditing.

In addition, the EU projects have addressed specific legislation drivers in relation to management needs, most recently including the WFD and MSD requirements. The TIDE project in which IECS is the Lead Organisation for the Humber, focuses on the development of integrated management of four estuaries with particular focus on integrating the needs of the ports industry, flood protection and environmental sustainability. Through this project IECS in conjunction with the other partners have developed a range of management tools e.g. a bird disturbance toolbox, best practice managed realignment etc.

IECS staff have also provided advice to the Environment Agency in terms of management requirements for compensation sites on the Humber, and in particular, methods to address any potential requirements for 'like for like' provision during the approvals stages.

In addition to this generic topic related planning research, IECS staff have undertaken site specific management plan development. This has usually been in conjunction with stakeholder groups and client, and has involved the setting of a series of management aims within a wider plan for a site. Whilst a range of such plans have been produced for developments in estuarine environments, one of note is the derivation of a management plan for the compensation of considerable habitat loss in Richards Bay, South Africa. Working with local consultants, IECS provided expertise in the derivation of suitable management targets for habitat compensation, based on best practice offset ratios and detailed GIS analysis of topography and habitat type. This culminated in the provision of a report establishing the levels of habitat loss, offset needs and likely compensation habitat development, together with red flags and recommendations.

IECS staff (N Cutts), provided much of the analysis for the management targets (habitats and birds) for the Paull Holme Strays site, during the early design stages, including calculations on carrying capacity losses to the waterfowl community from direct (flood works) and indirect(coastal squeeze) impacts. These were to species level and were then translated into offset targets for the site.

Most recently, IECS have been working in a consortium on behalf of the Environment Agency in the development on a range of best practice initiatives for managed realignment on the Humber Estuary, and it is hoped that once published, this experience where applicable, can be incorporated into the proposed EMMPs.

2.1.2 Monitoring Plans

IECS routinely provide monitoring plan advice for a range of projects both on the Humber and in other areas. On the Humber Estuary, IECS designed the monitoring programme for the Paull Holme Strays Managed Realignment site, upstream of the proposed AMEP compensation area. This included discussion with key stakeholders and consultees to identify the key aims of the site and an associated monitoring programme to assess whether these aims were being met, and to provide modification etc where appropriate. Other plans of relevance on the estuary include the development of a monitoring plan for the Alkborough Managed Realignment site, and procedures for monitoring habitat change on mudflats around Saltend. We routinely develop monitoring strategies to address BACI considerations from developments e.g. pipelines and offshore windfarms, with programmes in subtidal habitats including benthic invertebrate, epifauna and fish monitoring programmes. Such programmes are usually designed by IECS with input from the client and consenting bodies, and final sign-off from MMO/Cefas in many instances. Staff have provided advice and undertaken review of monitoring programme methods and applicability for statutory agencies, and have recently undertaken detailed statistical analysis of the outcomes from seabed monitoring programmes undertaken as part of the consenting process for offshore windfarm developments.

2.2 Selection of Relevant Project Examples

EU TIDE. 2009-2012. The project involves partners from the Humber, Elbe, Weser and Scheldt estuaries and focuses on the potential for the delivery of good conservation status in estuaries whilst allowing for port and flood protection development/maintenance. In particular, the project aims to provide an integrated framework for management of estuaries based on sound scientific knowledge, but with regard to ecosystem function rather than structural management. As such, strands running through the programme include the derivation of methods to assess and integrate the provision of estuarine ecosystem services and societal benefits into a management framework, and the development of function based system to deliver management goals through better targeted Conservation Objectives. Client: EU Interreg IVb.

Ecological development of the Alkborough Flats managed realignment site (Humber estuary). 2007-2012. Study of physical and biological development of a newly created habitat including topographic and sedimentological studies, colonisation rates and spatial distribution of benthic species and fish, colonisation by vegetation and use of the site by birds. Client: NE Lincolnshire Council and the Environment Agency

Physical and biological development of the Paull Holme Strays managed realignment site (Humber estuary). 2004-2013. 2007-2012. Study of physical and biological development of a newly created habitat including topographic and sedimentological studies, colonisation rates and spatial distribution of benthic species, colonisation by vegetation and use of the site by birds. Client: Environment Agency.

Paull Holme Strays Managed Realignment Scheme: Integrated analysis of physical and biological data 2004-2010. 2011. Identification of the processes driving and restricting colonisation of the realignment site by benthic species and use of the site by birds. Client: Environment Agency.

Environmental indicators: a structured approach to the evaluation of impacts arising from human activities at sea. Evaluation of the use of indicators of change in the marine environment, focussing on the selection and operational use of (Pressure, State & Impact) indicators. This work was carried out in conjunction with CEFAS, under contract to Defra (ME4118). Client: WRc (under contract to Defra).

Production of marine monitoring protocols. IECS worked with WRc, under contract to Defra, to produce a Marine Monitoring Protocols Manual. This underpins the UKMMAS (UK Marine Monitoring and Assessment Strategy) by fostering 'best practice' within programmes of monitoring through the definition, and where necessary, generation, of standards and protocols capable of providing quality assured data. Client: WRc (under contract to Defra).

Healthy & Biologically Diverse Seas Evidence Group (HBDSEG) Technical Report Series: Evaluation and gap analysis of current and potential indicators for Sediment Habitats. <http://www.jncc.gov.uk/page-5490>. This work aimed to assess the scientific robustness, practicality and economic viability of indicators of marine environmental health for soft sediment habitats. It forms the basis of current work by HBDSEG to formulate monitoring protocols under the Marine Strategy Framework Directive. Client: JNCC.

Development and testing of marine monitoring protocols for SAC features. 2004-5. IECS was involved in the development and implementation of protocols to monitor the condition of conservation features on the Welsh coast. Such features included intertidal mud and sand, underboulder and rockpool communities, *Sabellaria alveolata*, *Zostera. noltii* beds, piddock beds and muddy gravel communities. Client: Countryside Council for Wales

Ecosystem structure, functioning, health and management and potential approaches to marine ecosystem recovery: a synthesis of current understanding. IECS produced a report introducing the topics of ecosystem features, the determination of ecosystem and biological health, recent legislative and policy drivers and management philosophies, and the science and understanding behind the restoration of marine ecosystems (published partly as Elliott *et al*, Estuarine & Coastal Shelf Science, 2007). Client: Countryside Council for Wales.

2.3 IECS Staff with Relevant Experience



Prof. Michael Elliott: Director of the Institute and Professor of Estuarine and Coastal Sciences. Mike has a wide breadth of research and consultancy experience in the field of coastal ecology and coastal zone management and has published widely (co-author/editor of 11 books, and over 150 peer-reviewed publications). A marine biologist with a wide experience of intertidal and subtidal benthic analyses and inshore and estuarine fish studies, he has acted as an advisor for many environmental assessments for industry and statutory bodies in the UK and elsewhere. In the last 5 years Mike has acted as:

Chair, Expert Panel, BEEMS (British EDF Estuarine & Marine Studies, for New Build Nuclear power plants) (from 2007); Chair BONUS ERA-NET research application evaluation and selection, Helsinki, 2008 and member of evaluation panel 2012; Member of panel Estonia Higher Education Teaching and Research evaluation exercise, May 2007; Member Wadden Sea Research programme, research evaluation exercise, October 2007 – February 2008; Research recruitment panel, University of Lisbon, Faculty of Sciences, November 2008 and Oceanographic Institute Evaluation Panel 2011-12; Member of other advisory committees and working groups at local, regional, national and international level; member of Department, Faculty and University Committees; Member of international panels for research reviews in Belgium, the Netherlands, Finland, Sweden, South Africa, Australia, US and Estonia; from 2005-2009 President of the international Estuarine & Coastal Sciences Association (ECSA); from 2009 to 2012 member of the Scientific Advisory Panel for Defra MCZ project; Independent Expert Review Group, for MCZ, Defra, 2011-12; member Baltic STERN Science Advisory Committee, Stockholm (from 2010).

Prof. Elliott has spent almost 40 years working in marine and estuarine science and management which has involved publishing, teaching, advising and reviewing both in the UK and elsewhere. He has worked within a statutory body as well as providing services for statutory bodies, government departments, industries, NGOs and research and educational organisations. Mike has built up a pure and applied research and consultancy institute while at the same time fulfilling university duties. He has provided a wide service to the marine community through advice and reviewing of research and policy initiatives both in the UK and elsewhere and has a very wide knowledge of marine science and of the players and organisations in UK marine science and indeed have worked and collaborated with many of those. As shown by his publications and presentations worldwide (see appended CV), Prof Elliott has the ability to take a wide view and integrate across marine fields.

As shown by the publications, reports and other output, Mike has a wide experience and knowledge of the physical, chemical and biological features of estuaries and coasts, a knowledge of the policies and plans under which estuaries are managed, the implementation of relevant European Directives, OSPAR agreements and strategies and the wider policy field. He is also aware of the different and varied stakeholders in the coastal zone and of the inherent difficulties in reconciling the demands of the conservation designations, coastal management needs and the uses/users' demands on the estuary.



Nick Cutts: Deputy Director & Senior Ornithologist. Nick has over 20 years experience as a professional ornithologist, and specialises in estuarine and marine avifaunal communities. Prior to joining IECS in 1990, he had worked for the BTO and RSPB. He has carried out numerous surveys of estuarine and marine communities around the UK, and in particular along the east coast of England. These surveys have employed both standard and innovative methodologies in order to characterise the importance of waterfowl and seabird communities, often in the context of site or habitat function. Building from this

survey work, the derived data have been used for a variety of purposes, including ornithological baseline characterisation, Appropriate Assessments, Environmental Impact Assessments and habitat management, the work having been carried out on behalf of statutory agencies such as Natural England and the Environment Agency. Most recently, this has included a substantial amount of survey and assessment work in relation to coastal protection works, port developments and the offshore wind energy industry and in particular, with the setting of conservation objectives and habitat needs for birds in estuaries as well as practical advice to managers and developers in relation to ornithological impacts and mitigation measures. This has included the recent completion of a 'Bird Disturbance Guidance Toolbox' for the Environment Agency for use in aquatic environments with protected status. In his role of Deputy Director of IECS, Nick undertakes a range of project management duties (resource planning, deliverables monitoring and fiscal control). He is also Chairman of the Humber Wildfowl Refuge Committee, as well as a member of the Humber Advisory Group and is the WeBS co-ordinator for the Humber (north bank).



Sue Boyes: Senior Coastal Geographer & Marine Policy Researcher. Sue has experience in European and UK environmental legislation and integrated coastal zone management, and has carried out a variety of consultancy in the coastal environment. She is currently reviewing legislation for the FP7 VECTORS European project and has been involved in reviewing fisheries legislation and UK and European legislation for national conservation agencies and has devised a multiple use zoning scheme for the Irish Sea Pilot project based on existing legislated activities. She was also the lead author of the

review of UK marine legislation for JNCC for the Irish Sea Pilot Project and she co-authored the Defra review of unlicensed activities to provide an evidence base for the Marine Bill. Along with Mike Elliott, Sue played a key role in the Tees Estuary Joint Project Steering Group advising the scientific group in an investigation into Seal Sands, Seaton Channel and the Lower Tees Estuary. She has carried out topographic monitoring, saltmarsh mapping (both in the field and by aerial photographs) and has identified effective indicators of marine ecosystem state for intertidal and subtidal sediment habitats for JNCC.



Daryl Burdon: Estuarine Ecologist & Socio-Economist. Daryl has a good working knowledge of the estuarine, coastal and marine environment and has undertaken many projects within this field. Initially trained in estuarine and marine ecology, Daryl has widened his expertise since joining IECS into the fields of environmental economics, marine policy, legislation and management. Daryl has used this wide ranging expertise to publish numerous scientific papers and research reports.

Much of Daryl's current research is related to defining and assessing the impacts of various

anthropogenic drivers and pressures on the ecosystem services and societal benefits provided by the estuarine and marine environment. Daryl is the vice-chairman of the Humber Advisory Group and is an active member of both the Flamborough Head Maritime Forum and the Yorkshire and Humber Regional Hub of the Net Gain Marine Conservation Zone Project.



Krystal Hemingway: Senior Coastal Ecologist. Krystal has extensive expertise in the field of coastal science & management and has worked on a variety of European funded projects including the current 3 year Interreg IVB project (TIDE) where one of the primary objectives is the creation of a toolkit of sustainable management methods for estuaries. Other consultancy has included experience of EIA and AA procedures for a variety of development types in estuarine and coastal locations (e.g. power stations, wind farms and port development); intertidal and subtidal surveys as part of long-term monitoring programmes and EIAs; avifaunal monitoring; ecosystem restoration and recovery; research into marine species protection as part of the evidence base for the Marine Bill; monitoring and assessment of saltmarsh development and intertidal biodiversity in relation to possible future management targets; and broad-scale intertidal biotope/habitat mapping. She is the co-editor and joint author of 2 books published by Blackwell Science - *Effects of Pollution on Fish* and *Fishes in Estuaries*.



Dr Krysia Mazik: Senior Estuarine Ecologist. Krysia has specialist knowledge of the structural and functional ecology of marine and estuarine benthic communities, sediment processes, pollution, toxicology and data analysis. Recent work has included studying invertebrate colonisation patterns in restored habitats; analysis of long term data sets to establish changes in benthic community structure following improvements in water quality (Humber estuary); studies of estuarine eutrophication; biotope mapping and benthic community assessment throughout the UK; baseline surveys (benthic ecology) in relation to offshore activities and the development and application of environmental indicators. Other work has included pollution modelling and impact studies and assessment of the impacts of dredging on the chemical and biological quality of an industrialised river. In addition, Krysia spent three years examining the effects of petrochemical effluents on the structural and functional ecology of intertidal invertebrates and the effects of community changes on sediment properties (BP Chemicals (Saltend) Ltd, Humber estuary). She has also been involved in the analysis of bacteriological, meteorological and hydrographic data to determine the conditions likely to lead to poor bathing water quality. Krysia is a member of the Humber Realignment Group and a member of the National Saltmarsh Specialists Network (co-ordinated by CEH) which aims to share and discuss/disseminate research and monitoring results from intertidal and saltmarsh marsh habitats from around the UK, to identify requirements for future research and monitoring work and to form collaborative projects.



Dr. Rafael Pérez-Domínguez: Senior Estuarine and Coastal Fish Ecologist. Rafa has been working on a European funded project HARBASINS (Harmonised River Basins Strategies in the North Sea) - a three year Interreg project completed in June 2008. The goal of the program was to improve harmonization of methods in key coastal habitats including, fish impingement studies at power stations. This work is being extended into a newly funded European program WISER (Water bodies in Europe: Integrative Systems to assess Ecological status and Recovery) in which he will coordinate the assessment of fish indicators in transitional waters. He is applying all these ecological tools in EIA and ES for many of our commercial contracts. Rafa is also coordinating the sampling programme within of several contracts using a variety of sampling techniques. He has extensive experience of intertidal and subtidal benthic and epifaunal survey work, having led and participated in many benthic grab and trawl surveys often including tools such as AGDS, video and ROV work. He has also undertaken surveys and analysis of data derived from numerous North Sea projects in relation to proposed wind farm sites and other construction activities.

Appendix 1: Quality Assurance

The Institute of Estuarine & Coastal Studies has completed and passed the Category B2 Assessment for Safety, Health, Environmental & Quality practices and procedures and are a registered supplier on UVBD Verify. IECS Achilles supplier reference number is 702788.

IECS is also a member of the National Marine Biological Quality Control Scheme (NMBAQC), where it is regularly placed in the top few benthic analysis laboratories in the UK.

Fieldwork

Standard Operating Procedures SOPs are in place for all intertidal and subtidal survey work, and are designed to maximise consistency of core methods used for each survey undertaken. Daily reports and survey logs are utilised, taking into account any operational issues that may arise, and methods are adapted accordingly. Any such issues are also addressed post-survey and incorporated into updated SOPs and future survey work

Thorough planning is carried out prior to each survey to ensure that the correct procedures are in place to achieve agreed objectives. Regular reviews and re-evaluation of survey methodologies are also undertaken so that the survey outcome is in accordance with the original survey design.

Laboratory

The Institute is a member of the National Marine Biological Analytical Quality Control (NMBAQC) Scheme, an external quality assurance scheme. All procedures are based on best laboratory practice and those employed by SEPA East which has UKAS accreditation. A specimen reference collection is maintained and up-to-date taxonomic literature is stored in the laboratories. A representative collection containing all identified species is produced for each project and used for reference and quality control. Each reference collection is made available to the client or its representatives, if required. Quality control procedures follow Rees *et al.* (1990¹); Rees and Service (1993¹); and Gray & Elliott (2009²). All Standard Operating Procedures (SOPs) are in place for all such work, and are designed to maximise consistency of core methods used for each type of analysis undertaken.

Strict internal QC measures are undertaken for each laboratory project, with 10% of all samples analysed undergoing re-analysis. The results of the internal QC measures are documented and if required forwarded to the client via e-mail in a suitable format. However, the results are also reviewed internally to identify any issues that may arise within the laboratory. Any such issues are addressed and incorporated in updated SOPs for future work. Standard Operating Procedures for all laboratory practices are reviewed on a regular basis and can be provided upon request.

All staff involved in the sorting and identification of benthic samples are experienced marine biologists. IECS staff undertaking taxonomic analysis regularly attend workshops run as part of the NMBAQC Scheme. The following workshops have been attended:

- Benthic Invertebrate Taxonomic Workshop, October 2001, Portaferry Marine Station. Including Problem Taxa: Porifera, Hydroida, Annelida, Mollusca, Amphipoda, Decapoda, Echinodermata.

¹ Rees, H.L. & M.A. Service, 1993. Development of improved strategies for monitoring the epibenthos at sewage sludge disposal sites. In: *Analysis and interpretation of benthic community data at sewage sludge disposal sites*. Aquatic Environmental Monitoring Report, Number 37, pp. 55-61. MAFF Directorate of Fisheries Research, Lowestoft.

² Gray, J.S. & M. Elliott, 2009. *Ecology of Marine Sediments: From Science to Management*. Second Edition, Oxford University Press, Oxford.

- Benthic Invertebrate Taxonomic Workshop, November 2003, Dove Marine Laboratory, Cullercoats, Tynemouth. Including Problem Taxa: Oligochaeta, Echinodermata, Lumbrineridae, Dorvilleidae.
- Benthic Invertebrate Taxonomic Workshop, November 2006, Dove Marine Laboratory, Cullercoats, Tynemouth. Including Problem Taxa: Cirratulidae, Maldanidae, Glyceridae, Goniadidae, Syllidae.
- NMBAQC Expert Invertebrate Taxonomic Workshop, November 2008, Dove Marine Laboratory, Cullercoats. Included Problem Taxa: Hesionidae, Terebellomorpha, Nephtyidae, and Spionidae.
- NMBAQC Particle Size Analysis (PSA) workshop on laboratory methods, July 2009, Cefas Lowestoft Laboratory
- NMBAQC Experts Taxonomic workshop November 2010.
- NMBAQC Fish Taxonomic Workshop, April 2011. Dove Marine Lab, Newcastle, UK.

Desk-based

It is standard IECS procedure that all reports are internally reviewed for quality assurance by Senior Staff. The Institute also has a policy of, where possible, publishing research in peer reviewed journals (where client confidentiality is not an issue) to communicate work to a broader audience. IECS therefore welcomes any potential for aspects of this research to be converted into an academic publication and in such a case would ensure that collaborators would be acknowledged in the publications and may be even included as a co-author.

NMBAQC Scheme

The NMBAQC scheme assesses the quality of marine benthic work carried out by laboratories, with independent checking of outputs, staff training and technique refinement. Components of analysis which are checked include correct species identification, enumeration, biomass calculations and sediment analyses. In addition, workshops on analysis and identification techniques are regularly attended, and latest developments in taxonomy notified.

The Institute has consistently maintained an exceptional standard of sample processing and identification, ranking either first or second in all group exercises undertaken as part of the NMBAQC Scheme over the last five years. A summary of the latest results (2006 - 2012) including fish ring tests and invertebrate identification is provided in Table 4.

Table 4: Summary of the IECS NMBAQC Scheme results, 2006 - 2012.

Date	NMBAQC Scheme test	IECS Rank	Sample Pass/Fail (based on the Bray-Curtis Similarity Index (%))
Oct 2006	Fish Identification	1 st out of 13 entrants	-
Dec 2007	Invertebrate Identification	1 st out of 23 entrants	-
Jan 2008	Fish Identification	1 st out of 52 entrants	-
Feb 2008	Submission of own samples	n/a	Pass/Good (97.51%)
		n/a	Pass/Excellent (100%)
		n/a	Pass/Good (96.67%)
April 2008	Invertebrate Identification	2 nd out of 25 entrants	-
April 2009	Submission of Own Samples	n/a	Pass/Good (99.15%)
		n/a	Pass/Excellent (100%)
		n/a	Pass/Good (98.28%)
May 2009	Invertebrate Identification	1 st out of 25 entrants	-
Oct 2009	Invertebrate Identification	2 nd out of 24 entrants	-
Oct 2009	Submission of Own Samples	n/a	Pass/Acceptable (94.08%)
		n/a	Pass/Good (99.35%)
		n/a	Fail/Poor (88%)
Feb 2010	Invertebrate Identification	100% correct identification	-
May 2010	Submission of Own Samples	n/a	Pass/Good (98.20%)
		n/a	Pass/Good (99.69%)
		n/a	Pass/Good (99.05%)
		n/a	Pass/Acceptable (92.66%)
May 2011	Invertebrate Identification	92% correct identification	-
2011	Submission of Own Samples	n/a	Pass/Excellent (100%)
		n/a	Pass/Good (96.01%)
		n/a	Pass/Good (96.97%)
		n/a	Pass/Excellent (100%)
		n/a	Pass/Good (95.83%)
Feb 2012	Fish Reverse Ring Test	100% correct identification	-
July 2012	Fish Ring Test F RT05	1 st out of 17 submissions	-
July 2012	Invertebrate Identification Ring Test RTB 41	1 st out of 28 submissions	-

Appendix 2: Health & Safety

The Institute of Estuarine & Coastal Studies has completed and passed the Category B2 Assessment for Safety, Health, Environmental & Quality practices and procedures and are a registered supplier on UVBD Verify. IECS Achilles supplier reference number is 702788

The Institute of Estuarine & Coastal Studies takes the issue of Health, Safety & Environment provision at work extremely seriously and aims to have no accidents or incidents during operations and nor to cause harm to the environment. IECS HSE policy fits within that operated by the University of Hull and is particularly aimed at addressing issues associated with the marine ecology field.

All work undertaken by IECS staff and associates will be carried out in accordance with the University of Hull's Health & Safety Policy, to standards defined in The Health & Safety at work etc Act 1974, The Management of Health & Safety at Work Regulations 1992 and in accordance with IECS' own H&S policy.

All members of the Institute have completed basic first aid training courses, in addition a number of IECS staff are qualified first aiders in accordance with the Health & Safety (First Aid) Regulations 1981. All staff undertaking vessel-based work have completed and passed Marine Coastguard Agency (MCA) approved Personnel Survival Techniques (PST) at sea training courses to STCW95 Regulation VI/1 and STCW Code Section A-VI/1 para 2.1.1 Table A-VI/1-1. Those conducting aircraft based seabird surveys have completed and passed the HUET (Helicopter Underwater Escape Training) course - which is OPITO Approved. In addition IECS staff members have undertaken Risk Assessment and Manual Handling training courses. All staff working in the IECS laboratory adhere to The Good Laboratory Practice for the Prevention and Control of Exposure to Laboratory Chemical documentation. A stand-alone Health & Safety document is produced for each survey prior to the commencement of fieldwork. This document includes risk assessments, PPE, COSHH forms, incident handling and reporting procedures, responsibilities, contract details and staff details including training and certification.

IECS' Health and Safety Policy encompassing office, laboratory and fieldwork components can be provided upon request.

Example Risk Assessments for estuarine and coastal ecology work are provided in Appendix 2. However, given the scope of the works, these are considered generic for a range of potential working areas.

Appendix 3: Environmental Issues

Sustainability Policy

"Climate change induced by human action is now widely accepted, as is the depletion of a range of key natural resources. These concerns are addressed in a range of Government and HEFCE initiatives. Two fundamental and complementary objectives will be met by ensuring that this university, including the Institute of Estuarine & Coastal Studies" is both environmentally and financially sustainable".

The Institute of Estuarine and Coastal Studies fully comes within the environmental responsibilities and procedures of the University of Hull. In addition, it adds any other aspects particular to its activities but outwith those normally undertaken by the university. The University of Hull's Sustainability Policy recognises the objectives set down by HEFCE for sustainable development in Higher Education (Update to strategic statement and action plan February 2009/03. HEFCE - 2008). Specifically, the University will aim to:

- raise the profile of sustainable development to become a mainstream part of University activities, building upon section 1.4 of the University Of Hull Strategic Plan 2011-15
- introduce a carbon reduction culture to significantly reduce carbon emissions across our activities
- integrate sustainable development into our policy-making in relation to campus operations, curriculum and research being open about the reasons for policy choices
- demonstrate genuine efforts to promote sustainable development and extend good practice
- support innovative and novel projects engaging with staff, students and stakeholders
- include regional partners and business to build capacity to manage sustainable development and support good practice.

In order to deliver these objectives, the University of Hull is committed to preventing pollution and reducing its negative impacts on the environment and will contribute to the national commitment to sustainable development by:

- Meeting all relevant UK, European and international legislative and regulatory requirements and agreements
- Reducing its carbon emissions by reducing energy consumption and by increasing the efficiency of consumption
- Considering use of renewable energy; either, at source, during future construction projects, or by complementing energy supplies by purchasing from greener sources when negotiating electricity contracts
- Installing water conservation devices and technology
- Minimising waste by reduction, reuse and finally by increasing recycling on campus and within residences
- Creating a culture of energy and water conservation through training, education, curriculum and awareness campaigns
- Encouraging and facilitating modes of transport by staff and students that minimise environmental impact, and to apply environmentally friendly principles to the operation of University owned vehicles

- Influencing our suppliers and contractors to ensure that goods and services procured support the Sustainability Policy and, in turn, that all suppliers and contractors progressively improve their own environmental performance
- Maintaining the grounds and buildings of the University in an environmentally sensitive way, seeking to protect and enhance natural habitats and biodiversity
- Developing amongst our community the values, skills and knowledge that students and staff need to live and work sustainably.
- We will monitor and regularly review our progress against the targets identified within relevant Policies and our November 2011 Carbon Management Plan

University of Hull Strategic Plan

Our focus on promoting sustainable development in the wider context of the University's vision is laid out in the University of Hull Strategic Plan 2011 - 2015. This Plan is available on request, as well as the following environmental policies:

- Corporate Social and Environmental Responsibility
- Biodiversity Policy
- Energy and Water Policy
- Ethical Investment Policy
- Green Travel Plan Policy
- Higher Education Carbon Management Programme
- Hull Campus Biodiversity
- Sustainable Purchasing Policy
- Sustainability Policy
- Waste Management Policy
- EcoCampus

Alternatively, all policies are available on the University of Hull Environmental Web (<http://www.hull.ac.uk/environment/index.html>).

Appendix 4: Insurance Cover

The following summaries provide basic details of IECS insurance liability and environmental policy. Further details can be provided on request or downloaded from the University of Hull web site - www.hull.ac.uk.

Insurance Policies

This is to confirm the following insurances have been placed on behalf of the University of Hull:

Employers Liability:

Insurer: Zurich Municipal Insurance PLC. Policy Number: NHE-03CA04-0013. Renewal Date: 8 November, 2012.

Indemnity Limit: £25M any one incident.

Extensions: Indemnity to Principals, Temporary visits abroad, Private work of Directors and Officials

Public / Products Liability:

Insurer: Zurich Municipal Insurance PLC. Policy Number: NHE-03CA04-0013. Renewal Date: 8 November, 2012.

Indemnity Limit: £20.0M any one incident Public Liability. £20.0M any one period. Products Liability.

Extensions: Indemnity to Staff and Students, Financial loss, liability assumed under contract, accidental obstruction, nuisance etc.

Professional Indemnity:

Insurer: Zurich Municipal Insurance PLC. Policy Number: NHE-03CA04-0013. Renewal Date: 8 November 2012.

Indemnity Limit: £5.0M any one incident.



AMEP
RULE 17 FURTHER INFORMATION
APPLICANT'S RESPONSE

By:
Date: 08-11-2012

ANNEX 2

Notes of Telecon with NE and EA

ABLE UK	MINUTES	By: JM
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Present:

Richard Cram (RC)	-	Able UK
Jonathan Monk (JM)	-	Able UK
Nick Cutts (NC)	-	IECS
Steve Barnard (SB)	-	IECS
Emma Hawthorne (EH)	-	Natural England
Andy Whitehead (AW)	-	Natural England
Siobhan Browne (SBr)	-	Natural England
Richard Saunders (RS)	-	Natural England
Annette Hewitson (AH)	-	Environment Agency

Date & Time: 30th October 2012 @ 13:30

Location: Tele-conference call

Subject: EMMP's

	<u>ACTION</u>
<p>1 <u>COMPENSATION EMMP</u></p> <p>1.1 <u>OVERALL COMMENTS</u></p> <p>1.1.1 EH presented Natural England's comments on this document. In general NE requested the following: -</p> <ul style="list-style-type: none"> • Tabulated numerical baseline data. • Numerical objectives. • Proposed monitoring methodologies. • Details of remedial action. <p>1.1.2 EH confirmed this would be the minimum requirement by the close of the examination.</p> <p>1.2 <u>BASELINE</u></p> <p>1.2.1 NC explained that numerical tabulated baseline data alone would not fully reflect the context of these birds' population and activity within the estuary. It was agreed that the baseline data would be presented as follows: -</p> <ul style="list-style-type: none"> • Numbers of birds on existing intertidal at North Killingholme Marshes. • These will provide the target numbers. • Text illustrating variability context in the estuary. • Baseline data must be comparable with monitoring results, i.e. the methodology must be the same for monitoring as was used to collect the baseline, and the data must be presented in the same way. • Need baseline for intertidal usage on both banks. • Usage of fields adjacent to estuary (roost displacement) (NE/RPSB High Tide Roost Report). NE were concerned that the spatial extent of the roosting area was very significant – agreed that the next draft needed to include a plan. 	

ABLE UK	MINUTES	By: JM
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- Plans and figures of monitoring proposals.
- 1.2.2 RS noted that a potential discrepancy in the baseline invertebrate data might have been caused by an error in the statistical analysis. NC agreed to pursue and RS agreed to provide a list of questions to **NE's invertebrate specialist**. NC/RS
- 1.2.3 RC agreed to check what stoning was proposed within the breach. RC
- 1.3 OBJECTIVES
- 1.3.1 EH noted that the objectives as set out were focused on the SPA but that greater mention needed to be made of the SAC habitat objectives. Objective should be to create typical middle estuary mudflat and saltmarsh characteristics including invertebrate characteristics, rather than recreating the precise baseline characteristics.
- 1.3.2 The present invertebrate baseline contains only the North Killingholme Marshes foreshore and so the intertidal habitat to be changed at Cherry Cobb Sands requires survey. The objective is to create the standard invertebrate assemblage for the middle estuary, not a copy of North Killingholme Marshes foreshore though it must be of similar functional value. RS suggested that if new survey work was required, doing this at different times of year could be considered.
- 1.3.3 EH suggested that in paragraph 44, reference to 2 hectares should be replaced with a reference to use of LIDAR data to confirm the scale of habitat loss.
- 1.3.4 The objective should be for a mudflat greater than 44 hectares in extent. 44 hectares is only acceptable if the site is meeting all of its other objectives. Paragraph 10 gives mistaken areas as the bunds cannot take up any of the 101.5 hectares of compensation provided.
- 1.3.5 NE does not agree that it is not appropriate to identify a fixed target for bird use. The target needs to be greater than the standard for the middle estuary. RS explained that whilst being specific might be tricky, if it cannot be said with confidence that the site will support all of the displaced birds then the site will not be Habs Regs compliant.
- 1.3.6 NC accepted this but noted that targets should include a quantified degree of flexibility based on natural change; this is why the EMMP includes for looking at the wider use of the estuary by black-tailed godwit.
- 1.3.7 The objective of the plan will be over-arching i.e. including both the intertidal and wet grassland sites, but there need to be separate specific targets for each site.
- 1.4 MANAGEMENT
- 1.4.1 EH noted that the wet grassland management seemed to be focused on breeding birds rather than SPA birds which should be the priority.
- 1.4.2 Management techniques and proposals can be copied from Ex28.3 part 3 (a bullet point list). There is inbuilt flexibility in management of the intertidal site.

ABLE UK	MINUTES	By: JM
2.1.4	NC agreed to consider this further.	NC
2.2	<u>MONITORING</u>	
2.2.1	EH questioned the requirement for monitoring of long term changes. AH confirmed that the EA was happy that this was fully covered in the compensation package.	
2.2.2	RC explained that monitoring of suspended sediment and dissolved oxygen would be done by means of monitoring buoys and that this would cover capital dredging as well as piling.	
2.2.3	While there might be value in the continuing monitoring for the first round of maintenance dredging it was agreed that it was unlikely to be necessary to monitor further maintenance dredging.	
2.2.4	RC agreed to clarify the timescales for these works.	RC
2.2.5	RC questioned the monitoring of waves at the northern end of the quay, noting that any practical monitoring beyond recording when overtopping occurred might be impossible. AH confirmed that any monitoring the EA require will already be covered in the legal agreement and that this can therefore be removed from the EMMP.	
2.2.6	AH noted that the flood defence legal agreement is in the EA's court at the moment and agreed to respond to Able.	AH
2.2.7	EH noted that the requirement for noise monitoring set out in paragraph 19 should be taken from the DCO not from the SoCG. RC forwarded to IECS the updated text. The monitoring buoy needs only to record when piling is taking place not specific noise levels as the piling restriction is a time restriction not a level restriction.	
2.2.8	EH noted that the noise restriction for the operational buffers was still to be agreed and that NE would be providing comments to Able before the next document issue.	
2.2.9	AH requested that the EMMP include a plan showing how many monitoring buoys and where these would be placed. RC agreed to provide noting that this would also be in the legal agreement.	RC
2.2.10	It is agreed that monitoring for marine mammals is not necessary; a marine mammal observer will be present during marine piling works.	
3	<u>TERRESTRIAL EMMP</u>	
3.1	<u>OVERALL ISSUES</u>	
3.1.1	AW noted that the overall comments of NE on the terrestrial EMMP was similar to those on the other 2.	
3.2	<u>OBJECTIVES</u>	
3.2.1	AW requested clarification on the target soil invertebrate biomass figures for mitigation Area A asking if these would be the same as those proposed for Old Little Humber Farm. There was a discussion about whether the target should equal the existing baseline; RS said no. RC explained that we would need to aim for numbers equivalent to general high quality wet grassland.	

ABLE UK	MINUTES	By: JM
3.2.2	AW noted that paragraph 26 should refer to mitigation not compensation.	
3.2.3	Paragraph 27 was focused on the farmland bird species but the key objective is SPA birds. JM agreed to forward to IECS Steve Percival's note setting out the base line of breeding birds on the site.	JM
3.2.4	It was agreed that the ornithology section will be divided into breeding birds and SPA birds.	
3.2.5	AW noted the proposed farmland birds seed mix explaining that other mixes were available which might be more appropriate. He agreed to provide details.	AW
3.2.6	AW noted that NE's stewardship handbooks were further supported by RSPB advice. He agreed to forward this.	AW
3.2.7	EH requested that in paragraph 45 the word 'could' was no longer appropriate as the EMMP's need to be prescriptive.	
3.2.8	The comments previously raised on the Steering Committee apply also to this EMMP. It is likely that one Advisory Group will oversee the implementation of all 3 EMMPs.	
3.2.9	RS noted that the inclusion of the Shelduck nesting boxes in Mitigation Area B was inappropriate and requested that accommodation for Shelduck was made in Area A instead. NC agreed this.	Able
3.2.10	AW requested clarification on how Able's proposed GCN fencing was compatible with the existing badger use of Chase Hill Wood. Able agreed to clarify and amend drawing.	Able
3.3	<u>MONITORING</u>	
3.3.1	AW noted that when undertaking breeding bird surveys the survey routes used should be the same as those set out in the ES so that the data is comparable. He asked for clarification whether the times of day proposed for the survey were compliant with the recommended guidance.	
3.3.2	NC explained that the guidance advised that surveys should be taken in the mornings and evenings rather than across all times of day but that sometimes this could not be adhered to because of the practicalities of surveying a large site.	
3.3.3	It was proposed that the surveys in future should adhere to the guidance re timings but that the EMMP should explain that this could skew the abundance compared to the baseline data available.	
3.3.4	RS noted that this could be a useful opportunity to ground-truth the advice in the guidance to see what tail off in bird activity occurs during the day. This can be used to correct the baseline figures.	
3.3.5	EH noted that the stocking density for grazing and Mitigation Area A appeared to be unusually high. SB noted that this figure was that recommended by RSPB for breeding waders not for ordinary wet grassland. He agreed to cross check this with Thomson's design and to specify stocking densities in cattle rather than livestock units.	



AMEP
RULE 17 FURTHER INFORMATION
APPLICANT'S RESPONSE

By:
Date: 01-11-2012

ANNEX 3

'Humber Estuary Shoreline Management Plan Phase 2 – Geomorphology Addendum',
(Black and Veatch/Halcrow 2005)

**HUMBER ESTUARY SHORELINE
MANAGEMENT PLAN PHASE 2**

GEOMORPHOLOGY ADDENDUM

*FINAL
June, 2005*

**Environment Agency
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Global Avenue
Leeds
LS11 8PG**

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**HUMBER ESTUARY SHORELINE MANAGEMENT PLAN PHASE 2
GEOMORPHOLOGY ADDENDUM**

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CONTENTS

1	Introduction and Scope	1
2	Comments by the Validation Panel	5
3	Additional Humber estuary water level modelling	7
3.1	Recalibration of the water level model	7
3.1.1	Outcome of the HESMP2 hydrodynamic model	7
3.1.2	The revised hydrodynamic model	7
3.1.3	Performance of the revised Humber model	9
3.2	Calculated extreme Humber water levels	10
3.2.1	Extreme Humber water levels in 2004	10
3.3	Impact of Humber washland schemes	12
3.3.1	The Alkborough Flats project with current sea levels	12
3.3.2	The Alkborough project with sea levels raised 0.3m	13
3.3.3	Impact of overtopping of rural banks along the River Ouse	14
3.3.4	Impact of tidal river washlands	16
4	Geomorphology of the Immingham foreshore	20
4.1	Estuary water levels	20
4.2	Topographic and bathymetric data	21
4.2.1	Analysis of historic charts	21
4.2.2	Changes to upper foreshore levels	21
4.3	Immingham frontage geomorphology predictions	22
4.3.1	Long term predictions	22
4.3.2	Short term impacts of managed realignment	22
4.4	Impact of port developments	23
4.4.1	Recent and planned developments	23
4.4.2	Short term modelling of port developments	23
4.4.3	Impact of dredging on flood defences	24
4.4.4	Long term assessment of planned port developments	24
4.4.5	Potential future port developments	24
4.5	Conclusions of Immingham frontage studies	25
4.6	Impact of geomorphology on flood defence design	25
5	Bank erosion	29
5.1	Introduction	29
5.2	Erosion upstream of the Humber bridge	29
5.3	Erosion in the tidal rivers	31
5.4	Bathymetry survey	32
	REFERENCES	36
Appendix A	Humber Validation Panel Comments on summary and short term geomorphology Reports made by the Validation Panel January 2005	38
Appendix B	Geomorphology changes in the Immingham frontage	55

Tables**Figures**

HUMBER ESTUARY SHORELINE MANAGEMENT PLAN PHASE 2**GEOMORPHOLOGY ADDENDUM****1 INTRODUCTION AND SCOPE**

The results of the Humber Estuary Shoreline Management Plan Phase 2 (HESMP2) geomorphology studies were summarised in two reports (Refs 1 & 2): -

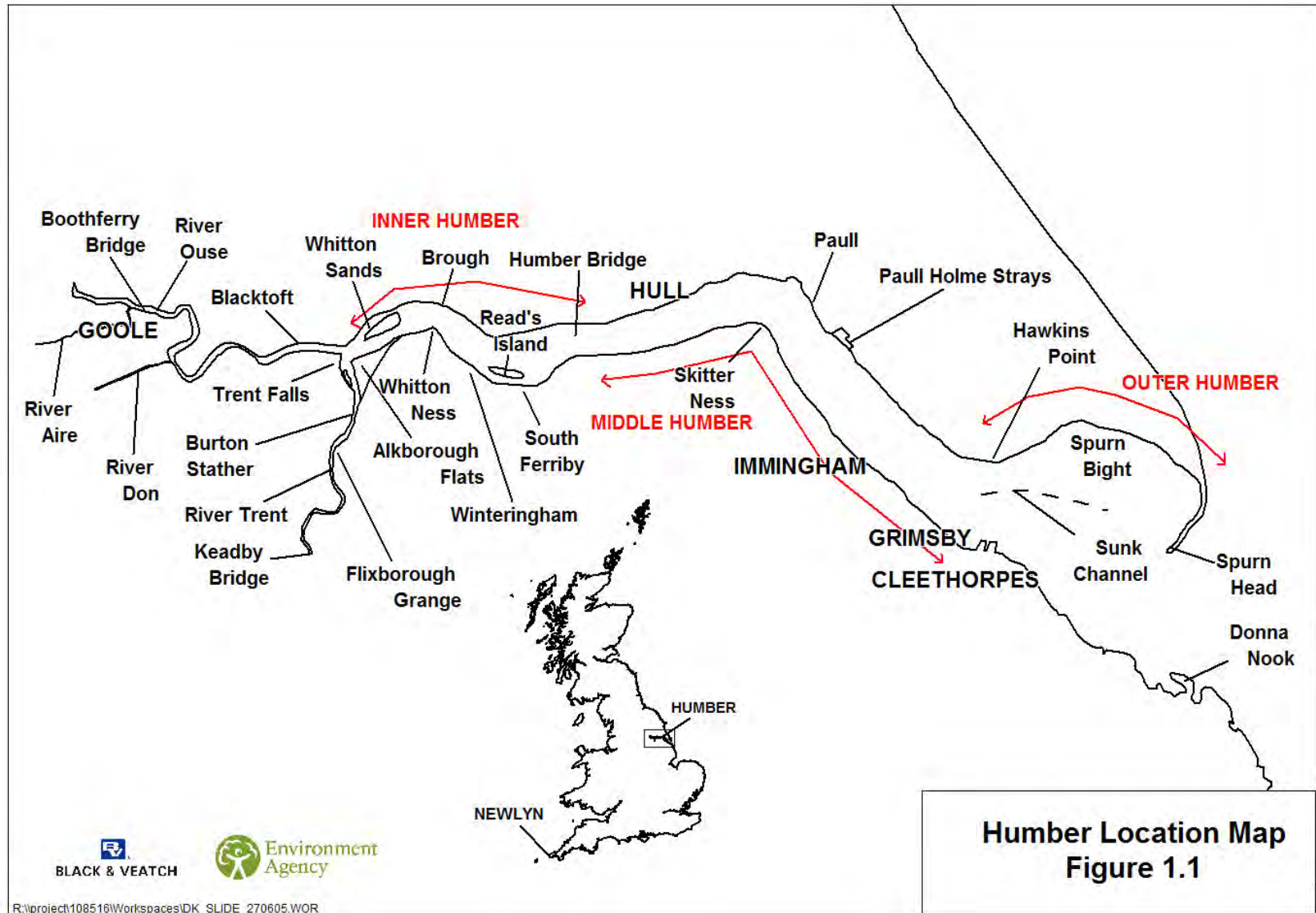
- Summary of Geomorphology Studies November 2004 and,
- Summary of Short Term Geomorphology studies, November 2004.

Since these reports were issued some additional work has been carried out that is reported in this Addendum. The additional work includes: -

- comments by the Validation Panel on the summary reports,
- further modelling of estuary water levels (Ref 3 & 4),
- assessment of geomorphology changes in areas particularly subject to erosion,
- a bathymetric survey of near shore cross sections in areas where there is deep water close inshore.

A sketch map showing the location of the majority of places named in this report is included in Figure 1.1.

The Validation Panel comprised Prof Brian O'Connor, Prof Keith Dyer and Michael Owen.



**Humber Location Map
Figure 1.1**

2 COMMENTS BY THE VALIDATION PANEL

The Validation Panel members commented on the two completed summary reports (Refs 1 & 2). Each member of the Panel prepared their own written comments. Their individual comments were combined into a single set of comments combining those made by more than one panel member. Draft responses to these comments were prepared by Black & Veatch and then provided to ABPmer and W1 Delft for their review where the comment related specifically to the work they had undertaken.

The agreed responses were issued to the panel members. The comments and responses are included as Appendix A. The comments have been grouped into three sections: -

- Key issues raised by the review of the two reports,
- Detailed comments on the Summary of Geomorphology Studies and
- Detailed comments on the Short term geomorphology studies.

The key issues were identified from comments made by the Validation Panel that highlighted particular limitations of the geomorphology studies that should be considered in any overall review of the two summary reports or the detailed modelling reports prepared by Consortium members. The detailed comments on each report are more minor comments that highlight typographical errors and minor issues that should be considered in the interpretation of individual sections or tables in the two summary reports.

The four key issues apparent in the comments by the Validation Panel are highlighted in Appendix A. These Key Issues are summarised below: -

- 1 The Validation Panel members confined their attention to the two reports issued in November 2004. It is clear that the two reports now contain more realistic comments and conclusions on the results of the morphological studies. The review process and the increased inter-partner discussions have clearly been of benefit to the consortium and, I hope, to the individual partners.*
- 2 No sensitivity testing was carried out for seasonal and freshwater flow variations with the Delft 3D model. These seasonal and flow related changes will affect the siltation rates in set back sites in the inner estuary and tidal rivers.*
- 3 The hybrid modelling appeared insensitive to river flows. Perhaps river flow per se is not that important, but is it possible that some of the sediment properties change seasonally? Some sensitivity testing on the effects of different (assumed) sediment properties might give some insight into possible winter/summer behaviours.*
- 4 There is doubt that the correct balance between sediment import and export to the estuary has been achieved in the short term model.*

The detailed responses from the consortium to all the Validation Panel comments are included in Appendix A and the responses to the Key Issues are summarised below.

The Validation Panel were reassured that their concerns about the reliance that might be placed on the geomorphology predictions had been incorporated into the text of the reports (Key Issue 1).

The comments show that the Validation Panel remain concerned about the limited sensitivity testing of the results to freshwater flows or seasonal impacts (Key Issues 2 & 3). The Panel note that freshwater flow sensitivities may be related to seasonal effects, possibly expressed through a seasonal change in sediment properties. In future studies of Humber geomorphology a more thorough investigation of seasonal changes in sediment properties and freshwater flow effects should be carried out. At the current stage of development of modelling software and understanding of sediment processes such tests are difficult to carry out realistically.

As part of the Humber geomorphology studies, an independent assessment of the siltation rate within the Alkborough managed realignment site was carried out by PML (Ref 5) using continuously measured sediment concentrations throughout a complete year. This assessment showed a more rapid siltation rate than predicted by the short term geomorphology modelling.

The short term modelling was unable to develop a realistic balance between sediment inflow and outflow from the Humber (Key Issue 4). The consortium accepts that this limits the time scale over which morphology modelling of sediments should be carried out using the short term Humber models. All morphology modelling using the short term models has been based on comparing results with and without a scheme to minimise the errors introduced by the incorrect overall sediment balance. The consortium considers that interpreting the morphology modelling in this way provides an indication of relative changes, even though the absolute magnitudes may not be correct.

3 ADDITIONAL HUMBER ESTUARY WATER LEVEL MODELLING

3.1 Recalibration of the water level model

3.1.1 Outcome of the HESMP2 hydrodynamic model

The initial testing of the Humber water level model (Ref 6) demonstrated that although the HESMP2 hydrodynamic model provided a good representation of normal tidal conditions (Ref 7), the prediction of extreme levels was less reliable. The principal issues were that extreme water levels in the Immingham area were too low and those in the inner estuary and Ouse were too high. In a surge with a 1 in 50 year return period such as occurred in 1983, the accuracy of the model was considered to be within $\pm 0.25\text{m}$ on absolute level.

In the assessment of the short term modelling (Ref 2) the conclusion was drawn that extreme water levels should be based on a combination of the JPA analysis of 1999 (Ref 8) and the 1991 extreme value analysis of water levels measured at Humber tide gauges (Ref 9), rather than the predictions of the HESMP2 hydrodynamic model. Levels from the JPA analysis were adopted for the Engineering studies report (Ref 10) and the subsequent documents supporting the Humber Technical Report (Ref 11), where such levels exist, and from the 1991 extreme value analysis in the remaining areas, principally the River Trent downstream of Keadby.

Although the extreme levels predicted by the HESMP2 hydrodynamic model were not used for the Engineering and Technical reports (Refs 10, 11) this situation was unsatisfactory as there was no adequate explanation of why the HESMP2 water level models did not predict reliable extreme levels. There was also the practical issue of how to link the Humber extreme level predictions for the lower Ouse and Trent estuaries to the predictions of extreme levels in the upper Ouse and Trent estuaries and also the Don and Aire estuaries that are the subject of parallel Environment Agency strategies.

In an attempt to resolve these issues the calibration of the HESMP2 Humber model was reviewed and updated to take account of features not included within the original HESMP2 model. These features were:-

- Incorporation of tidal reaches of Don and Aire,
- Revised (reduced) ground levels within Blacktoft and Whitton Sands,
- Review the shape of a typical surge entering the Humber.

3.1.2 The revised hydrodynamic model

Inclusion of rivers Don and Aire

The previous HESMP2 hydrodynamic model was extended to include the tidal reaches of the Don and Aire rivers. The Don cross sections were surveyed for the National Rivers Authority in about 1993, typically at 500m intervals and those for the river Aire were surveyed in 2002 at approximately 200m intervals.

Apart from the first few hundred metres of the Don and the first 2km of the Aire, the remainder of the tidal reaches of both rivers were represented within the model by artificially straightened channels, a similar approach to that adopted for the tidal reaches upstream of the study boundaries at Keadby Bridge on the Trent and Boothferry Bridge on the Ouse. This approach ensured the tidal rivers included the correct tidal volume, though would not properly represent conditions near to river bends.

Inclusion of the two rivers has very little impact on normal tide levels in the Humber downstream of Trent Falls. High tide levels were lowered seaward of Hull by 0.01m and raised by a similar amount upstream. There were negligible changes to low tide levels seaward of Hull but upstream they were raised by about 0.03m.

Larger changes in spring tide high and low water levels were noted in the Ouse. High tide levels were raised 0.04m at Blacktoft and lowered by 0.50m at Goole. At Blacktoft low water levels were lowered by 0.20m. There were also changes in the phase of the tide in the Ouse.

In the Trent, inclusion of the Don and Aire reduced high water levels at Keadby by 0.025m and low water levels by 0.05m.

These changes in model calibration are not large enough to change the overall assessment of the model calibration for normal tides (Ref 2 section 2.1.2). However, the Consortium recommends that if the model is used for further studies of the lower reaches of the Ouse that the Don and Aire are included within the model and that the model calibration is revisited and reviewed prior to use.

Revised ground levels for Blacktoft and Whitton Sands

Land survey of Blacktoft Sands nature reserve in March 2004 had indicated that actual ground levels were around 0.5m lower than those assessed using Lidar because of the presence of reeds which prevent Lidar determining the true ground surface level. The ground levels of Blacktoft Sands were reduced 0.5m within the model to represent flooding around the base of the reed beds. A similar reduction was made at Whitton Sand which is also covered by reeds, though access difficulties have prevented a land survey of this area.

Lowering ground levels at Blacktoft Sand and Whitton Sand by 0.5m reduced surge tide levels between Hull and Blacktoft by around 0.03m. There are no changes to mean spring tide levels as these sites are not inundated during normal tides.

Revised surge tide shape

The HESMP2 modelling assumed a 15 hour long sinusoidal surge with the maximum increase in sea level timed to coincide with high tide time at the seaward boundary. This surge shape was superimposed on a mean spring tide and its elevation changed to give the correct extreme water level at the model boundary.

The characteristics of surges in the Humber between 1990 and 2003 were analysed to understand the typical characteristics of Humber surges. This showed that small surges peaked at all states of the tide, but that larger surges tended to peak at around low water. The analysis also indicated that extreme levels are more likely to result from moderate surges coinciding with high astronomic tides rather than from the occurrence of a large surge at the time of a moderate astronomic tide. However, when a large surge coincides with a high astronomic tide a very extreme level will result. Larger surges typically last for 20 to 30 hours rather than the 15 hours assumed previously.

These analyses suggested that the most realistic method for simulating extreme levels in the Humber is to:

- Use a predicted tide that is 0.2m higher than a mean spring tide
- The surge should last 20 hours and if larger than 1m, its peak should coincide with the time of low water.

3.13 Performance of the revised Humber model

The performance of the revised model including the rivers Don and Aire and the lowered ground levels at Blacktoft Sand and Whitton Sand is compared with the original HESMP2 model in two validation tests.

The first test used the surge tide and wind conditions that occurred at the time of the 1983 surge. The differences between the original and revised model and the measured values are set out in Table 3.1. More than half of the improvement, in the Ouse is due to the changes in model configuration. However, the improvement in surge shape representation accounts for the majority of the improvement within the Humber.

Table 3.1 Water level differences for 1983 surge event (observed - modelled)

Site	Original model differences (m)	Revised model differences (m)	Revised model with correct surge shape differences (m)
Spurn	-0.11	-0.09	-0.11
Immingham	0.23	0.26	0.18
Hull	0.20	0.20	0.13
Brough	-0.03	-0.03	-0.01
Blacktoft	-0.26	-0.14	-0.13
Goole	-0.25	0.13	0.09
Keadby	0.11	0.10	0.16

A test of the 1983 surge conditions that omitted wind stress reduced water levels in this surge by between 0.05 and 0.12m, and increased model errors at all except two sites (Spurn and Blacktoft).

The second test used the standard surge shape recommended following the surge analysis and compared extreme water levels with those predicted in the JPA analysis. For the comparison with the JPA, no wind stresses were included in the estuary model. The

results are presented in Table 3.2 and show that the revised model slightly underestimates the JPA levels from the Humber Bridge to a line joining Hawkins Point and Grimsby. The revised model also slightly underestimates extreme levels in the rivers Ouse and Trent. Elsewhere the revised model predicts heights slightly above those predicted in the JPA. In all cases the difference is less than $\pm 0.23\text{m}$, with a standard deviation in the results of 0.11m .

Table 3.2 Comparison of JPA and modelled extreme water levels

Site North (N) South (S)	JPA no	Easting	Northing	2% AEP levels (m)		
				JPA	Model	Diff'ence
Easington (N)		538983	417271	4.44	4.49	0.05
Hawkins Point (N)		528541	416478	4.57	4.54	-0.03
Little Humber (N)		518844	423611	4.92	4.76	-0.16
Thorngumbald (N)		517100	425100	4.94	4.82	-0.12
Alexandra Dock (N)		512380	428662	5.02	4.96	-0.06
Hessle Haven (N)		503467	425604	5.29	5.26	-0.03
Ellerker Clough (N)		493300	426548	5.44	5.63	0.19
Weighton Lock (N)		487457	425635	5.56	5.72	0.16
Humberston (S)		533300	406000	4.36	4.42	0.06
Pyewipe (S)	1	525959	411366	4.55	4.53	-0.02
Laporte Rd (S)	4	521381	415464	4.76	4.61	-0.15
N Killingholme Haven (S)	7	517090	419528	4.93	4.70	-0.23
(S)	10	513773	424635	4.98	4.85	-0.13
(S)	12	510167	425164	5.07	5.03	-0.04
Humber Bridge (S)	16	502495	423405	5.30	5.30	0.00
(S)	18	498772	421418	5.39	5.46	0.07
(S)	20	495025	421890	5.44	5.51	0.07
Whitton Ness (S)	22	492172	424705	5.41	5.59	0.18
Saltmarshe (Ouse)		478240	423850	5.70	5.64	-0.06
Goole (Ouse)		474900	422950	5.81	5.70	-0.11
Keadby (Trent)		483540	411330	5.72*	5.70	-0.02

Note: * JPA levels from Ref 9.
Some places not shown in Figure 1.1

The performance of the revised model is generally of a high standard with differences of less than 0.10m at around 60% of sites. The difference between the model prediction and the JPA analysis exceeds 0.16m at 10% of sites.

3.2 Calculated extreme Humber water levels

3.2.1 Extreme Humber water levels in 2004

The revised Humber model was used to calculate extreme water levels throughout the Humber estuary for a range of return periods. The model predictions at 10 key sites for

events ranging between 10% and 0.2% AEP (Annual Exceedance Probability) are set out in Table 3.3. The extreme levels calculated by extreme value analysis at the same 10 key tide gauge sites are listed in Table 3.4 (from Table 3.2 of Ref 2). The figures in Table 3.4 are for 1991 sea levels.

Table 3.3 Model predicted extreme water levels

	Water level mOD with stated AEP			
	10%	2%	1%	0.20%
Spurn	4.20	4.41	4.51	4.67
Grimsby	4.30	4.52	4.61	4.78
Immingham	4.43	4.66	4.75	4.92
Hull (Alexandra Dock)	4.72	4.97	5.08	5.26
Humber Bridge (Hessle Haven)	5.06	5.30	5.40	5.58
Brough (Oyster Ness)	5.33	5.58	5.68	5.85
Blacktoft	5.44	5.68	5.78	5.96
Goole	5.41	5.68	5.78	5.96
Trent Falls	5.45	5.69	5.79	5.96
Keadby	5.45	5.69	5.79	5.95

Table 3.4 Humber, Lower Ouse and Trent extreme water levels in 1991

	Ref	Water level mOD with stated AEP					
		10%	5%	2%	1%	0.5%	0.2%
Spurn	9	4.14	4.24	4.36	4.44	4.50	4.59
Grimsby	9	4.30	4.40	4.52	4.60	4.67	4.77
Immingham	9	4.62	4.72	4.85	4.94	5.03	5.14 [#]
Hull (Alexandra Dock)	8	4.80	4.90	5.02	5.12	5.24	5.30
Humber Bridge (Hessle Haven)	8	5.12	5.20	5.29	5.36	5.41	5.50
Brough (Oyster Ness)	8	5.31	5.36	5.44	5.52	5.55	5.61
Blacktoft	9	5.38	5.46	5.55	5.61	5.66	5.72
Goole	8	5.67	5.74	5.81	5.85	5.89	5.91*
Trent Falls	+	5.39	5.46	5.57	5.61	5.65	5.69
Keadby	9	5.61	5.67	5.72	5.75	5.77	5.79

Note + by interpolation between Keadby, Blacktoft and Brough levels from Ref 9.

* 0.2% AEP level for Goole taken from Ref 9.

value corrected following typographic error in Ref 2

Source Ref 2 Table 3.2

The differences between the model predictions and the values obtained from the extreme value analysis are set out in Table 3.5. The differences are larger for the more extreme events, but this is as expected as the uncertainty in the extreme value analysis of rare events is much greater. The contribution of sea level rise to this difference between 1991 and 2004 at approximately 2 mm/year is around 0.03m, comparable with the overall average difference of 0.02m in Table 3.5. There is a consistent under estimate of extreme values at Immingham as noted in the model calibration for all return periods and

indicated by the average difference of -0.20m at Immingham. The average difference in Table 3.5 of -0.05m at Hull is much less significant.

There is an indication that the model is more reliable for sites downstream of the Humber Bridge since these sites have a smaller standard deviation of the difference between model and observed results of 0.01-0.02m. For sites upstream of the bridge the standard deviation of the difference is much larger and in the range 0.08-0.13m.

Table 3.5 Differences between model and observed extreme water levels

	Difference (model -observed) m					
	For stated AEP				For all AEP	
	10%	2%	1%	0.2%	Average	Std dev
Spurn	0.06	0.05	0.07	0.08	0.06	0.01
Grimsby	0.00	0.00	0.01	0.01	0.01	0.01
Immingham	-0.19	-0.19	-0.19	-0.22	-0.20	0.01
Hull (Alexandra Dock)	-0.08	-0.05	-0.04	-0.04	-0.05	0.02
Humber Bridge (Hessle Haven)	-0.06	0.01	0.04	0.08	0.02	0.06
Brough (Oyster Ness)	0.02	0.14	0.16	0.24	0.14	0.09
Blacktoft	0.05	0.13	0.17	0.24	0.15	0.08
Goole	-0.26	-0.13	-0.07	0.05	-0.10	0.13
Trent Falls	0.06	0.12	0.18	0.27	0.16	0.09
Keadby	-0.16	-0.03	0.04	0.16	0.00	0.13
Average for AEP	-0.06	0.01	0.04	0.09	0.02	
Standard deviation	0.11	0.11	0.12	0.15		0.13

3.3 Impact of Humber washland schemes

3.3.1 The Alkborough Flats project with current sea levels

The Alkborough Flats scheme includes two fixed spill weirs each of 750m length at levels of 5.1 and 5.4mOD to allow surge tides to flood the site. This arrangement becomes more effective as peak water levels become higher provided the storage capacity of the site is not completely filled. The Humber model was tested for surge conditions giving rise to extreme water levels with 10%, 2%, 1% and 0.2% AEP with present sea levels. The results presented in Table 3.6 predict increasing water level reductions as the severity of the event increases.

The water level reductions predicted near the site at Blacktoft and Burton Stather are maintained further up the Trent at Keadby, but gradually reduce in the Ouse between Blacktoft and Goole, before increasing further upstream. The Trent banks in the south west corner of the Alkborough site would be overtopped in a 0.2% AEP event.

The model predictions for the Ouse summarized in Table 3.6 differ from the model performance described in the earlier report on water level predictions (Ref 2), which

utilised the original model that excluded the tidal reaches of the rivers Don and Aire and assumed a different surge profile in the North Sea. The earlier modelling suggested water level reductions would be maintained upstream in both the Ouse and the Trent.

Table 3.6 Water level reductions associated with Alkborough flood storage

	Estuary water level reduction (mm) with given extreme water level			
	10% AEP	2% AEP	1% AEP	0.2% AEP
Immingham	-1	-2	-2	-4
Hull	-10	-11	-10	-8
Humber Bridge	-10	-16	-18	-28
Brough	-18	-45	-55	-87
Trent Falls	-32	-72	-92	-145
Blacktoft	-39	-84	-103	-155
Goole	-27	-61	-72	-86
Burton Stather	-49	-85	-104	-156
Keadby	-48	-82	-101	-154

3.3.2 The Alkborough project with sea levels raised 0.3m

The proposed managed realignment and flood storage scheme proposed for Alkborough Flats is anticipated to reduce water levels in the inner Humber and the rivers Ouse and Trent by up to 100 mm in current conditions during a 1% AEP extreme water level event as indicated in Table 3.7. The reductions are a maximum close to the site and in the River Trent and reduce towards the Humber Bridge and within the River Ouse.

As sea levels rise, Table 3.7 suggests the reductions in surge tide level would increase in the Trent and Inner Humber but reduce in the Ouse if there was no accretion of sediment within the site. However, the site is exposed to the silt loads in the Humber every spring tide period and it is likely that accretion within the site will fairly rapidly reduce the storage available for flood waters in the lowest parts of the site. By the time sea levels have risen 0.3m (2055 assuming sea levels rise at 6mm/year) the minimum ground level within the site might have risen to 4.5mOD. In such circumstances, the model predictions in Table 3.7 suggest the capacity of the Alkborough site to store surge tides is likely to be reduced.

The final column of Table 3.7 suggests that one way of mitigating the effect of accretion within the site will be to raise the level of the spill weirs to match the rise in sea level. In these circumstances, the original effectiveness of the Alkborough project might be largely maintained with only a 10mm reduction in the water level reduction during a 1% AEP event upstream of the site. Downstream of the site, in the Inner Humber, the

benefits of Alkborough may increase with time, again by around 10mm in a 1% AEP event.

Table 3.7 Effectiveness with sea level rise of Alkborough flood storage

	Estuary water level reduction (mm) with 1% AEP water level			
	Initially	After sea level rise of 0.3m		
		with no in-site changes	with minimum site level of 4.5mOD	
			No change to spill weir levels	Spill weir levels raised 0.3m
Immingham	-2	-5	-5	-4
Hull	-10	-7	-8	-5
Humber Bridge	-18	-39	-33	-26
Brough	-55	-116	-88	-68
Trent Falls	-92	-118	-54	-81
Blacktoft	-103	-95	-46	-92
Goole	-72	-45	-17	-66
Burton Stather	-104	-137	-83	-97
Keadby	-101	-135	-81	-94

Note: Water level reductions calculated relative to water levels without Alkborough for the same sea level.

The variation in model results suggests that the reductions achieved are likely to be sensitive to the amount of siltation experienced at the site, and well chosen changes to the spill weir levels may provide an effective strategy to mitigate the adverse impacts of siltation within the site and rising sea levels.

3.3.3 Impact of overtopping of rural banks along the River Ouse

In the tidal rivers there are some sections of the flood defences which are likely to be overtopped during particularly extreme events. By contrast in the Inner Humber even where the standard of protection is relatively low, the crest level of the defence is in almost all sections above the most extreme still water level, because of the need for an allowance for wave run up. This overspill in the rivers, principally the Ouse, during extreme events will lead to a reduction in extreme water levels.

The most notable area where banks could be overtopped by extreme events are on the north (left) bank of the Ouse opposite Goole where water can spill into the large river meander. There are other sections of relatively low banks that would allow spill into rural areas east of Blacktoft and between Blacktoft and Yokefleet on the north bank. On the south bank the lowest section of rural bank is between Reedness and Swinefleet. This

bank seems less likely to overtop than the north bank sections. These sections of bank are identified in Figure 3.1.

In Figure 3.1, the Goole bend banks have been given a uniform level which is used when all the rural banks are allowed to overtop. However, the levels of the banks around Goole bend are quite variable as Figure 3.2 illustrates. This more detailed definition of bank levels is used in tests of the Goole bend banks alone.

The predicted effect of overtopping opposite Goole now and with sea levels raised by 0.3m during a 1% AEP event is illustrated in Table 3.8. This table also shows the additional impact of allowing overtopping east of Blacktoft, between Blacktoft and Yokefleet and between Reedness and Swinefleet in 50 years time. In all these model predictions, any existing low sections of bank adjacent to villages are assumed to have been raised to prevent overspill directly into the villages.

With overtopping of the low banks opposite Goole, in addition to the Alkborough managed realignment and flood storage scheme, there is an extra reduction in surge tide levels of around 40 mm with current sea levels during a 1% AEP event. With a higher sea level there is a larger head over the banks that overtop and so the reduction in peak levels is larger. This is particularly evident at Goole where the spill over the opposite bank is predicted to lower the 1% AEP event by around 180 mm. In the Inner Humber the predicted impact of raised sea levels is minimal and in the Trent amounts to an extra 20 mm reduction if only the Goole bend banks overtop.

Table 3.8 Effect of overtopping existing Ouse banks in a 1% AEP event

	Estuary water level reduction (mm)		
	Current sea level	Sea level rise of 0.3m	
	Goole bend banks overtop	Goole bend banks overtop	All low rural banks overtop
Hull	-7	-7	-17
Humber Bridge	-12	-14	-25
Brough	-24	-23	-37
Trent Falls			
Blacktoft	-58	-73	-124
Goole	-40	-181	-158
Burton Stather	-39	-64	-92
Keadby	-37	-63	-91

Notes: All results compared relative to predicted 'with Alkborough' water levels (Table 3.7)

If the other existing low rural banks as well as the Goole bend banks are allowed to overtop the level reduction in the inner Humber is predicted to increase by 10 mm and in the Trent by 30 mm. This extra level reduction in the inner Humber and Trent is because these other Ouse banks, especially that between Faxfleet and Blacktoft, are further

downstream and close to the Trent confluence. The level reduction in the Ouse is predicted to be more uniform when all the banks are allowed to overtop. However, the model predicts the reduction in level at Goole will be less than when only the Goole bend banks are allowed to overtop. This is likely to be because the levels of the Goole bend banks were less well defined in the test of all rural banks based on Figure 3.1 than when overtopping is restricted to the Goole Bend using Figure 3.2.

These model test results are indicative of the significance of allowing overspill of the existing river banks to continue. These overspills are one reason why the tidal model over predicts peak water levels during extreme events. These overspills also indicate that lower defences in rural areas are a valuable means of minimising peak water levels in urban areas where the consequences of flooding will be much more severe.

Over recent decades, there has been a tendency to raise defences in areas where banks are lower than elsewhere to prevent overspill. An unintended side effect of this approach is that it reduces the effective standard of protection for other sections which initially had banks offering a higher standard of protection. In allowing overspill into rural areas it is important that the movement of the flood waters is understood as far as possible to ensure they do not flood sensitive assets or sever key access routes or other infrastructure.

Where overspill is being used as a deliberate policy option, it will be important to check that the risk of a bank breaching as a result of the anticipated overspill is acceptably small, unless the consequences of the much more extensive flooding that would follow a breach are known not to be important. This will require strengthening of bank crests similar to that proposed for the spill weirs at Alkborough to ensure they can tolerate the anticipated overspill.

3.3.4 Impact of tidal river washlands

Apart from overspill that occurs because an extreme event overtops a length of river bank, sections of bank may be deliberately lowered to allow overspill into a designated washland area. These overspills are likely to have a similar general impact to overspills of low bank sections but there is greater ability to design such areas to minimise flood damages arising from the overspill and to maximise the benefit in those areas where investment is required.

Washland areas within the Goole bend opposite Goole on the Ouse and at Flixborough Grange on the east bank of the Trent have been identified as potential washland areas. Development of either of these areas as washland will allow reductions in peak water levels during extreme events. With spillweirs set to allow overspill when water levels exceed the 5% AEP level, each of these areas could reduce water levels in their own river by 80 to 100 mm and in the other river by 30 to 40 mm during a 2% AEP event (Ref 2). The model testing also indicated that the development of these sites using appropriate spillweir levels could be done sequentially and the benefits of later washlands could well be additive to those achieved with earlier schemes, including Alkborough .

The actual reductions in water level that are achieved as a result of developing a washland will be a trade off between the cost of developing the scheme to deliver maximum water level reduction for a range of extreme events and the economic benefits of lowering extreme levels elsewhere and so delaying the need for further investment in the raising of tidal defences.

One advantage of a washland scheme over a habitat creation scheme such as proposed at Alkborough is that there is unlikely to be significant accretion of silt within the area as it would only rarely be filled. However, washland performance will also change over time as fixed spillweirs will overtop more frequently as sea levels rise. The impacts of such changes in performance need to be considered in the scheme concept and where appropriate spill weirs may need to be designed so their level can be changed in response to a rise in sea level or the development of other washlands.

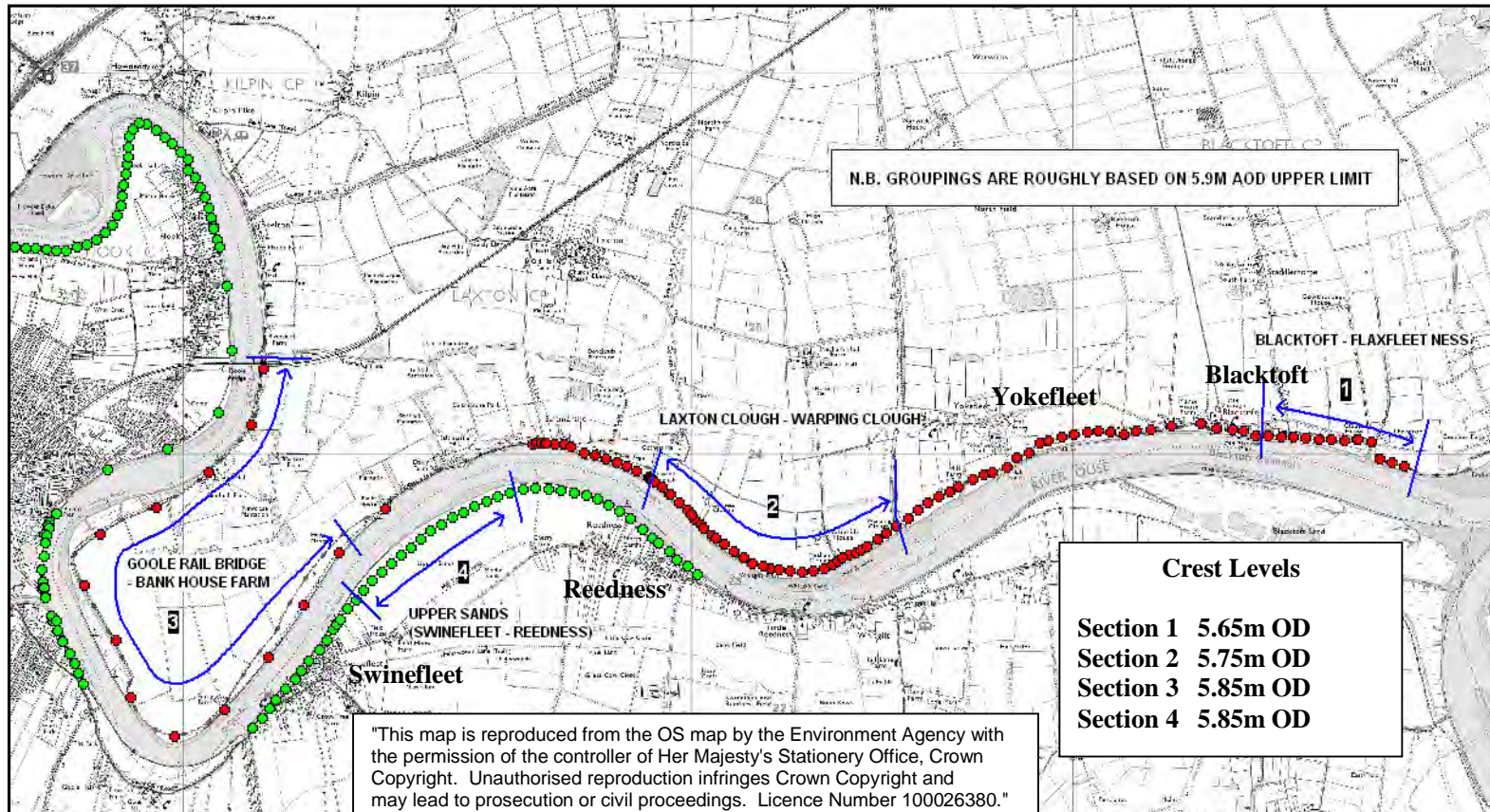


Figure 3.1 Reaches with low rural banks in the River Ouse

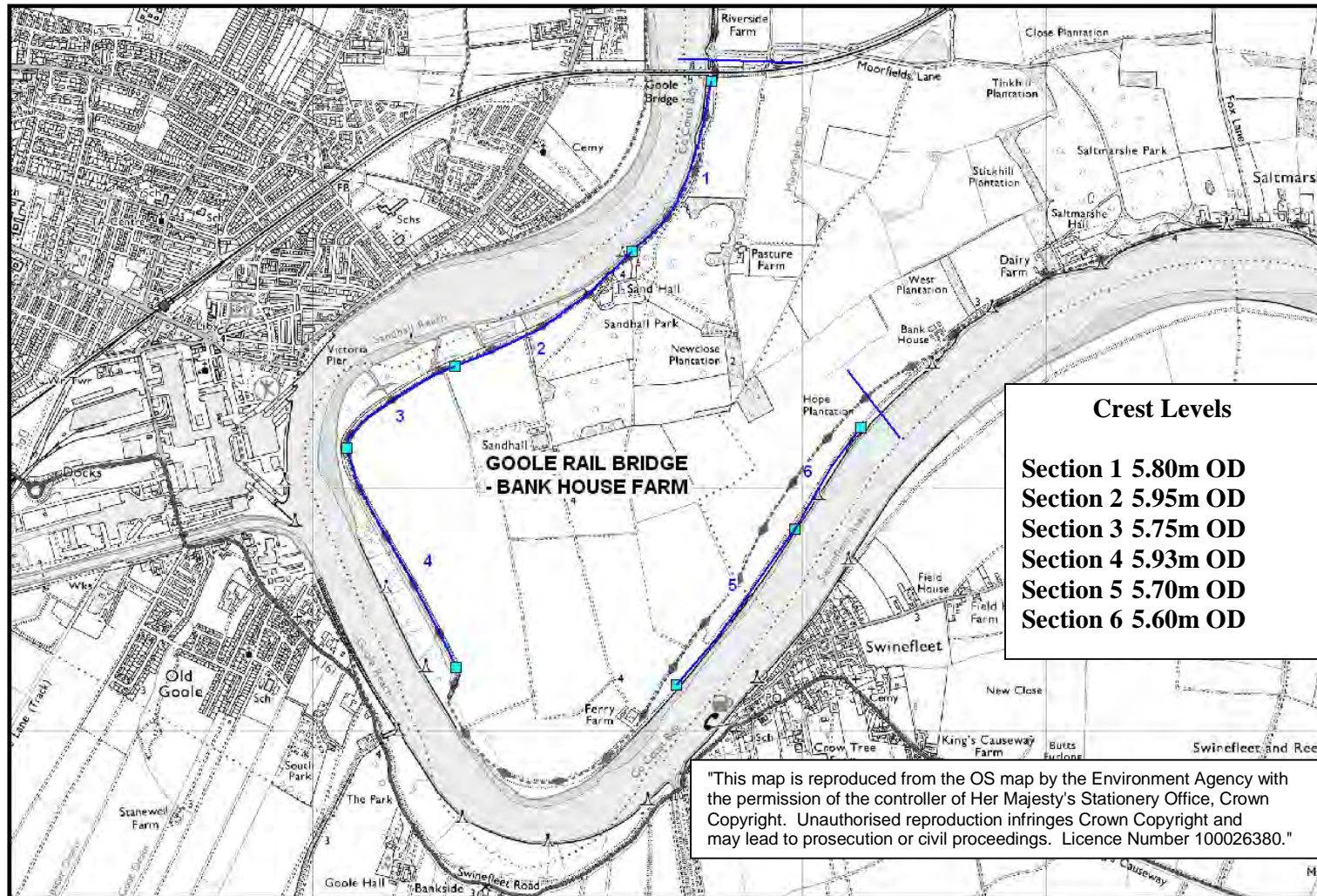


Figure 3.2 Levels of low rural banks around the Goole Bend (Rail bridge to Bank House Farm)

4 GEOMORPHOLOGY OF THE IMMINGHAM FORESHORE

4.1 Estuary water levels

Tidal range in the Humber increases up estuary and tidal analysis suggests mean sea level has been rising at around 2mm/year for the past century (Ref 1). There is also some evidence at Immingham that mean tidal range has increased by around 1mm/year over the past 50 years as well as long term cyclical changes in mean tidal range associated with the Lunar nodal tide.

A Joint Probability Analysis (JPA) to assess the combination of waves and water levels that provide the design conditions for flood defence design in the Humber (Ref 8) was carried out in 1999. The locations of the JPA points along the Pyewipe to East Halton Skitter frontage are shown on Figure 4.1. The design combinations of wave height and water level for this frontage are set out in Table 4.1 for events with an Annual Exceedance Probability (AEP) between 1% and 0.2%. The extreme water levels in Table 4.1 are based on sea level conditions in 1991. Sea levels are assumed to have increased at 2mm/yr between 1991 and 2004, so that 2004 levels are considered to be 0.026m higher than those listed in Table 4.1.

Table 4.1 Extreme wave and water level combinations (1991)

Wave height m	1% AEP water level (mOD) at JPA Point				0.5% AEP water level (mOD) at JPA Point				0.2% AEP water level (mOD) at JPA Point			
	1	4	7	10	1	4	7	10	1	4	7	10
0	4.62	4.84	5.03	5.08	4.72	4.93	5.11	5.12	4.87	5.05	5.21	5.20
0.9	4.14	4.59	4.75	4.72	4.29	4.78	4.87	4.82	4.44	4.97	5.03	4.89
1.2	-	4.26	4.66	4.17	-	4.50	4.73	4.35	2.00	4.63	4.87	4.56
1.5	-	3.87	4.35	-	-	4.05	4.54	-	-	4.32	4.70	2.00

JPA Point 1 – Pyewipe

JPA Point 4 – Immingham (S) or Laporte Road

JPA Point 7 – North Killingholme

JPA Point 10 – Skitter Ness

There is an increase in the extreme water level in the absence of waves along the estuary between JPA Points 1 and 10 because of the propagation of the tide up the estuary which causes an increase in extreme water levels between Pyewipe and East Halton Skitter. The changes in the exposure to wave attack are also illustrated by Table 4.1. Near North Killingholme (JPA Point 7) wave attack is most severe. South of Immingham (JPA Point 4) wave attack is a little less severe and becomes much less severe at Pyewipe (JPA Point 1) because of the shelter afforded to this site by the Grimsby docks area (Figure 4.1). North of North Killingholme, wave attack decreases towards Skitter Ness (JPA Point 10) because of the narrower estuary, the shorter fetch from the north between Hull and Paull and the reduced exposure to the outer estuary beyond Hawkin's Point.

4.2 Topographic and bathymetric data

4.2.1 Analysis of historic charts

The frontage between East Halton Skitter and Pyewipe forms the majority of the southern bank of the Outer Middle section of the Humber estuary, defined as the area between Skitter Ness and Grimsby / Hawkins Point. The bathymetry of this section of the estuary in 2000 is shown on Figure 4.1.

The analysis of the 2000 bathymetric chart in conjunction with the HESMP2 water level model indicated there were 527 ha of intertidal foreshore on the south bank of the Outer Middle section of the estuary and 1215 ha on the north bank. Analysis of historic charts at approximately 5 year intervals since 1936 indicated an average loss of almost 10 ha/year of intertidal foreshore from this section of the estuary, of which approximately 3 ha/year was from the south bank (Ref 1). This analysis is reported in greater detail in Appendix B.

Just over half of the south bank intertidal area of this section of estuary frontage is between Stallingborough and Grimsby. The historical analysis suggests this intertidal area has fluctuated considerably, although there has been a general trend for a gradual reduction in the area. 1976 was the year for which the minimum area was calculated since when there has been a small recovery.

The analysis of changes on the north side of the estuary in Appendix B suggests that the subtidal part of the estuary has consistently migrated to the north at Hawkin's Point and squeezed the width of the foreshore at this location, but the intertidal area has expanded into the estuary south of Stone Creek and squeezed the subtidal towards the south side of the estuary at Stallingborough. These features are identified in Figure 4.1. If the historic migration of this subtidal area continues, there is likely to be continuing erosion of the intertidal area at Stallingborough.

4.2.2 Changes to upper foreshore levels

Historical topographic survey data from the past 40 years was analysed at selected points along the East Halton Skitter to Pyewipe frontage in order to determine how the level of the upper foreshore, adjacent to the seaward side of the tidal defence has changed. This data was combined with data from the 2002 Lidar survey and bathymetry from the 2000 survey. The following observations on the vertical change of foreshore level fronting the defences were made:

- At Halton marshes between 0.4 and 0.9m of upper foreshore was lost between 1965 and 1987, and 0.4m since 1987, except near East Halton Skitter where there has been no change since 1987.
- There appears to have been no significant change of foreshore levels at North Killingholme Haven since 1965.
- At Killingholme Marshes, 0.7m of upper foreshore level has been lost since 1965 immediately fronting the toe of the defence, though there was no significant overall change in foreshore level 10m seaward of the defence during this period.

- Since 1965 the upper foreshore has accreted by approximately 1m in the vicinity of South Killingholme Haven.
- Adjacent to the SCM jetty at Stallingborough there has been up to 1.8m of foreshore erosion since 1987. Between 1976 and 1987 there was 0.6 to 0.9m of erosion.
- Between the Middle Drain and Oldfleet Drain outfalls there was up to 0.5m erosion between 1997 and 2002.
- Downstream of the Oldfleet Drain outfall there has been no significant change in foreshore levels since 1987.

4.3 Immingham frontage geomorphology predictions

4.3.1 Long term predictions

The long term geomorphology predictions (Ref 1) conclude that over the next 50 years there may be a loss of 140 ha of intertidal foreshore from the middle estuary (Humber Bridge to Hawkins Point) due to coastal squeeze if sea levels continue to rise at the historic rate of 1.8mm/year during the past century. The loss due to coastal squeeze in this section is predicted to rise to 360 ha if sea levels rise at 6mm/year throughout this period. The majority of this loss would be likely to occur downstream of Skitter Ness as it contains two thirds of the intertidal area of the middle estuary, although for habitat replacement purposes, the whole of the middle estuary should be considered as a single unit.

On this basis and the assumption that half of the loss occurs on the south bank, the reduction in the intertidal area between East Halton Skitter and Pyewipe over the next 50 years might range between about 45 and 120 ha depending on the sea level rise rate compared with a loss of about 150 ha during the past 50 years. This suggests losses of intertidal area are likely to continue over the next 50 years, though possibly at a slower rate if sea level rise is less than anticipated.

In the long term hybrid geomorphology modelling (Ref 12) the analysis identified some sections of the Humber where accretion was least likely to occur as sea levels rose and erosion was more likely to occur if there was an increase in tidal range. This modelling identified the cross sections at Stallingborough just downstream of Immingham (Figure 4.1) as the section most likely to experience overall erosion.

4.3.2 Short term impacts of managed realignment

Short term changes to estuary water levels and geomorphology as a result of strategic managed realignment have been modelled (Ref 2). For these studies, a baseline case predicting the short term geomorphological evolution of the estuary was compared against all the planned managed realignment sites, though only site S11 between East Halton Skitter and Skitter Ness had a discernable impact on the East Halton to Pyewipe frontage.

4.4 Impact of port developments

4.4.1 Recent and planned developments

The port facilities along the East Halton to Pyewipe frontage have developed because the main deep water channel of the Humber lies close to this bank. Navigation access to these facilities was enhanced by dredging of the Sunk Dredged Channel in 1968 on the northern side of the estuary east of Hawkins Point. The Sunk Dredged Channel connects the local deep water at Immingham to the deep water at the mouth of the Humber and the North Sea.

Between 1950 and 1995, major expansion of port facilities along the frontage occurred with the construction of long jetties terminating in the deep channel. The main effect of these facilities on estuary morphology has been the capital dredging of berthing pockets and access channels and the dredging required to maintain published navigation levels.

This pattern of development continues with the development of the riverside terminal at North Killingholme based on a dredged offshore jetty with a piled link to the shore. Unlike the earlier jetties this development was preceded by a minor reclamation of upper intertidal areas to increase the land area available for riverside storage.

Recent and planned developments at Immingham are of a different nature, having direct impacts on the intertidal area and the flood defences at their landward edge including the reclamation of 14ha of intertidal foreshore fronted by a piled jetty dredged on its outside. This reclamation moves the high water line of the estuary seaward by around 300m locally. Recently, approval has been granted for construction of a new dredged riverside harbour with the loss of 22ha of intertidal foreshore. Compensation for this loss of intertidal habitat is being provided on the north bank of the Humber to the east of Hawkins Point.

These developments to the north of the enclosed docks at Immingham are creating a major estuary strongpoint preventing further local erosion of the adjacent foreshore. Since the initial reclamation there has been local accretion of intertidal foreshore both upstream and downstream of the site.

4.4.2 Short term modelling of port developments

Model studies for port developments at both North Killingholme and Immingham suggest small changes in accretion and erosion along the intertidal foreshore from East Halton Skitter to Pyewipe.

Detailed modelling for both the Immingham and North Killingholme projects suggest small changes in accretion and erosion with the risk of less accretion being greatest along the Halton Marshes frontage. In practice as erosion has occurred historically on the upper foreshore at this cross section, there is a risk that the erosion rate might increase as a result of the planned port developments.

4.4.3 Impact of dredging on flood defences

Both the Immingham and North Killingholme development proposals include dredging close to shore, which could have a potential impact on the stability of adjacent flood defences.

As the Immingham developments are within the Immingham dock area, any issues with the stability of the existing defences will need to be resolved by ABP who are designing the new works and who own and maintain the existing facilities in the Dock area including the flood defences. Dredging associated with the Immingham developments is thus not anticipated to have an adverse impact on the stability of the Environment Agency's flood defences.

The Planned developments at North Killingholme include dredging just offshore of the low water mark to provide access and a berthing pocket. The side slope of this dredged area will need to be sufficient to maintain a stable face in the material present in this area to avoid erosion and potential adverse impact on the stability of the adjacent flood defences which are maintained by the Environment Agency.

4.4.4 Long term assessment of planned port developments

The port developments at Immingham will reduce the conveyance of this part of the estuary, and as the south bank is heavily defended, there might in the long term be more erosion on the north bank as the channel is pushed towards that side. However, the alignment of these new developments with the prevailing currents may well succeed in minimising this effect.

In the longer term, the Immingham developments might affect the potential movement of the apex of the main channel meander that brings deep water close to Immingham. In practice these structures are likely to help stabilise this section of foreshore and reduce any tendency for the apex of the meander to move.

4.4.5 Potential future port developments

The presence of deep water close inshore between North and South Killingholme may create pressure for the development of further port facilities along this frontage. The foreshore level and the intertidal area of the reach fronting Killingholme marshes has been slowly declining. Reclamation or dredging of this foreshore could be accepted on this frontage provided the designs take appropriate account of flood defence issues as such developments might avoid the need for increasingly substantial flood defence works. Any activities that affected the integrity of the internationally designated foreshore site would need to be justified by means of an Appropriate Assessment.

If dredging of the adjacent deep channel in the absence of reclamation works is proposed, it would be essential to ensure that the dredged side slopes were stable, did not promote foreshore erosion and were far enough offshore not to affect the stability of the flood defences.

4.5 Conclusions of Immingham frontage studies

There has been a continuing loss of intertidal area between East Halton Skitter and Pyewipe since 1936 on all sections of the frontage apart from the section around North Killingholme Haven. These losses of intertidal area and the associated increase in subtidal area illustrate the classic response of a defended coastline to coastal squeeze.

Analyses of foreshore cross sections shows some foreshore erosion at the majority of sites reviewed on this frontage, especially along the Stallingborough frontage, where erosion of 1 to 2 m in 10 years has occurred recently. Elsewhere erosion rates are much slower and do not exceed 0.3m in 10 years. Accretion has only been consistently observed in areas sheltered by port facilities. The changes are consistent with the main channel migrating north at Grimsby and south at Stallingborough.

Recent and planned port developments are likely to promote local siltation immediately upstream and downstream, although there is a possibility that the Halton Marshes frontage might experience more foreshore erosion as a result of these developments. The impact of near shore dredging for port facilities should be carefully reviewed and monitored to ensure it does not adversely affect the stability of the flood defences directly or in time as a result of additional foreshore erosion.

4.6 Impact of geomorphology on flood defence design

All the estuary process studies indicate that the foreshore of the East Halton to Pyewipe frontage has reduced in area over the past 50 years, and is likely to continue to do so, especially if sea level rises at a faster rate. There is thus no justification in the design of flood defences for assuming that foreshore levels in the future are likely to be any higher than they are at present, and the probability is that along most of the frontage foreshore levels will reduce except in areas sheltered by port facilities which may benefit from local siltation.

North of Immingham docks foreshore erosion of the toe of the flood defences has been variable. Although at some sections there has been little erosion, elsewhere the foreshore level at the toe of the existing defences is reducing at a rate of up to 0.2m in 10 years. On this basis future designs should probably assume that erosion will continue at a rate of 0.2m in 10 years with a sensitivity test to examine the consequence of a more rapid reduction in foreshore level of 0.3m in 10 years.

South of Immingham docks along the Stallingborough frontage, there have been localised dramatic losses of foreshore level over the past 40 years especially near the SCM jetty. Foreshore levels 10m in front of the defence have reduced by up to 1.8m since 1987, a rate in excess of 1m in 10 years. Erosion at this rate is unlikely to continue indefinitely. The presence of the offshore sea bed 'platform' at -6mOD evident in the bathymetric surveys (Figure 4.1) may indicate the lower level to which the toe of the defence could eventually erode. Subject to soil investigations of the resistance to erosion of the strata

above -6mOD, it is recommended that erosion to this level is assumed in the design of long term flood defences that maintain their current alignment.

In the Pyewipe embayment the foreshore is wide and sheltered from wave and current activity. Design of flood defences in this section could assume, subject to monitoring, that the level of the foreshore is unlikely to change significantly. It would seem prudent to assume that some erosion might occur at any point along this frontage, though the foreshore may well recover its existing level fairly rapidly.

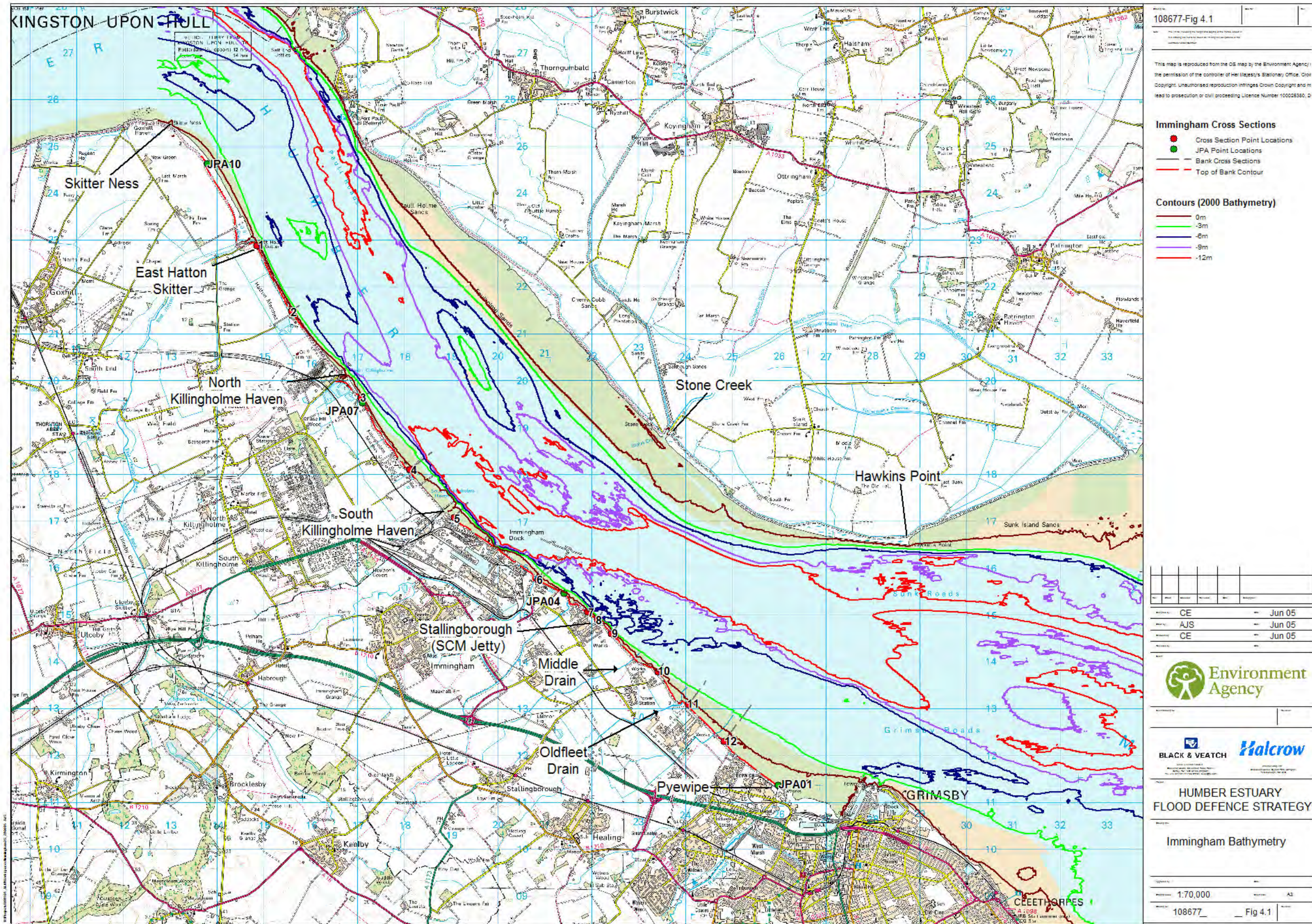


Figure 4.1 Skitter Ness to Pyewipe frontage and estuary bathymetry

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5 BANK EROSION

5.1 Introduction

Movement of the channels in the Humber causing bank erosion and undercutting of the flood defences is a major reason why urgent and emergency flood defence works have been required on the Humber flood defences during the past decade. These works have usually been restricted to the well defined sections of the defences listed below:

- East Halton Skitter to Pyewipe
- South bank upstream of the Humber bridge
- North Bank upstream of the Humber bridge
- River Ouse
- River Trent

The erosion of the East Halton Skitter to Pyewipe frontage have been discussed in section 4 of this report.

5.2 Erosion upstream of the Humber bridge

Within the Humber, the other area of particular erosion is upstream of the Humber Bridge to Winteringham on the south bank and to Brough on the north bank. Erosion in this area is associated with the frequent and somewhat unpredictable movement of the main navigation channel. The channel is usually in the centre of the estuary to the north of Read's Island, but at times can move to the south of the island close to the south bank of the estuary or run close to the north bank of the estuary. When the channel is close to either bank erosion of the adjacent bank can occur.

There have been six periods when the channel has been close to the north bank and a further six when it was close to the south bank since 1900. sustained high fluvial flows at times of high tidal range have been proposed as the event that initiates a switch from south to north, after which the channel slowly migrates southward again (Ref 13). The periods when the channel was close to either the north or the south bank of the estuary during the 20th Century are listed in Table 5.1 (from Ref 13). The switches during the 1930's might be attributed to the construction of the training works at Trent Falls

Table 5.1 Years when the navigation channel upstream of the Humber Bridge was close to the north or south bank

Navigation Channel close to south bank	Navigation Channel close to north bank
1909-11	1902
1923-30	1930-2
1933-5	1936-7
1938-1947	1947
1969-1977	1977-83
1992-4	1994-8

Since the channel was on the north side in the mid 1990s, the main navigation channel has remained in the centre of the estuary on the north side of Read's Island and has caused considerable erosion of this side of the island, leading to fears that a switch to the south side of the island might occur within a few years.

At present there is a wide intertidal foreshore along most of the north bank of the Humber between Brough and the Humber Bridge. On the south bank, there is relatively deep water alongside the south bank between Winteringham and South Ferriby, even though this is not the official navigation channel and a larger channel exists to the north of Read's Island. Nevertheless there are strong ebb currents in the deep water close to the south bank of the estuary that have caused erosion and necessitated Urgent and Emergency works in 1995, 1999 and 2001 (Ref 15).

There are few reliable records of erosion along either the north or south shores of the estuary upstream of the Humber Bridge. Comparison of surveys for 1966 and 2000 was carried to assess probable erosion rates along the south bank where erosion is a current risk. The bathymetry of 1966 was chosen as it is the most detailed historic bathymetric survey of the estuary, surveyed to provide data for the physical model of the Humber and so extended to higher foreshore levels than normal. In the 2000 survey, the surveyed estuary bathymetry has been combined with the Lidar survey of the foreshore. The different survey methods limit the robustness of the comparisons that may be made.

Foreshore accretion and erosion was assessed by comparing the bed levels along the seven cross section lines shown on Figure 5.1. Table 5.2 indicates the horizontal movement of the 0.0m contours at each cross section over the 34 years between the two surveys and the slope of the upper foreshore measured for each survey. The shape of the cross section in 1966 and 2000 is compared for lines 1, 2, 4 and 5 in Figures 5.2 to 5.5. At all sections, the depth of the channel south of Read's Island was around 2m less in 2000 than in 1966.

Table 5.2 Erosion and accretion south of Read's Island 1966 - 2000

Line	Horizontal foreshore movement*	Foreshore slope (1 in x) between +3 and 0 m OD	
	At 0.0 mOD	In 1966	In 2000
1	249	5.7	41
2	-104	23	5.7
3	-2	2.1	1.6
4	-0.4	0.7	0.6
5	-24	7.4	7.3
6	-38	14	4.2
7	24	16	13

Note * Positive values indicate accretion (northward movement of the contour)

Significant accretion has occurred since 1966 at the west end at section 1 (Figure 5.2) near Winteringham Haven and also at the east end close to South Ferriby Sluice (line 7). At all sections in between erosion of the foreshore was detected by the southward movement of the 0.0 mOD contour between the two surveys, though the amount varied from less than 0.5m change at section 4 (Figure 5.4) at the west end of the A1077 to in excess of 50m at section 2 (Figure 5.3). Near section 2 a bitumen grouted stone revetment was added in the mid 1970's, since when there has been no significant erosion as this revetment remains serviceable. This suggests erosion at this cross section occurred while the navigation channel was south of Read's Island between 1969 and 1977 and was controlled by adding a revetment.

On all eroding cross sections the foreshore has become steeper. The steep slope at section 4 (Figure 5.4) near the west end of the A1077 section presumably represents the face of the steel sheet piles along this section.

The cross sections for lines 1 and 2 (Figures 5.2 & 5.3) illustrate the significant changes in the position of the nearby channel and the erosion and deposition adjacent to the estuary banks during this 34 year period. The presence of Read's Island is marked in the 1966 survey by ground levels at an arbitrary 4mOD in Figures 5.2, 5.3 and 5.4. The significant reduction in the width of the island at sections 4 and 5 is immediately evident. At cross section 2 (Figure 5.3) the island has disappeared to be replaced by a wide area of high intertidal bank that would be covered on spring tides. This significant erosion of Read's Island is likely to significantly affect the future evolution of the nearby southern shore of the estuary, though it is not possible at this stage to say if the erosion of the island will make it more or less likely that the southern shore will erode in the future.

5.3 Erosion in the tidal rivers

Erosion of the flood defences along the tidal reaches of the Ouse and Trent rivers has been a persistent problem controlled primarily by stoning. There was a major programme of stoning on the Trent when the flood defences were reconstructed in the 1960s and 1970s. These stone banks have been well maintained since then and remain generally in good condition. There was no such major construction campaign on the Ouse and less has been spent on the maintenance of these banks so their condition is generally poorer.

Along both rivers, there is a historic pattern of settlement close to the river which has fossilised the course of the river and meant that the local community has always tried to ensure the river keeps within its historic channel. There are places along both rivers where the main channel has moved very close to one or other bank and has persistently undercut it. The good maintenance of the Trent banks has controlled this but in the Ouse the closeness of the main channel seems to be linked to flood defence instability in several locations. Very often this attack is associated with particularly deep sections on the outside of bends, but such scour may also be an indication that the tidal river would change its course or meander pattern if it was allowed.

Little study has been carried out on how the course of the tidal river might respond to any change in bank alignment nor to the areas where scour of the river banks might be expected in future in response to changing fluvial or tidal conditions possibly as a result of changed rainfall or rising sea levels. A model study of the geomorphology of the lower Ouse might be a useful precursor to the planned improvement to the stoning of the Ouse banks to ensure that this programme works with the natural processes in these rivers wherever possible taking account of the significant constraints imposed by the existing river bank settlements and infrastructure.

5.4 Bathymetry survey

One of the difficulties in understanding undercutting and erosion of river banks is that there is often little reliable information on the profile of the river bank as indicated in sections 4 and 5 above. The bathymetric charts are particularly interested in the deep navigation channels and the port surveyors only have a peripheral interest in the intertidal edge of the estuary where the flood defences are located. The flood defence engineers use land survey techniques including remote sensing to check on the profile of the defences, but these techniques are only satisfactory for the intertidal section of the defence and cannot survey the subtidal part of the bank that is permanently submerged.

In order to overcome this mismatch between terrestrial and bathymetric techniques, a limited bathymetric cross section survey of 11 critical sections of the Humber and tidal rivers was carried out in April and May 2005 in association with the full survey of the estuary flood defences by low level Lidar in March 2005. The sections surveyed are listed in Table 5.1. These locations were chosen to include those sections of the estuary where the bathymetric charts indicate that deep water, not necessarily the main navigation channel, was located close to a flood defence. Areas where a significant intertidal foreshore was present in 2005 or where the flood defence is retired some distance behind the flood defence were not surveyed as the risk of erosion or bank slips in these reaches can be assessed without bathymetric survey.

At the time of writing these surveys have been completed but the results have not been integrated to provide a picture of the bank profile above and below low water level.

Table 5.1 Bathymetric surveys in 2005

Humber	Ouse	Trent
Stallingborough	Sand Hall	Keadby
North Ferriby	Swinefleet	Keadby – Boskeydyke
Winteringham - S. Ferriby	Saltmarshe - Laxton Clough	Gunness
	Reedness – Whitgift	Neap House – Flixborough
		Amcotts – Livithorpe

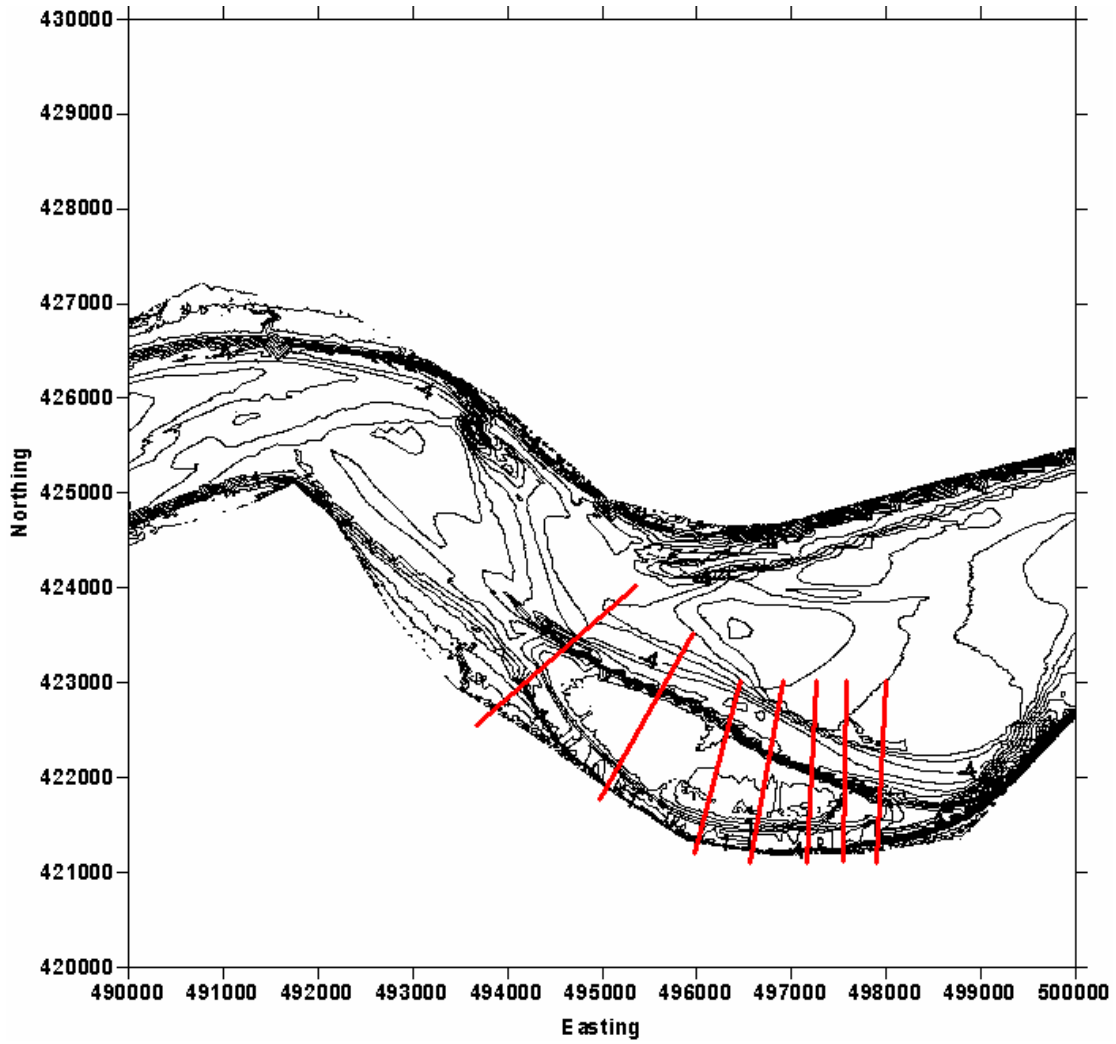


Figure 5.1 **Location of south bank transect lines around Read's Island**

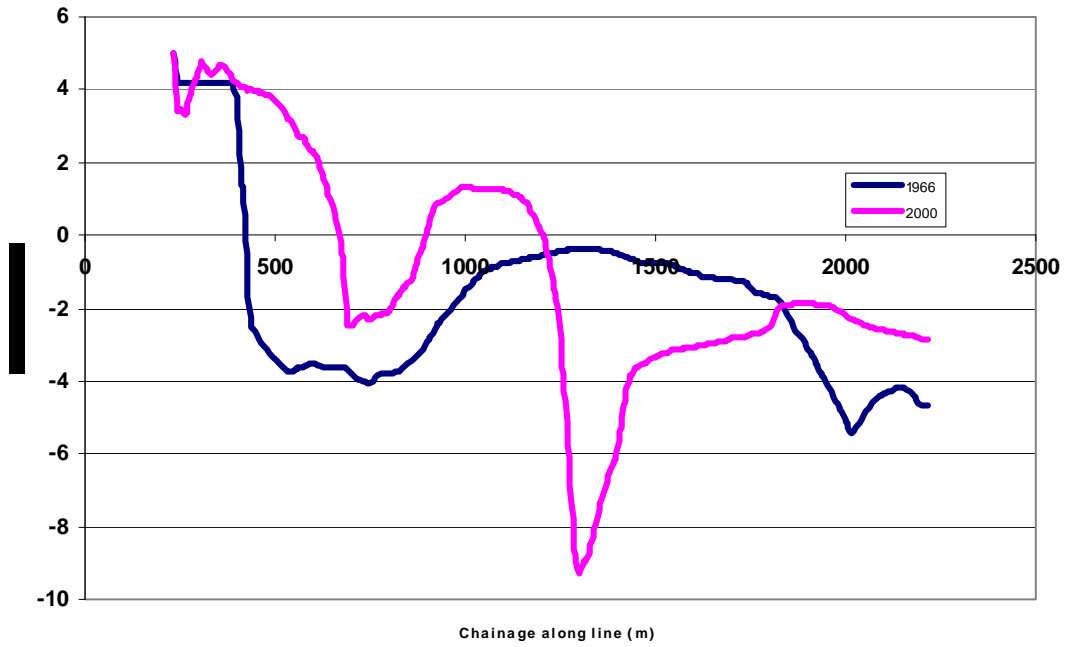


Figure 5.2 Cross Section 1: Comparison of 1966 and 2000 surveys

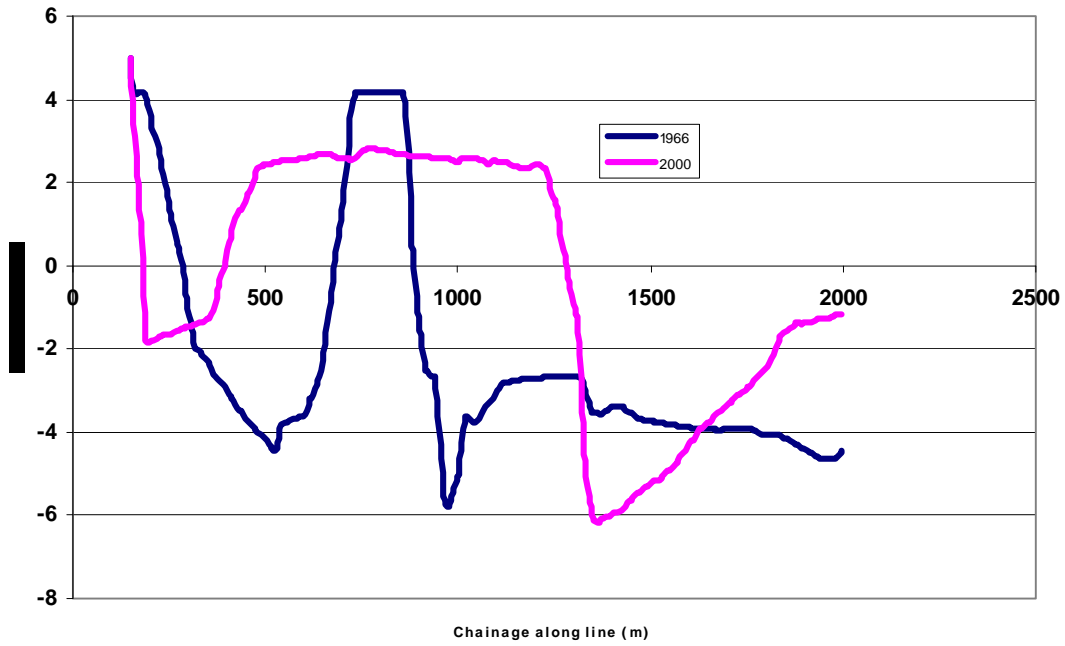


Figure 5.3 Cross Section 2: Comparison of 1966 and 2000 surveys

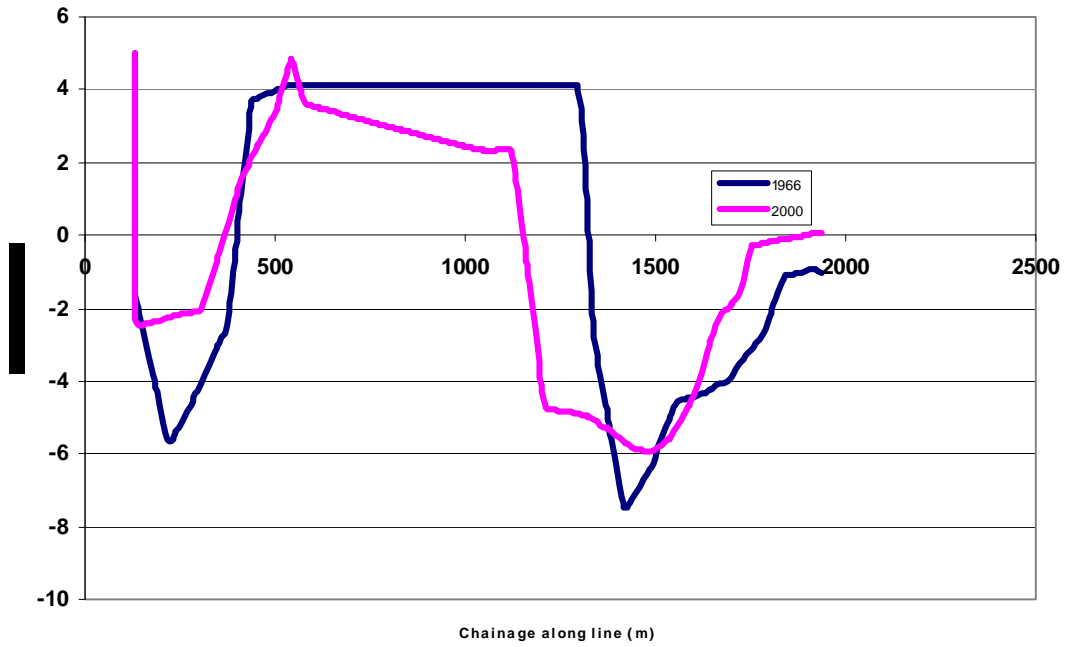


Figure 5.4 Cross Section 4: Comparison of 1966 and 2000 surveys

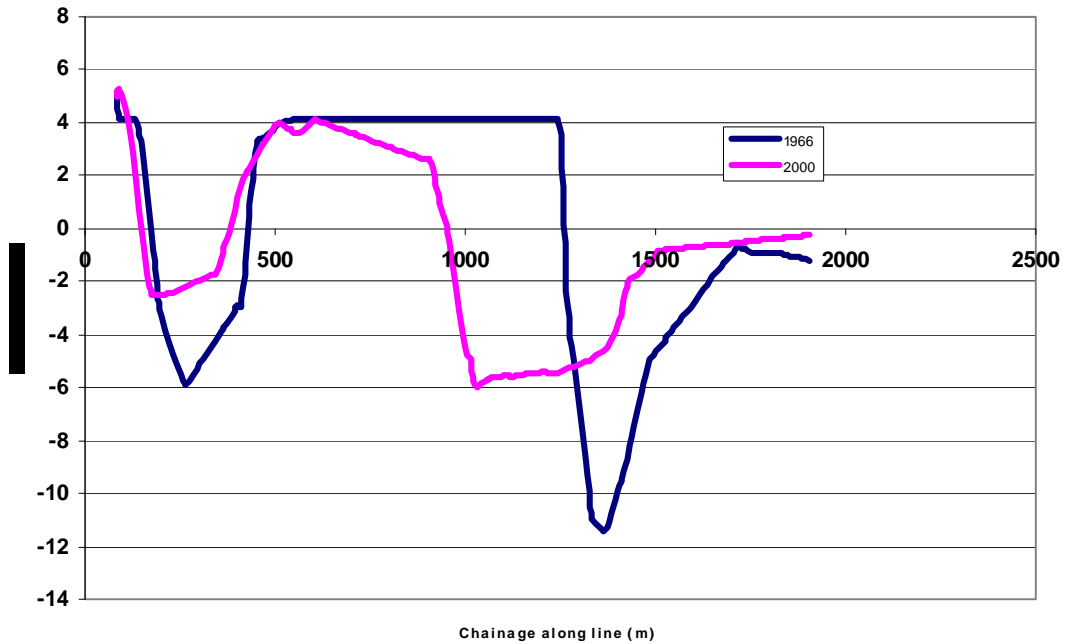


Figure 5.5 Cross Section 5: Comparison of 1966 and 2000 surveys

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Appendix A

Humber Validation Panel

Comments on summary and short term geomorphology reports

made by the Validation Panel January 2005.

Key Comments

- 1 *The Validation Panel members have not been back over all the previous reports to see if their earlier queries have been addressed in detail since this would take too long. They have confined their attention to the two reports received in December 2004. It is clear that the two reports now contain more realistic comments and conclusions on the results of the morphological studies. The review process and the increased inter-partner discussions have clearly been of benefit to the consortium and, I hope, to the individual partners.*

- 2 *I have one major outstanding worry, and this stems from the use of summer time river flows for all of the hydrodynamic modelling. It is not clear to me that the results of the sediment transport, erosion and deposition, and extreme levels relating to setback conditions may not show important effects. The work done by PML for the LOIS study showed that there were major changes in the position and intensity of the turbidity maximum, and of the salinity intrusion with season, and that there were lags of some weeks between the position of the turbidity maximum and the salinity. Additionally, remote sensing has shown the presence of significant plumes emanating from the Humber at high river discharge. These have been supported by salinity measurements taken from ferries from Hull across to Holland. I would have thought that a few runs of the main models with high river discharge would be justified, if only to remove this concern. How one could incorporate the effects of the observed lags, I don't know. The setback calculations of areas will certainly be sensitive to river flow in the upper estuary and the rivers Trent and Ouse.*

Response: We accept the short term modelling was carried out for summer flow conditions and the predicted turbidity maximum was more typical of summer than winter conditions. Additional predictions using a complete year of turbidity data were carried out by PML (Reg Uncles) to determine the probable siltation rate for the Alkborough site. This additional work showed higher siltation rates. This extra study is obliquely referred to in the final paragraph of section 8.4 (Short Term report).

The calculations for setback area in the inner Humber and in the lower reaches of the Trent and Ouse are not sensitive to river flow as only low tide levels are affected. River flows have a minimal impact on high water levels within the study area. See the response to comments on p8 & p10 of the Short Term report for more detail.

- 3 *I was also rather surprised that the hybrid modelling appeared insensitive to river flows. My recollection of the (physical) modelling and other studies carried out around the 1970's was that winter conditions in the Humber were very different from summer conditions. If that were true, then the impact of realignment schemes on winter conditions could be very important. Perhaps river flow per se is not that important, but is it possible that some of the sediment properties change in winter, e.g. reduced settling velocities at reduced temperature, different degrees of bio-turbations etc (hence different thresholds of erosion)? Some sensitivity testing on the effects of different (assumed) sediment properties might give some insight into possible winter/summer behaviours.*

Response: Seasonal variations in the turbidity maxima are known to be significant, though usually linked to freshwater flow changes as indicated in the response to Key Issue 2. Seasonal changes in sediment properties is an issue that was not investigated in the hybrid morphology modelling, and may need to be investigated in a future study in parallel with the potential sensitivity to freshwater flows.

- 4 *There seems to be some contradictions between results showing export and import of sediment. I am unsure whether this is the result of real variation depending on the timescale of averaging involved in each calculation, or whether they are simply measures of the overall variation in the errors of the assumptions made in each case. A time vs export/import plot might show the trends in an indicative way. There does seem to be evidence that export is occurring in the outer estuary and accumulation in the inner estuary. This would appear to justify the results of the setback studies. In the conclusions a statement of the consensus scenario would be helpful.*

The silt morphology model has not got the right balance between the mechanisms that import and export silt. It is more likely that some of the important mechanisms are not included in the model. These are likely to be vertical stratification of salt and silt, and the tidal pumping caused by hysteresis effects.

The comment about incorrect balance and significant processes missing from the model makes one ask what they are. A brief comment on them would be useful in showing insight into the problems. What are the significant processes missing from the model that might encourage import of sediment into the Humber?

Response: The Consortium accepts there is significant doubt in the modelling about the correct balance between import and export of sediment in the short term model. At this stage we are not sure what these processes are.

Summary of Geomorphology studies

General comments

I have already made comments on a previous draft but some typos still seem to remain and there is still a need to alter some wording to clarify comments. The document has pulled together all the relevant information and now contains appropriate caveats with respect to the accuracy and reliability of the results and conclusions. The work on water levels and inter-tidal loss provides a good guide to expected conditions in the estuary. The modelling of detailed accretion and erosion patterns is less useful but provides general background information on possible effects.

I think that there needs to be an overall concluding conceptual description, with quantification where possible, which integrates all of the results summarised in this report. At the moment one is not left with a clear picture of what the operational model is.

Detail Comments

Long term increase in tidal range

p5 line 20: *“...not proven.” While this is true, the increasing bed shear stress from increasing water depth requires an increasing flow velocity, which can only be produced by increasing the tidal range, since friction coefficients are likely to reduce. This type of argument leads to an increase in range of a similar magnitude to the rise in tidal-mean water depth.*

p6 *Some of the increase in tidal range might be the result of the increase ocean temperatures, and the increases in mean sea level. It is interesting that there appears to be a 2 year lag between the lunar nodal cycle and the changes in intertidal area. This sort of change will not show up in the setback modelling, and might mean that the changes are underestimated.*

p6 *“the recent increase in tidal range seems unlikely to be maintained indefinitely and is likely to reverse at some time in the future as tidal ranges probably remain fairly constant over the long term” I appreciate that there is a reference here to another (more detailed) report, but I think that the reasoning behind this rather important statement should be summarised in this report.*

Response: Evidence from studies of the Holocene suggest that tidal range has remained relatively constant. This means that the trend identified for the 20th century cannot be linearly extrapolated backwards and it is therefore unlikely to extrapolate into the future.

p6 last line: *While attention is drawn to 1988 and 1997, other dates could also be used to reinforce this important point and also the need for regular observation of the system.*

Response: Agreed.

p7 2nd paragraph, *mention is made of Skitter Ness and Hawkins Point, but neither of these features is shown on the Location Map (Fig. 1.1)*

Response: They are included on our copy. Please see revised map attached with the short term report.

p8 The suggested comparison of historic maps and charts would probably be worth while.

Response. This could form part of a subsequent study.

p10 It is not clear whether the results in table 3.1 are for spring or neap tides.

Response: These results are for spring tides.

p10 Table 3.1: Could the report be consistent in either using “loss” as in this table or “negative gain” as in Table 3.2? We again switch to loss from “negative gain” in Table 4.3!

Response: We accept that both loss and negative gain are used and apologise for the inconsistency.

p10 I have commented on the likely accuracy of this type of model before. It has served as a useful guidance tool but reliance should not be placed on absolute answers.

Response: The views of the Panel member are noted.

p11 The use of Tonnes per tide and cubic m per year is confusing. Could only one set of dimensions be quoted, or one set put in brackets.

Response: The units of measurement provided depend on which component of the sediment budget under consideration and the method by which it is quantified. Conversion of in-situ volumes to mass requires an assumed in-situ density about which there will undoubtedly be some level of uncertainty. The preference would be to only make the conversion between mass and volume when absolutely necessary. See Townend and Whitehead, 2003 for further discussion on this point.

*p17 Table 3.5: The explanation of the **Bold** figures is not clear, at least to me! Typo for bracketed “Whole Humber” value.*

Response: Bold figures are used in this and some other tables to indicate those trends which explain a large part of the variance in the data that is present if no trend is assumed. The trends in normal type explain less of the variability and so may be less significant. The Whole Humber figure should be -2.2.

p18 Table 3.6: The values for Case 6 with 1.8mm/year sea level rise are not consistent with Table 4.2

Response: The values for Case 6 should read: Whole Humber -125, Outer estuary -15, Middle estuary -140; inner estuary +35. The figures do not add up because the values given in Appendix 2 of R.1053 are rounded to one decimal place. Multiplying these rounded values to obtain areas for a 50-year prediction results in the 5 ha discrepancy. When multiplied by 50, each value quoted could deviate by up to ± 2.5 ha (ie. 0.05×50). Unfortunately, data presented in Appendix 2 is not readily accessible due to subsequent changes in functionality of the latest software version.

p19 2nd para: The emphasis given to the Regime model absolute values is unwarranted since Table 3.1 shows that a change in assumption about the estuary cross-section leads to large differences in absolute value. It would be more appropriate to say, though not to

report, that by choosing a geometry that gives results within 15% of the mean for 1.8 mm rise, it is possible to produce (realistic) estimates for other rises in mean sea level. However, using loss uncertainty figures in model estimates of 1/3rd of the mean value removes to a large extent the dependency of final estimates on the Regime model values. Indeed, the results are then very close to the values from the Hybrid model, which has the best scientific basis.

Response: The views of the Panel member are noted.

p19 Table 4.1: The Form model figures in this table have been taken from Table 3.6 as well as Table 3.5 although the dates shown are different: (1946-2000) and (1950-2000): reference is only made to Table 3.5.

Response: We agree there should also be a reference to Table 3.6, and accept the starting dates differ by 4 years, but considered this of minor significance.

p19 4th para, lines 5-7: This argument is weak in view of the difficulties with the Regime model: see above comments. The Hybrid model is the better model!

Response: The views of the Panel member are noted.

p20 6th para: The disagreement between the Hybrid and Form models should receive some comment at this point in the text.

Response: We agree there is a significant difference between the two models. The Form model was calibrated against conditions between 1946 and 2000 so has been developed to reproduce the increase in intertidal area in the two parts of the Inner estuary (Table 3.5). By contrast the hybrid model was calibrated assuming the estuary to be in overall equilibrium (section 3.3.1 4th & 5th paragraph). The hybrid model was subsequently validated against the historic changes observed between 1966 and 2000, with limited success (sect 3.3.1 final para), especially in the inner estuary.

p21 Table 4.2: The figures in this table need checking. The 120 should be 125, I think.

Response: Agreed, there is an error in Table 3 of report R.1053 which should have a rate of intertidal area loss for the 'Outer Middle' estuary of 2.5 ha/yr instead of the 2.3 ha/yr stated. See also response to comments on Table 3.6.

p21 Table 4.3. For the Middle Humber, I believe the figure of 146 is incorrect – it should be 140 as shown in Table 4.2, Middle Humber, Form Model. The figure of 232 for the Whole Humber is also incorrect, it should be 236.

Response: Agreed

p21 final para. The phrase “while providing an allowance in the Inner Estuary in case there is a change in behaviour that leads to future losses in the Inner Humber as anticipated by the Hybrid model”. However this allowance for future behavioural change has not been incorporated into the recommendations of Table 4.5. There should be some discussion about why it has not been included, how a change in behaviour could be detected, and how the extra allowance could be incorporated later if necessary.

Response: Table 4.5 is based on the precautionary assumption that there may be a future loss of intertidal area in the inner estuary, and so recommends the provision of a

relatively small area of intertidal habitat against this eventuality. If future monitoring shows that the historic trend for increased intertidal area in the Inner estuary continues then there would be no need to continue providing such habitat.

p22 Table 4.5: *The derivation of the figures for the River loss needs some comment.*

Response: The anticipated increase in intertidal area in the rivers is based on rounding the hybrid model results of Table 4.2.

p23, *The second sentence of section 4.4 could easily be misread to imply that there could be several decades of decreasing area followed by several decades of increasing area. The sentence could be clarified by changing just two words to give “This means that there are likely to be decades when the intertidal area decreases, alternating with decades when it increases.”*

Response: Agreed.

p23 last para: *While understanding the comments on variability of estuarine quantities, a review every 15-20 years seems too long given that survey information is available every year. The review should be at closer intervals although action would not follow unless conditions in the estuary dictated otherwise: action on the ground also has its own timescale.*

Response: The 15-20 year review period is to ensure that any influence of the lunar nodal tide can be taken into account, give enough time to distinguish random fluctuations from long term trends and check whether the provision of replacement habitat is adequate. There is significant variability in calculated intertidal areas between successive surveys as indicated in section 2.5.

p24 line 15: *“.....identified in Geo 2.....” it would help to have the reason stated here rather than expect the reader to go to the reference.*

Response: This is discussed in more detail in the Short term geomorphology report. The Geo 2 report identified this feature predicted by the modelling. The reason for it has not been fully established but is believed to be because of the time lag between HW at the mouth of the estuary and in the Inner estuary. By the time defences are overtopped in the Inner estuary the tide is ebbing at Spurn, so the volume of water in the estuary is limited. If defences are overtopped in the outer estuary, more water is sucked into the estuary and the levels do not reduce.

p24 3rd para: *Fig.5.1 is missing from this report, and is not listed on the contents page.*

Response: Apologies that this Figure is missing from both reports. The figure is attached.

p26 1st para; *There is mention of the suggestion that there are some significant processes missing from the models. Is there enough discussion in the report of the consequences of the failure to model the correct balance between import and export of sediment?*

Response: See Key Issue 4

p26 last para; Typo. Words missing? Meaning unclear.

Response: Apologies that Table 5.1 is missing from this report. The referenced paragraph is copied from the Short Term Geomorphology report where a copy of the Table may be found.

p27 5th para: “...opposite to...”. There is no explanation as to why or if it is an expected result.

Response: The result was not expected.

p27/28: Conclusions on the amount of sedimentation and erosion as a result of different schemes must be treated with caution given the modeling problems.

Response: Agreed.

p28 line 1: There is no indication of the alternative method used or if it is reliable!

Response: See Response on Key Issue 2

p40 last para: No details of location of Keadby etc.

Response: Apologies that Figure 1.1 does not include Keadby. It is included on the attached map.

p41 5th para: Typo. “...on...” should be “...in...”. Also, some indication of the likely timescale of changes could be given eg decadal, since the modeling suggests such figures. See also p11.

Response: Changes in estuary morphology following a major development are decadal. The hybrid model (p11 section 3.3.1) suggests the estuary has a morphological timescale of about 35 years.

p44 notes to tables: Explanation unclear, at least to me!

Response: See response above to comment on Table 3.5 p17.

Short Term Water Level and Geomorphology

Impacts of managed realignment in the Humber

General comments

The report provides a realistic view of the modelling work completed. It is now clear that correct results cannot be expected unless the correct physics is employed in the models. The need for further information from the estuary is clear. Equally, correct results will not be obtained unless appropriate wind, wave and fluvial variability are included. The water level aspects of the modelling are very useful and would be expected to provide a good guide to effects in the estuary. The morphological results should be treated with caution.

Sections 5, 6 and 7 shown that the basic principles are clear, but the magnitudes and rates are questionable. The values shown in, for instance Table 6.3, do not have any error bars on them and these are likely to be quite high for different conditions. They are probably more correct in proportion to one another, than absolutely.

All of the {morphology} calculations are done with mean conditions. I wonder whether it might be that the range of variation in conditions is more important in driving the sediment response than the mean per se.

Detailed comments

p4. No mention is made of sensitivity tests for river flow. As stated above summer flows are going to bias the results, and in particular affect the setback responses in the upper estuary. The model is constant density too. Definition of the river channel shapes may be able to maintain continuity, but it is unlikely to correctly define the friction.

Response: See Key Issue Response 1 on freshwater flow.

p4, p7: Although a Location Map is included in the report, there are several places mentioned in the report which are not identified on the map. Examples are Hawkins Point, Cherry Cobb Sands, Sunk Channel, Bull Sand Fort, Middle Shoal, Donna Nook, Cleethorpes, North Killingholme, Island Sand, Spurn Bight, Keadby.

Response: Agreed. They are included on the attached map Figure 1.1.

p4. The coarse grid model may calibrate rather better than the fine grid because the cumulative build up of errors occurs more slowly.

Response: The most likely reason why the coarse grid model calibrated better was because it was calibrated before the fine grid model. In these early stages of the project, a significant effort (eg. manual editing of bathymetry) was focussed on achieving a high level of calibration. In contrast the fine grid model did not receive this level of attention. Since the fine grid was also used with historic bathymetries, manual editing was kept to a minimum to ensure a consistent approach could be applied during the set-up of each model.

p5. If the coarse grid model calibrates better than the fine, why not use it rather than the fine grid for Tables 2.1 and 2.2?

Response: The fine grid model was the main model applied in the study. The coarse grid was originally intended to be applied in 3D mode for morphological modelling applications. In the end it was considered preferable to use the fine grid model in 2D mode instead. This meant that the coarse grid model was only applied in such early sensitivity tests.

p6 line 5. If there is no pattern to the variation along the Humber, how can you say the model reproduces the progression of the tide well?

Response: There is a pattern of progression of the tide through the estuary and within the tidal rivers which the model is shown to reproduce well.

p7 Section 2.2.3: Have tide-gauge errors due to salinity, possible pitot effects, and channel curvature etc been eliminated?

Response: No. There is also uncertainty about the reliability of the tide gauge datums relative to ODN. Key tide gauges are to be resurveyed to new GPS defined ODN datum to remove errors from earlier benchmark levelling.

p8. The exclusion of the Don and Aire from the model is mentioned. Can an approximation of their storage effects be estimated on simple river flow comparisons.

Response: The subsequent model revisions include the Don and Aire, but recalibration has been restricted to surge tide conditions. Including the Don and Aire rivers resulted in lower low water levels predicted under HAT and surge tide conditions at Blacktoft. This is a feature that was found impossible to achieve with the previous model configuration during calibration. The calibration of low water levels could therefore be improved under normal tides, although these checks have not been made.

p8 & p10. Why has the model not been checked for large fluvial flows? Extreme water levels should take into consideration the highest river flows. Surges are likely generally to correlate with high river flows.

Response: This is true for the upper reaches of the tidal rivers where there is significant storage for fluvial flood waters which is an important consideration in the application of models (Isis) for the tidal Trent and tidal Ouse strategies. Within the Humber strategy area (d/s of Boothferry Bridge on the Ouse and Keadby Bridge extreme fluvial flows do not raise high water levels significantly and have been ignored.

p10 Table 3.2. Check figures.

Response: There is an error in the quoted 0.2% AEP level of 5.08 at Immingham. The correct value should be 5.14.

p14. As there is a cycle of weather, waves and river discharge, the response is likely to be different from a sequence of steady mean conditions. It might be instructive to model this for a known event when some measure of the forcing and the response is available.

Response: The tests of wind and wave conditions were primarily to indicate the sensitivity of the model (and the real estuary) to these effects.

p15. The model correctly predicts the position but not the intensity of the overall accretion and erosion. It might be sensible to say that the bedload sand transport does depend strongly on the transport formula used.

Response: Noted

p16 Section 4.2.7: Unclear if variable river flow and wind and wave action was included in these tests.

Response: Neither variable river flow nor wind and waves were included in these sensitivity tests.

p17 Section 4.2.9: The need for further field information is an important point. Perhaps it could be given more emphasis?

Response: Noted.

p18 2nd para: Typo. "...in(t)erest..."

Response: Agreed.

p18. The silt concentrations appear to be sensitive to the threshold conditions for erosion. It is not surprising that the results are not too good if 5cm of silt are assumed evenly spread over the whole estuary bed.

It is not clear whether the {silt morphology} model is sensitive to changes in settling velocity, or not.

Response: The 5 cm of silt concerns the initial condition, intended to quickly spin up the model; all testing included spinning up the model over a month, after which there is no influence of this initial condition. Sensitivity testing on the effect of settling velocity was not carried out.

p19. The dispersal of silt from dumping near Hull does not come out from Figure 4.5. The figure caption needs major improvement.

Response: The concentrations of silt in suspension following dumping at Immingham or Hull are not shown. Figure 4.5 shows the natural distribution of silt in the inner estuary. In the remainder of the estuary the maximum concentration gradually declines seawards.

p20 3rd sentence. Is it possible to normalise the rates of settlement against the quantities released?

Response: This was not attempted.

p20. The predictions of concentrations are similar to summer values, but as summer river flows are used, this is not very helpful for overall morphology.

Response: Please see the response to Key Issue 2.

p22 The small gains in area in the tidal rivers are only possible if the HW is unconstrained. What river flows were the tests carried out for?

Response. This conclusion is from the Hybrid modelling reported in Section 3.3 of the Summary report. The HW is partially constrained and so HW area can increase a little.

However, as LW area is determined by drainage of the tidal rivers, and not ocean LW level the river LW level does not rise if sea levels rise, giving an increased tidal range in the rivers.

P22; There is no figure 5.1

Response: Apologies that this Figure is missing from both reports. The figure is attached.

P25 There is no Figure 6.1.

Response: The figure is attached. The text refers to both mean spring and 2% AEP surge tide levels, both of which are shown. Figure 6.1b is a repeat of Figure 2.1.

p26, In the first sentence after Table 6.2 there is a possible confusion between managed realignment sites, and sites where water levels are modelled. To clarify, the sentence should be re-ordered to give “At sites downstream of Humber Bridge, all the management realignment sites except S11 caused changes in spring high water levels of less than 5mm,”

Response: Agreed.

p26, Similarly, the first sentence in the next paragraph should be amended to give “All realignment sites located downstream of Hull (S1, S2, S3/4, S11 and S12) cause reductions in spring high water levels upstream of Humber Bridge, but.....”

Response: Agreed.

p33, 1st para; First sentence is rather clumsy, and could be improved to “The most significant predicted change in the patterns of sand erosion and deposition appears to be for site S9 (Alkborough) with a modelled breach length of 250m: for this site increased deposition of up to 0.5 m is predicted within the mouth of the Trent between Trent Falls and Island Sand.”

Response: Agreed.

p33 section 7.2.2 1st para; It is stated that the boundary conditions were changed slightly. I can understand why a supply of silt from Holderness was introduced at the seaward boundary, but no explanation is given as to why the river concentration in the Trent was set to zero, whilst maintaining the Ouse at 1g/l.

Response: This is just one of those things that happen. There was no time to rerun all the tests, and the impact of this boundary condition on the results was not considered significant.

p34 2nd para; It is said that the presence of site S9 may be removing some of the silt which would otherwise be available to settle near the low water line in Spurn Bight. This seems to me to be most unlikely, given that the two locations are something like 48 km apart, and are subject to quite different hydrodynamic regimes.

Response: Noted.

p34 Section 7.2.3: it is unclear if the effects of sediment-induced density currents have been included in the modeling of sediment infill into habitat areas. Sediment infill calculations for tidal dock systems show that salt and sediment-induced density currents have a much greater influence on accretion than tidal filling alone.

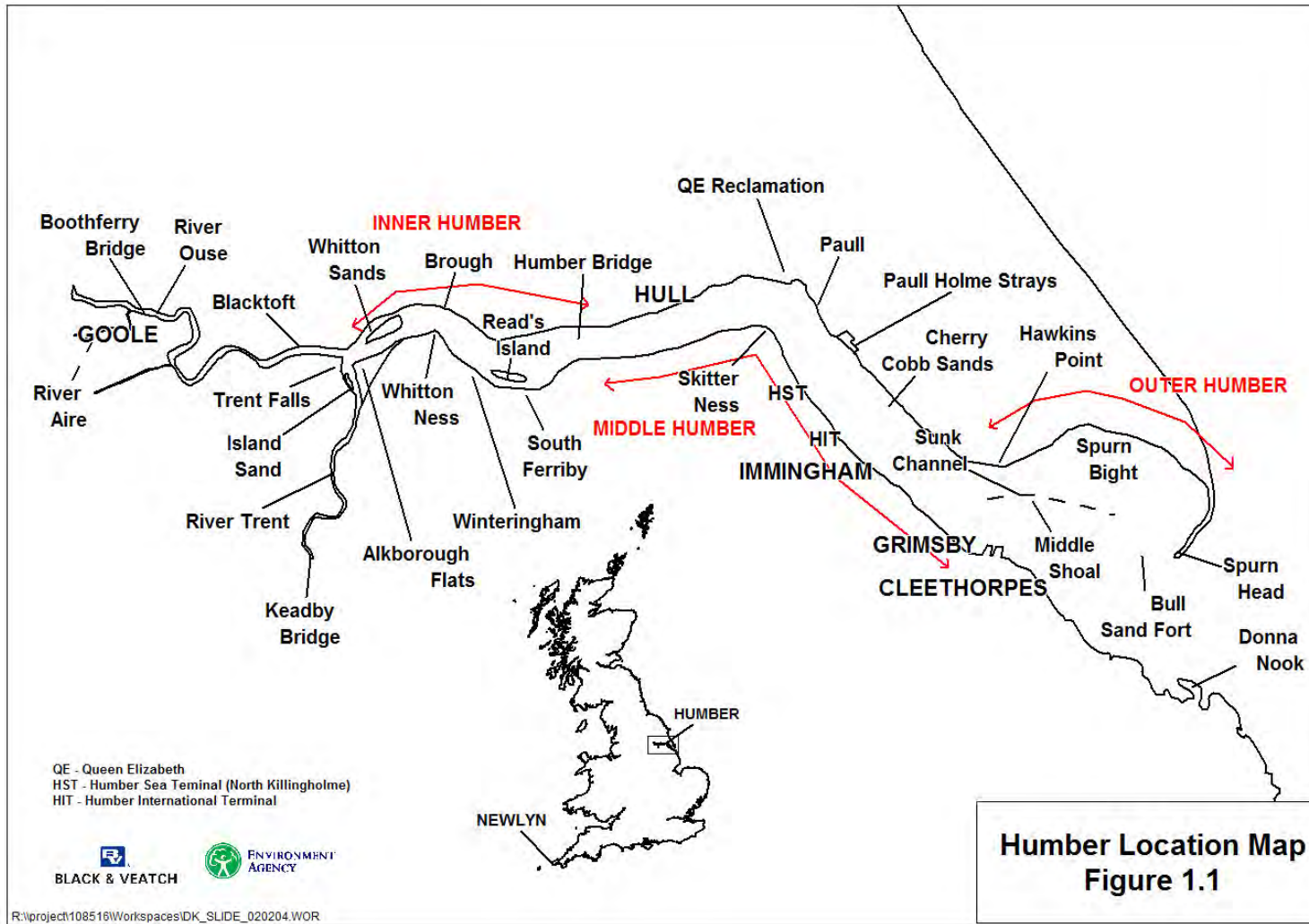
Response: Sediment induced density currents were not included. Would such processes be significant for set back sites where ground levels are typically above mid tide level? At some sites (eg Alkborough) the breach will be narrow with a high cill (+2.8mOD) protected by armouring and so this mechanism seems unlikely to dominate as the flow will be critical through the breach at almost all tidal states.

p36 section 8.1 4th para; It is said that “as JPA levels include implicitly the impacts of any historic overtopping they may underestimate extreme levels in the upper estuary if the frequency of overtopping is reduced.” The frequency of overtopping can be reduced by three different mechanisms (a) less frequent surges, (b) lowered water levels for given surges, e.g. due to managed realignment schemes, (c) raised/strengthened embankments. Although it is not clear from the text, I presume that in this section it is the last of these three that is the relevant mechanism. This could be made clear by adding something like the following few words to the end of the above sentence “...frequency of overtopping is reduced, e.g. by increasing bank heights .”

Response: Agreed

p36 section 8.2 3rd para; The factor of about 5 between the summer silt concentrations and the winter ones emphasises the need for doing some modelling with winter conditions.

Response: See response to Key Issues 2 and 3.



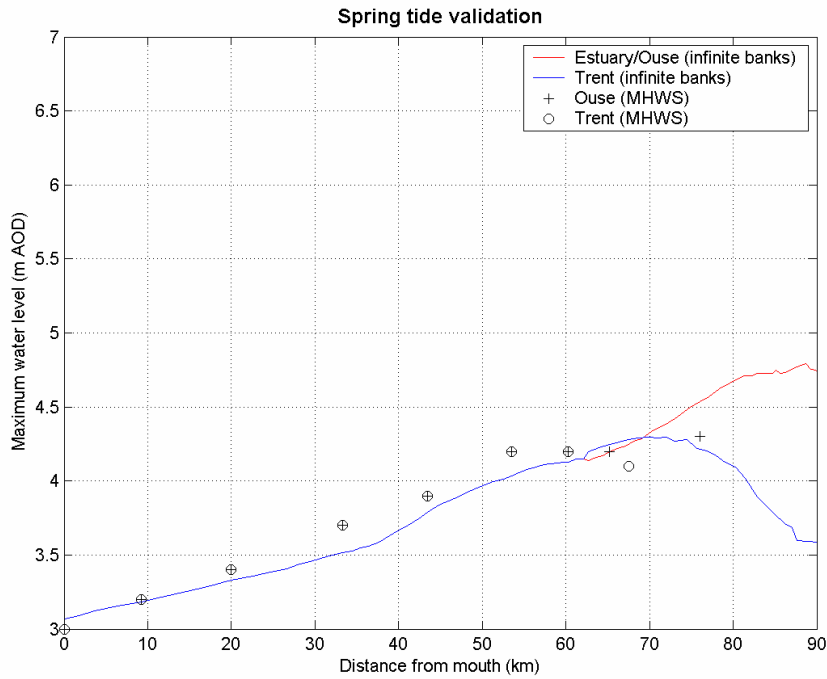


Figure 6.1a Validation of spring tide water levels

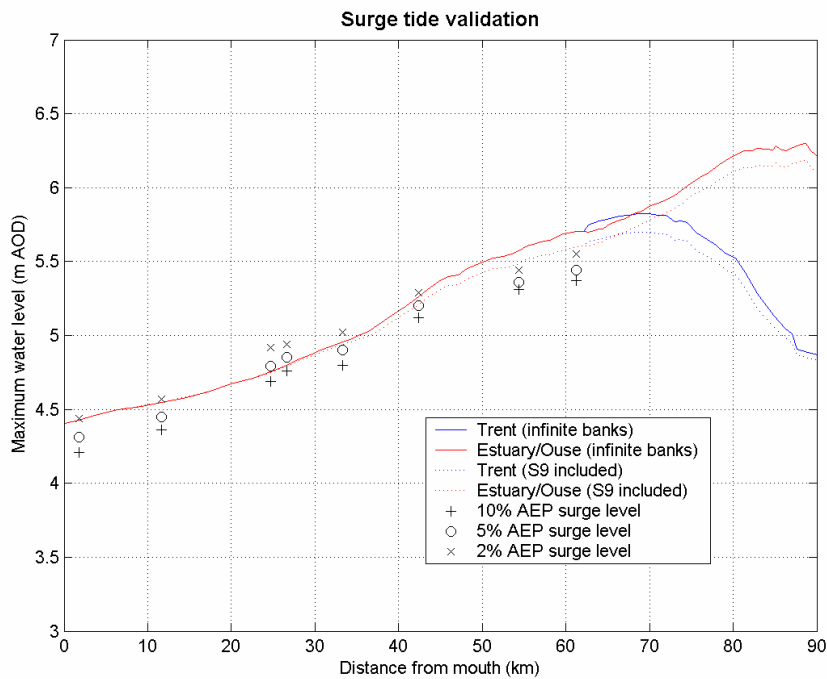


Figure 6.1b Validation of 2% AEP surge

Appendix B

Geomorphology changes in the Immingham frontage

B1 Historical changes in bathymetry

B1.1 Introduction

The analysis of historic charts in conjunction with model testing in the Delft 3D estuary model (Ref 1) calculated the total surface area of the estuary at mean high water on a spring tide and also at mean low water of spring tides. The area covered by water at low tide is defined as the subtidal area of the estuary. The difference in area between high and low water is defined as the intertidal foreshore that is alternately covered and exposed each tide.

In the interpretation of the historic analysis, the Humber was subdivided into 29 Zones and then grouped into five geographic sections including the Outer Middle estuary between Paull and Grimsby that covers Zones 6 to 12 which are shown on Figure B1 and has been subdivided north and south of a notional estuary centreline.

The location of high and low water lines on a mean spring tide in the Humber was determined by running the Delft 3D Humber model using bathymetry for various years and the sea level and tide range assessed for the year of each survey as described in the Geomorphology Summary Report (Ref 1) where a fuller description of the methods used may be found.

B1.2 Changes 1936 to 2000

Figure B2 shows the changes in surface area of the south side zones between East Halton Skitter and Pyewipe at high and low water between 1936 and 2000. The intertidal area on the south bank in each zone is calculated as the difference between high and low water area. The high tide, low tide and intertidal areas are discussed in the following sections.

B1.3 High Water area

The high water area shown on Figure B2 and for each south bank Zone in Figure B3 has remained almost constant since 1936, and especially since about 1960 as would be expected in a developed area. The main exception is in Zone 12S, which includes East Halton Skitter, where the high water area increased by about 25 ha in 1960 and a further 10 ha in the 2000 survey. However the increase in area in about 1960, merely replaced the loss of area in this zone after 1925. The recent changes in high water area in Zone 12S are most likely to be associated with the portion north of East Halton Skitter where saltmarsh fronts the flood defences.

At Zone 10S, North to South Killingholme, there is a 10 ha reduction in high water area in the 2000 survey, possibly because of the impact of the Humber International Terminal (HIT) phase 1 construction. In other zones the changes in high water area do not seem significant, with differences being more likely the result of issues with individual surveys rather than indicative of a definite trend.

The survey of 1940 for many zones shows markedly smaller high and low tide areas than later or earlier surveys, including the lead line surveys. The 1940 intertidal area calculated as the difference between the high and low water area is generally more consistent with both earlier and later surveys, suggesting there may have been a datum problem in that particular year.

B1.4 South Bank Subtidal and Intertidal Area

The low water areas shown in Figure B2 and in detail for each zone on Figure B4 indicate a general increase in subtidal area and Figure B5 a general reduction in intertidal area consistent with the 3 ha/year identified for the whole outer middle section of the south bank of the estuary since 1936 (Ref 1). Within each of the individual zones the overall trend has also been for an increase in subtidal area, and a reduction in intertidal area. This is the classic response of a defended coastline to coastal squeeze as sea levels rise.

The trend for loss of intertidal area is particularly marked in Zone 10S, North to South Killingholme, where 1.0 ha/year of intertidal area has been lost since 1936 accounting for half the variance in the calculated intertidal areas.

In Zone 8S, Stallingborough to Immingham, there has been 0.6 ha/year loss of intertidal area since 1936, which accounts for around half of the data variance. In the other Zones, particularly 6S and 7S, Stallingborough to Grimsby, losses of intertidal area account for 1.5 ha/year overall, but the trends are less consistent. In Zones 6S, 7S, 8S and 10S the minimum intertidal area was calculated for 1976, since when there has been a small recovery. Despite this, the overall trend for a reduction in intertidal area between Immingham and Grimsby has been fairly well established, and the results for the past 20 years suggest at most that this trend may have slowed.

Between 1997 and 2000, there was a marked increase from 44 to 78 ha in the intertidal area of Zone 12S, East Halton Skitter. Two thirds of this increase is due to a reduction in subtidal area and one third due to an increase in high water area.

The intertidal area in Zone 9S, Immingham docks, was 35 ha in 2000, an increase of around 10 ha compared with 1999, possibly attributable to siltation associated with the nearby reclamation for the Humber International Terminal phase 1 development. In Zone 10S where the reclamation is located, the intertidal area hardly changed between 1999 and 2000 despite the reduction in high water area discussed above.

Zone 11S is notable as the one zone between East Halton and Pyewipe where there has been very little loss of intertidal area since 1936 (<0.1 ha/year) and no overall change since 1851.

B1.5 North bank Subtidal and Intertidal Area

On the north bank, the overall increase in subtidal area has been similar to that on the south bank. Figure B6 shows that on the north bank, the major increases in subtidal area since 1936 have been concentrated in Zones 10N and 11N, Cherry Cobb Sands to Little Humber. This is mainly associated with a reduction in the area of Foulholme sands (Figure B1). Further north in Zone 12N around Thorngumbald Clough, the subtidal area has remained remarkably constant possibly stabilised by the presence of Paull Holme.

At the south end of the reach there has been a continuing increase in subtidal area in Zone 6N, around Hawkin's Point, that has persisted since 1851. This increase cannot continue for long as the intertidal area in this zone has reduced by a factor of 3 since 1936. This north ward move of the subtidal might be a long term adjustment to the construction of Grimsby docks.

The loss of intertidal area near Hawkin's Point is matched by a similar persistent loss of subtidal area in Zone 8N, downstream of Stone Creek (Figure B1), where the intertidal area has expanded. This movement on the north side may indicate a southward movement of the whole subtidal section of the estuary that would lead to a loss of intertidal area in Zone 8S, Immingham to

Stallingborough, where the intertidal foreshore is now less than 100m wide on average, and possibly half its width in 1936 and one third the width in 1851.

These results suggest the estuary is moving to the north in Zone 6 and to the south in Zone 8 which would tend to tighten the bend between Grimsby and Immingham. Further upstream the increasing subtidal area in Zone 11N may be one reason why there has been no reduction in intertidal area at North Killingholme Haven (Zone 11S).

B1.6 Summary of historic bathymetric analyses

The analysis of the changes between East Halton Skitter and Pyewipe indicates there has been a loss of intertidal area in all sections, whether only the echo sounder surveys since 1936 or all surveys since 1851 are considered. These losses of intertidal area and the associated increase in subtidal area illustrate the classic response of a defended coastline to coastal squeeze.

Most zones of the outer middle estuary show some increase in subtidal area and loss of intertidal area. These losses in intertidal area have persisted since 1936 and along the south bank frontages at Stallingborough and Grimsby these losses have persisted since 1851. Only Zone 8N on the north bank opposite Stallingborough shows a consistent increase in intertidal area that has persisted since 1851.

The historic analysis of the Outer Middle estuary implies a total loss of around 155 ha of intertidal area over the past 50 years. In this period the loss of intertidal area has been matched by a corresponding increase in the subtidal area of the estuary. The increases in subtidal area north and south of the estuary centreline on Figure B7 are very similar at 3.8 or 3.9 ha/year.

These changes are consistent with the main Humber channel migrating north at Grimsby and south at Stallingborough. The reductions in intertidal area at Foulholme sand may be one reason why the foreshore at North Killingholme Haven is relatively stable.

The general reduction in intertidal area along the south bank has been reversed around East Halton Skitter (probably on its north side) since 1997 with a marked increase in intertidal area caused by a reduction in subtidal area and an increase in high water area.

The chart analysis for 2000 shows the first indications of the impact of port reclamation works at Immingham.

B2 Historical changes in upper foreshore levels

The analysis of historic bathymetric charts is particularly valuable for the subtidal parts of the estuary as the surveys of these areas are most reliable. Most surveys extend onto the lower intertidal foreshore, but few are likely to extend above mean sea level because of the difficulties of hydrographic survey in shallow water and the absence of interest in upper foreshore levels for navigation. The survey of 1966 and those since 1997 have included additional information to better define the levels of the upper foreshore, which is of particular interest for flood defence.

Cross sections of the foreshore between East Halton Skitter and Pyewipe have been undertaken occasionally since 1965 as part of surveys of the flood defence. Some of these cross sections shown on Figure B1 were surveyed in 1965, 1976 or 1980 and all were surveyed in 1987. A few were also surveyed in advance of engineering works in 1997 and 2003. The foreshore levels calculated from a Lidar survey flown in May 2002 have been added for comparison, though because of the different survey technique there is no guarantee that exactly the same points have

been identified. The changes in the level of the toe of the defence works and of a point 10m seaward before and after 1987 are listed in Table B1.

Table B1 Changes in foreshore levels 1965 – 2002

Cross section number	Change in level mOD 1965 – 1987 (22 years) CS 1 – 5 1976 – 1987 (11 years) CS 7 – 9		Change in level mOD 1987 – 2002 (15 years)	
	Toe	10m point	Toe	10m point
1	-0.4	-0.7	+0.3	< ± 0.3
2	-0.4	-0.9	-0.4	-0.3
3	-0.4	<± 0.3	+0.3	< ± 0.3
4	-0.4	<± 0.3	-0.3	< ± 0.3
5	+0.6	+0.6	+0.4	+0.3
6			< ± 0.3	< ± 0.3
7	-0.7	-0.6	-1.8	-1.6
8	-0.8	-0.9	+0.6	-3.0
9	<± 0.3*	<± 0.3*	+1.2	-2.0
10			+0.9	-2.3
11			+0.7	< ± 0.3
12			< ± 0.3	< ± 0.3

Note * 1980 – 1987 (8 years)

CS 5 just north of the Immingham Dock entrance is the only cross section where levels of both the toe and the foreshore 10m seaward of the toe have risen throughout the period since 1965. CS 3 near North Killingholme is the only cross section which shows no overall change in toe or foreshore levels since 1965. There has been continuing erosion at CS 2 and CS 7 since 1965.

At cross sections CS 7 there has been between 1.6 and 1.8m of foreshore erosion since 1987. This is a more rapid erosion rate than in the period prior to 1987.

At CS 8, 9 and 10 there was between 0.3 and 0.5m of erosion at the toe of the open stone asphalt revetment between 1997 and 2002.

There seems to have been no significant change in foreshore levels at CS1, 3, 4, 6, 11 and 12 since 1987.

CS 7, 8, 9 & 10 that have suffered the greatest erosion are all located in Zone 8S (Figure B1), which has been identified as the zone where the intertidal area has been reducing steadily because of apparent migration of the subtidal section of the estuary at this point. It is noteworthy in Figure B1 that only in Zone 8S does the -6mOD contour approach close to the south bank of the Humber. This relatively deep water close to the defence banks probably contributes to the erosion experienced in this area.

The shape of the 12 cross sections has been plotted in Figures B8 to B12. The upper foreshore of all cross sections has been based on the unfiltered Lidar survey of 2002. In addition for some of the cross sections, the bathymetry derived from the 2000 bathymetry survey has also been plotted with the position of this cross section adjusted so that the chainage of the 0mOD contour coincides on the two surveys.

At most locations, the subtidal foreshore slope is milder than 1 in 25 between -3 and -4mOD, though it is sometimes steeper in deeper water especially at CS 3 & 4 (Figures B8, B9) where the deep channel is close inshore.

At CS 7 & 8 (Figure B10) the subtidal slope is steeper, around 1 in 16 at CS 7 to -6 mOD and 1 in 9 at CS 8 to -5 mOD. The bathymetry indicates that there is a nearly horizontal platform with a level around -6 mOD that is close inshore all along the Stallingborough frontage.

B3 Review of Geo 2 studies

The issue of foreshore erosion along the Immingham frontage was considered as part of the Geo 2 studies (Ref 13). Studies were carried out by University of Newcastle (UoN) and HR Wallingford (HR) using two different approaches to consider the evolution of the same foreshore profile in response to sea level rise.

Both studies agreed that the mudflats on the lower foreshore were unlikely to change significantly in level in response to sea level rise, but their analyses emphasised different aspects of behaviour on the upper foreshore. UoN concluded using typical wave and current conditions for the site that sea level rise would cause accretion of the upper foreshore. In contrast, HR considered that rising sea levels would allow larger waves to reach the upper foreshore and so anticipated greater erosion of the upper foreshore close to the toe of the sea wall. UoN qualified their conclusion because their wave distribution did not include any major storms with a return period greater than a year which were expected to cause erosion of the upper foreshore and so possibly bring the two studies into closer agreement.

Both these studies largely excluded consideration of the impact of channel migration, though identifying this as a possibly critical factor affecting the future foreshore profile. The UoN study reproduced the short term changes in foreshore level that occurred over a four year period but were not able to reproduce the long term erosion experienced at this site.

The Geo 2 final report (Ref 14) concluded that the whole estuary response to sea level rise which anticipated a widening of the estuary in the Immingham area was likely to dominate the short term local response of waves and tides which cause warping up of the foreshore. This final report also highlighted the potential impact of the evolution of the large channel meander that brings the deep water channel close to shore at Immingham. Sea level rise was expected to lengthen the wavelength of the meander and so move its apex to the north of Immingham. Thus in future foreshores north of Immingham might experience greater pressure and those to the south rather less from this cause.



Figure B1 Estuary Zones Skitter Ness to Grimsby

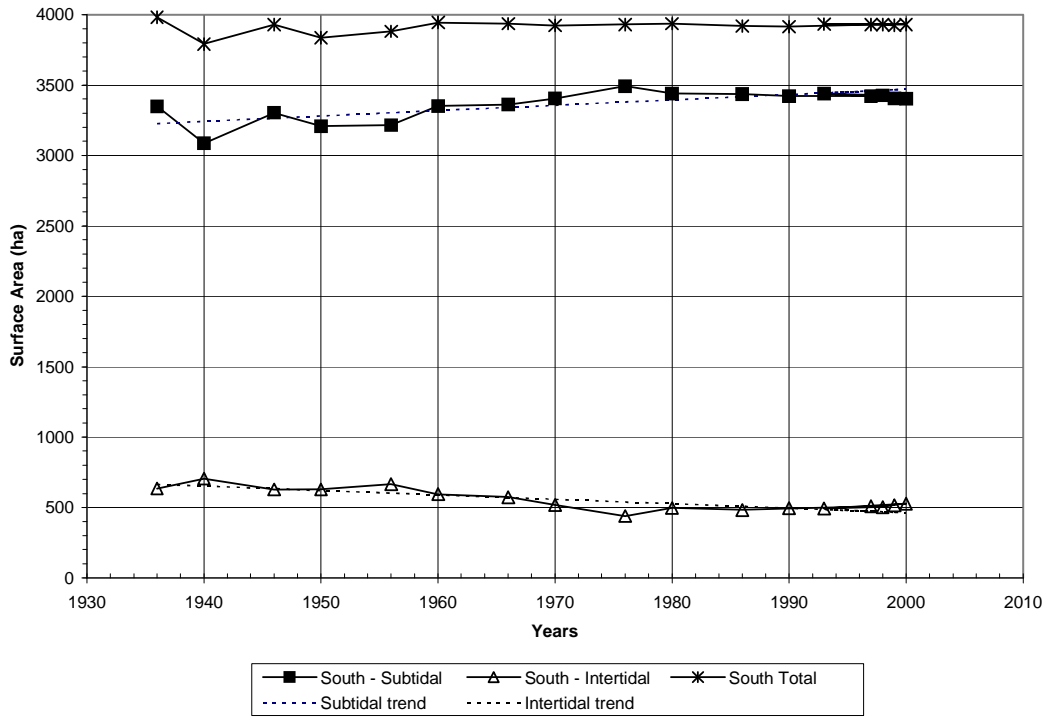


Figure B2 Intertidal and subtidal surface area of the Outer Middle Humber south bank

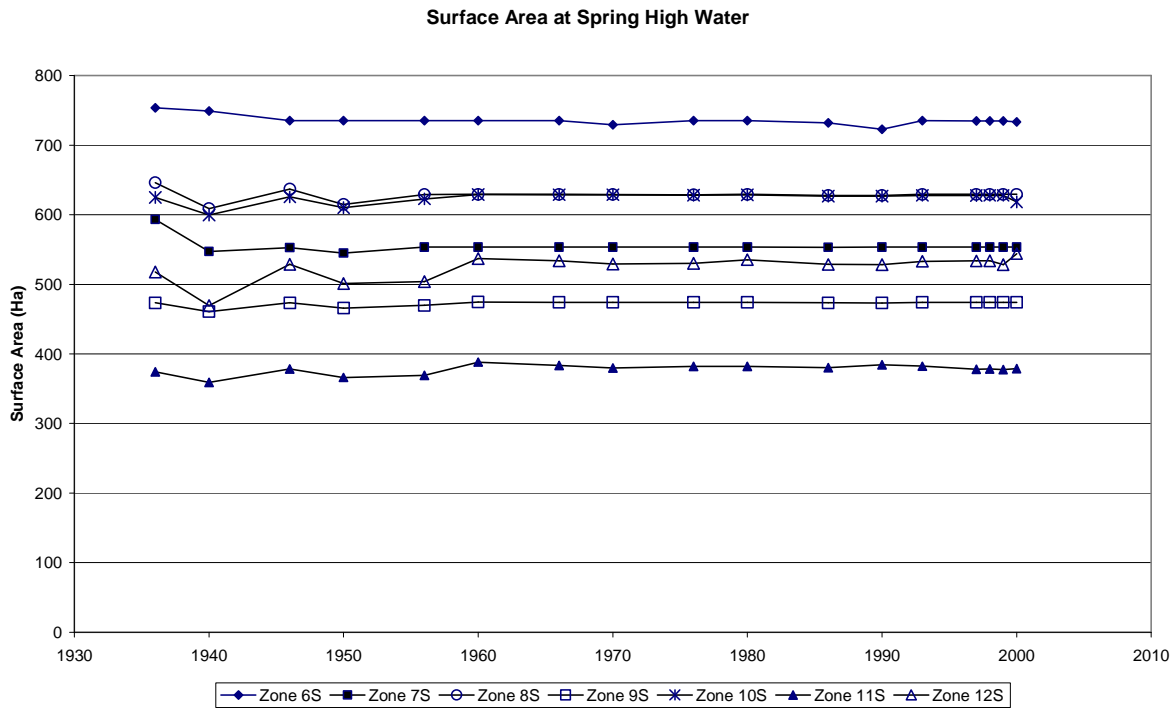


Figure B3 High water area in Zones 6S - 12S on the Humber south bank 1936-2000

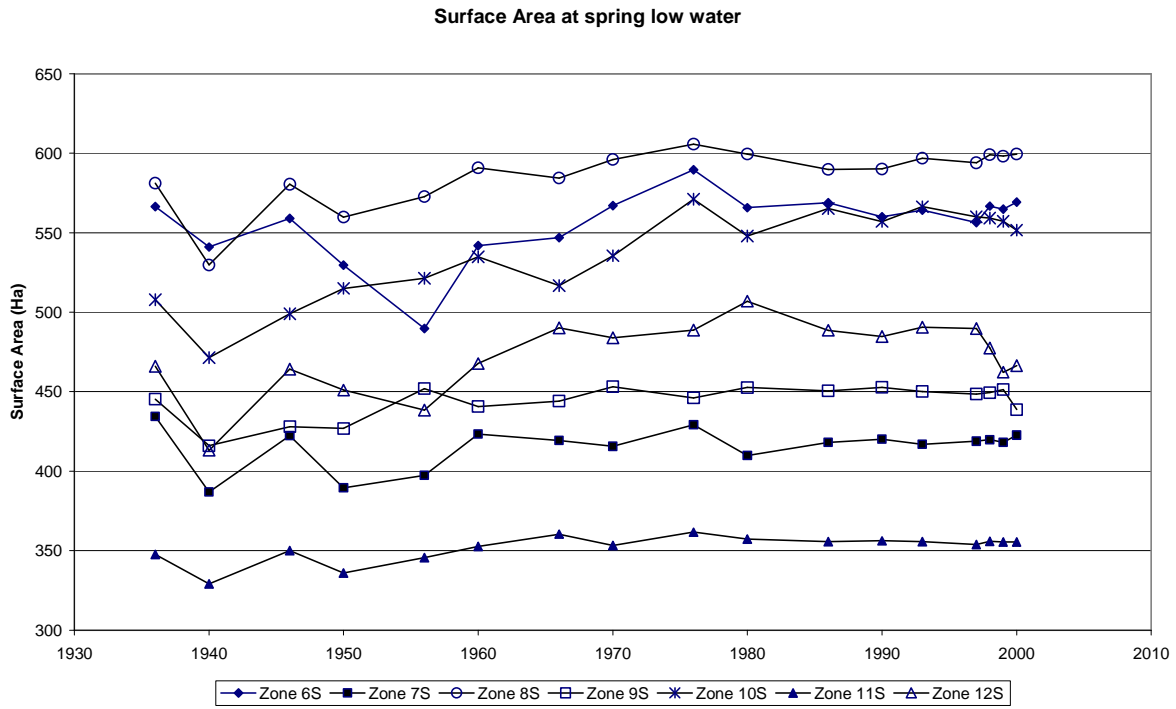


Figure B4 Low water area in Zones 6S - 12S on the Humber south bank 1936-2000

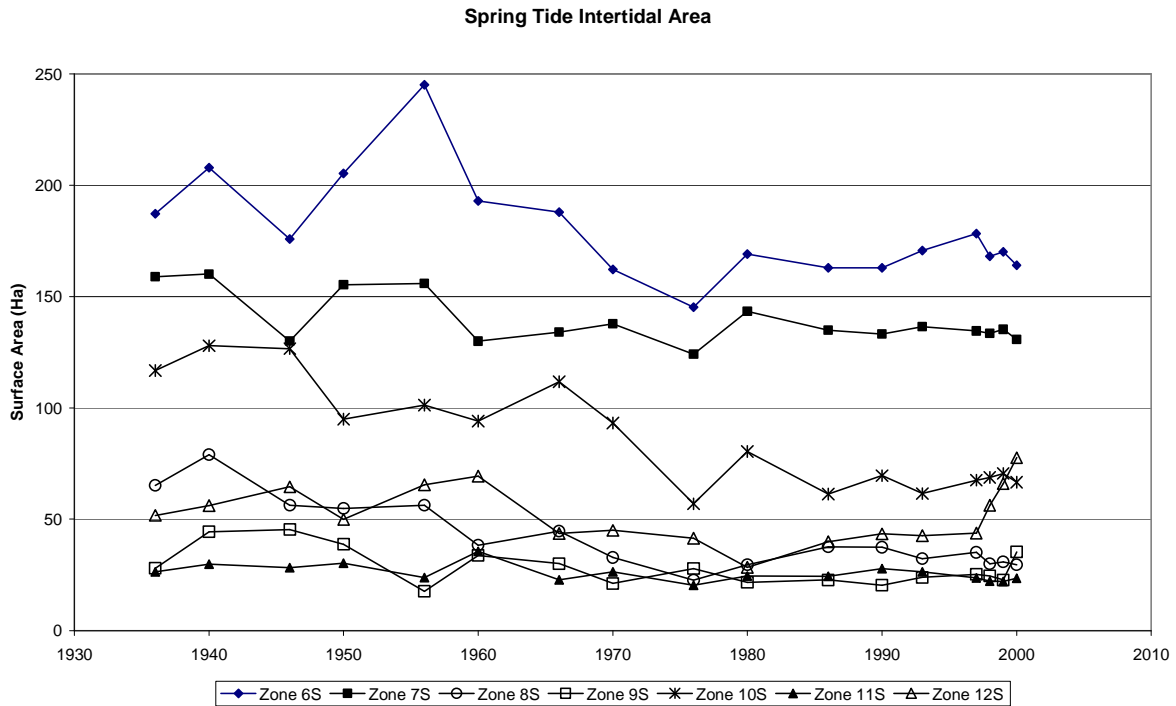


Figure B5 Intertidal Areas in Zones 6S - 12S on the Humber south bank 1936-2000

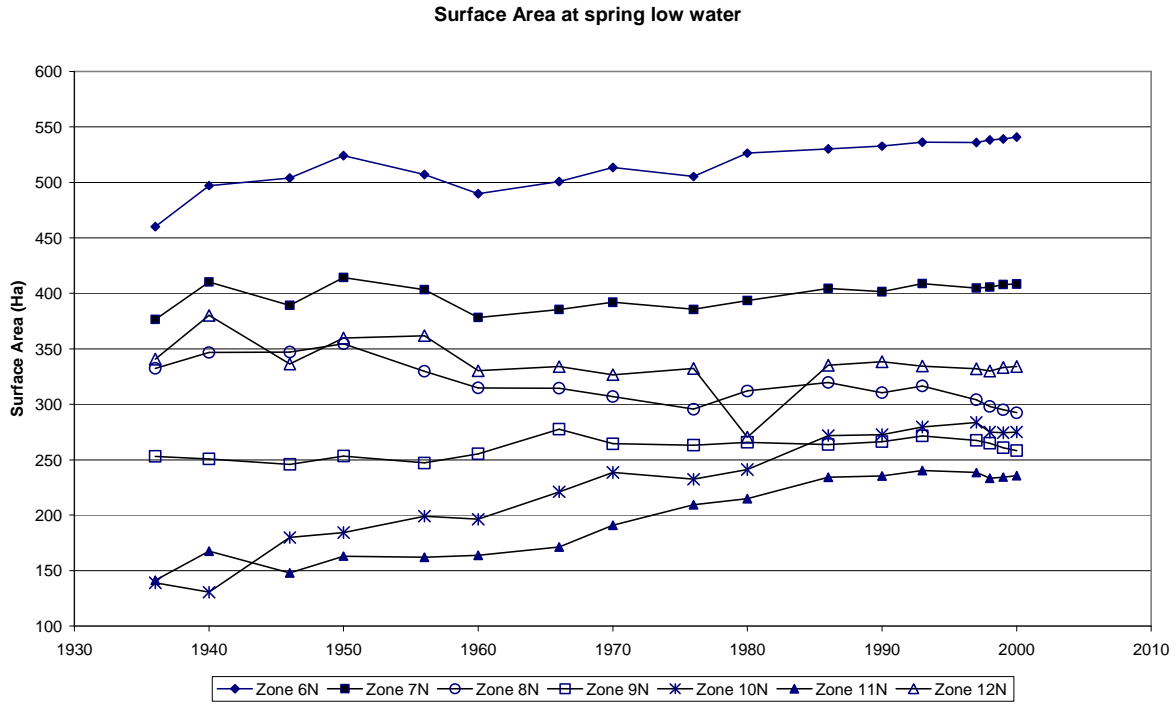


Figure B6 Low water areas in Zones 6N -12N on the Humber north bank 1936-2000

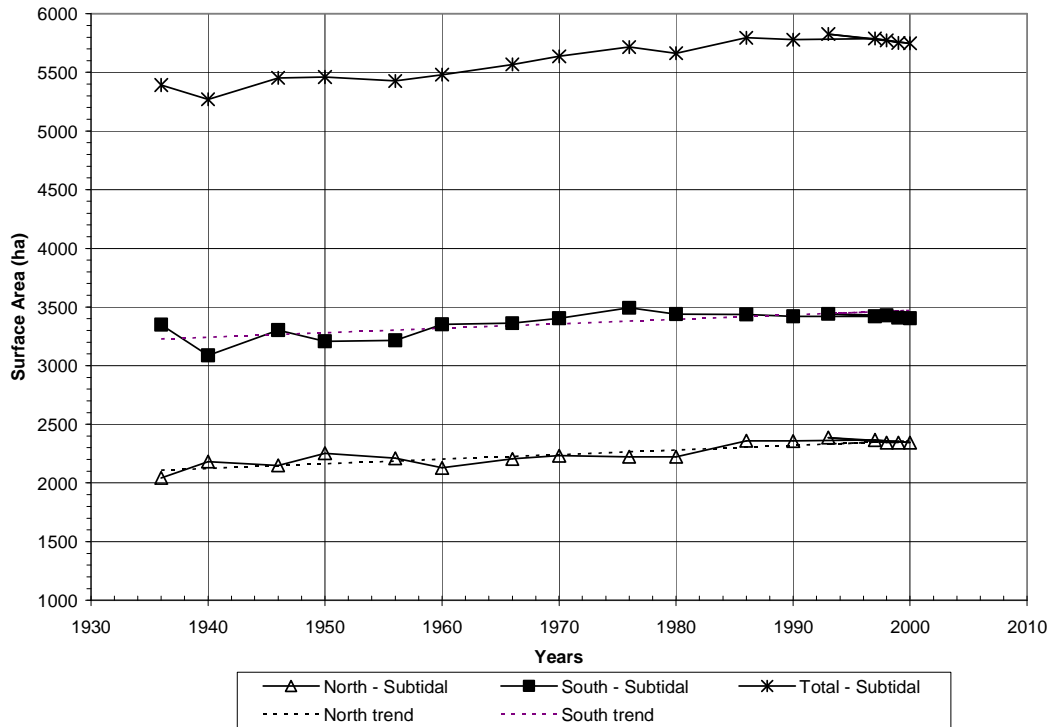


Figure B7 North and south bank subtidal areas for the Outer Middle Humber

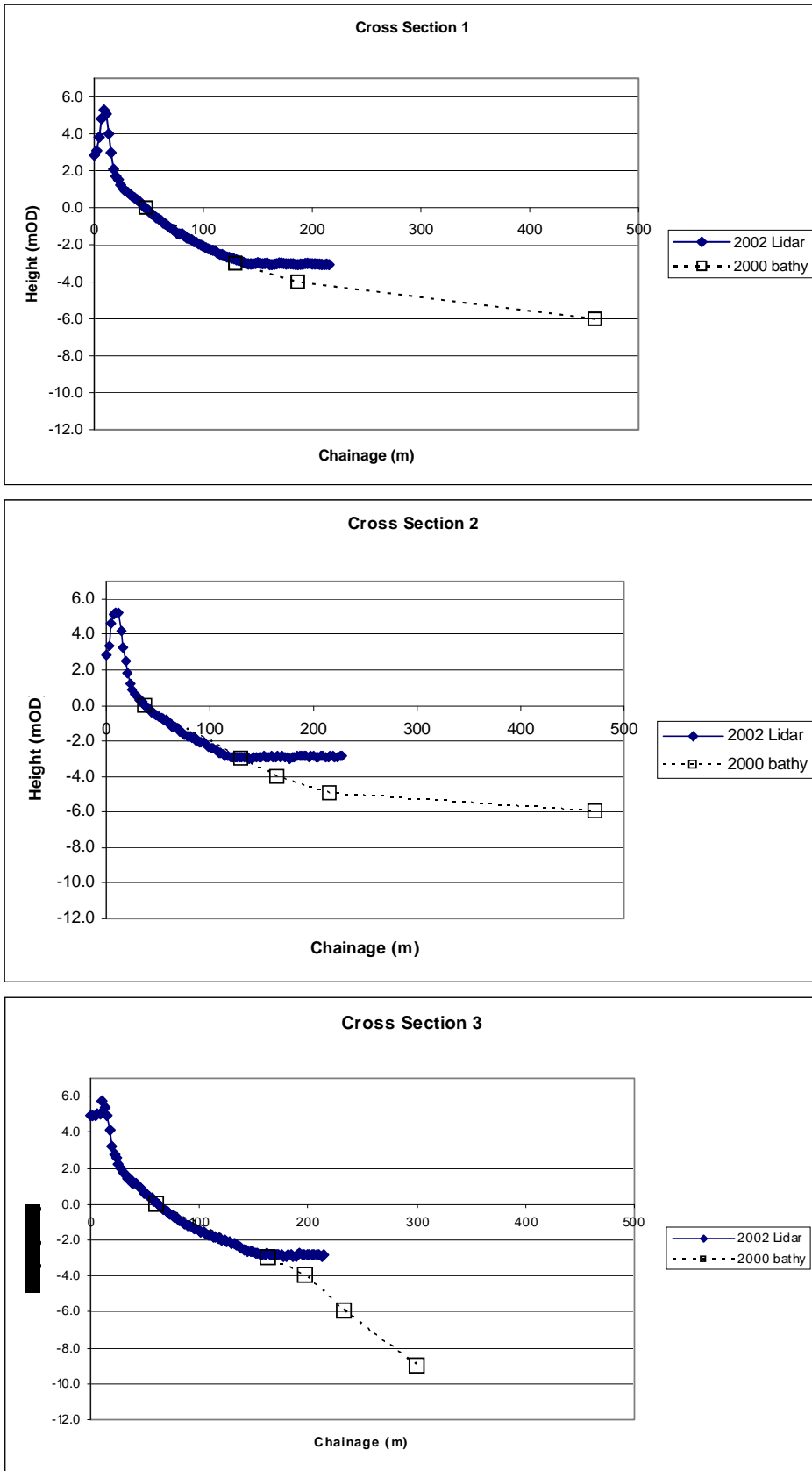


Figure B8 Lidar and Bathymetry for Immingham Cross Sections 1 – 3

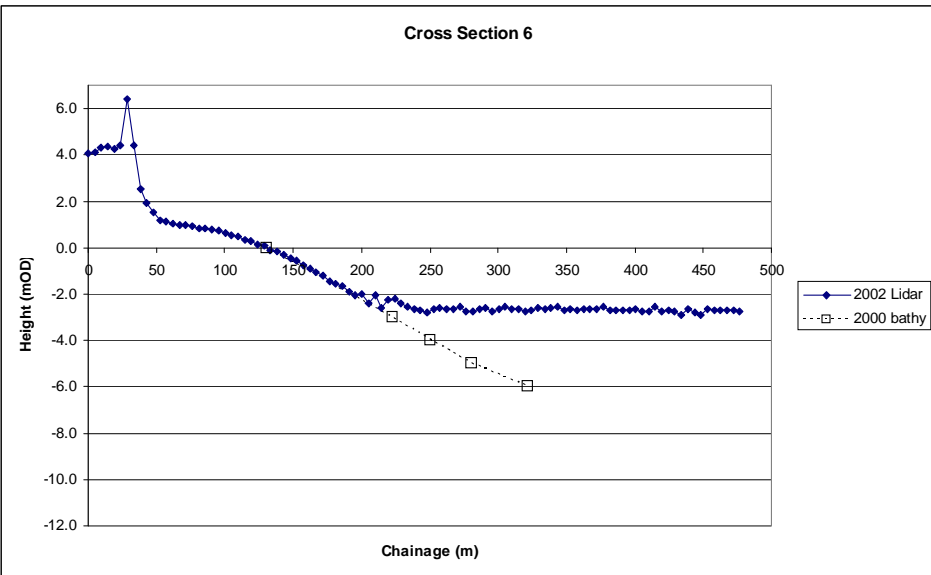
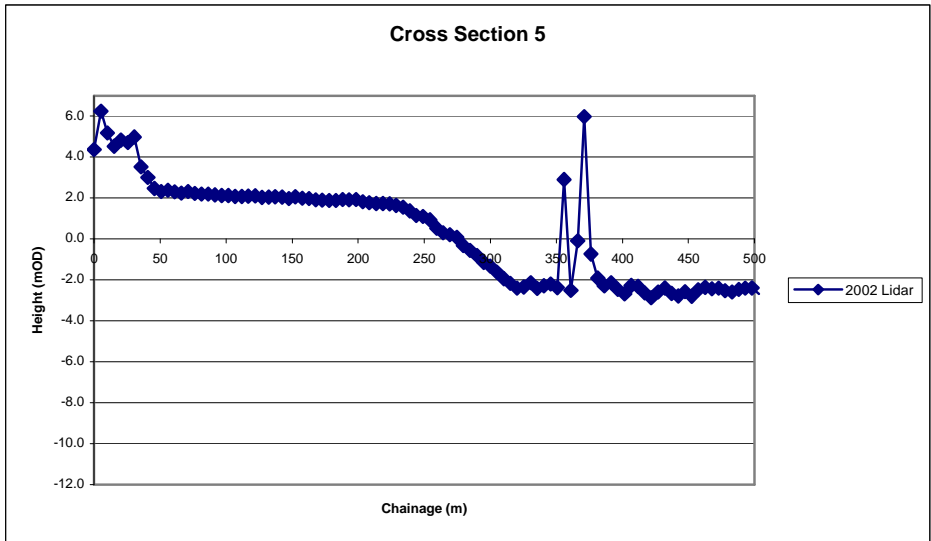
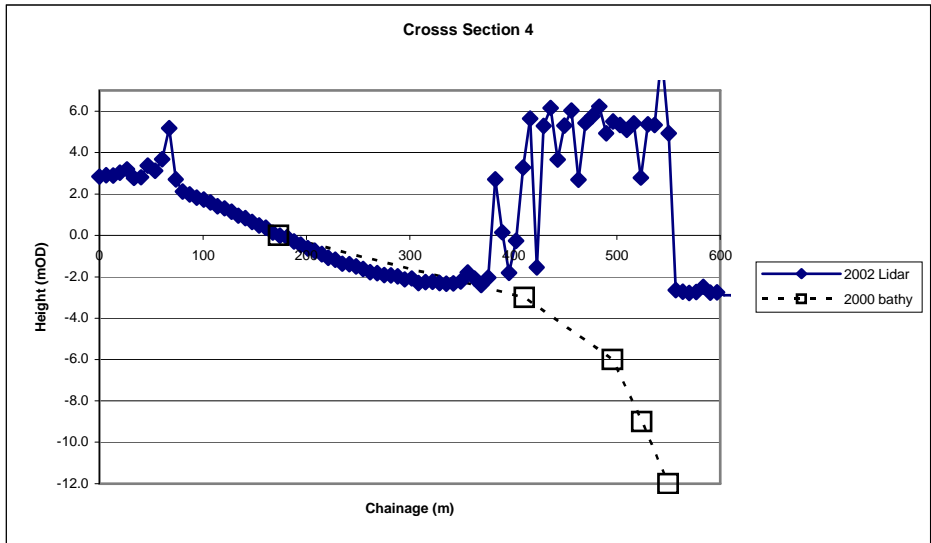


Figure B9 Lidar and Bathymetry for Immingham Cross Sections 4 – 6

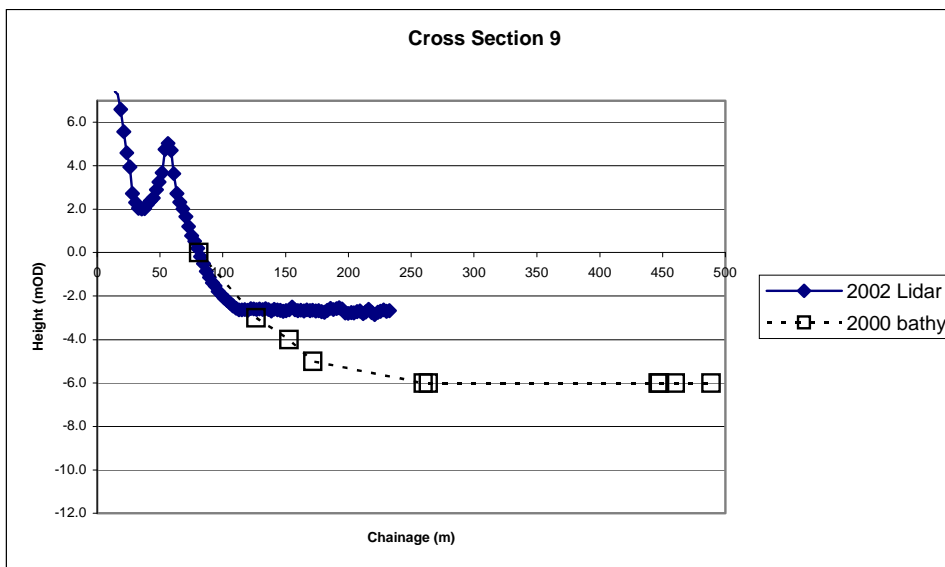
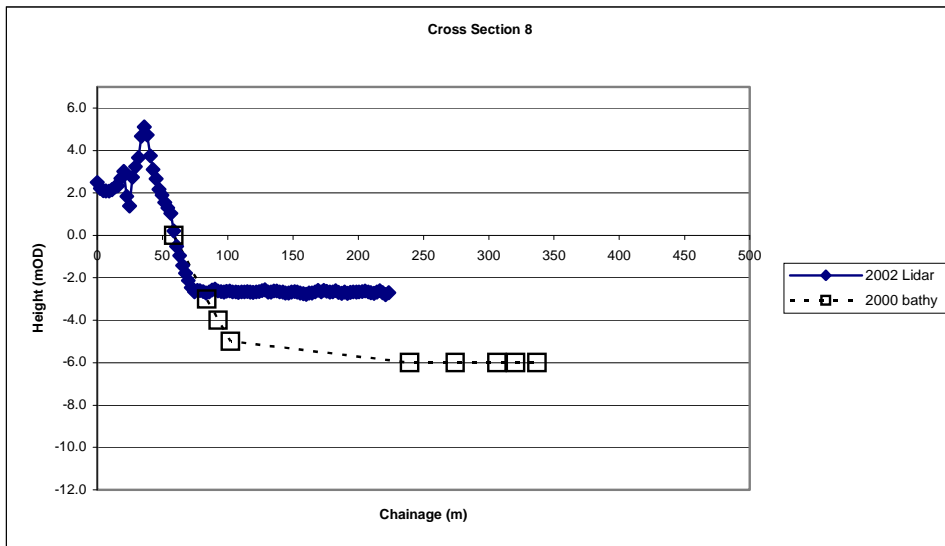
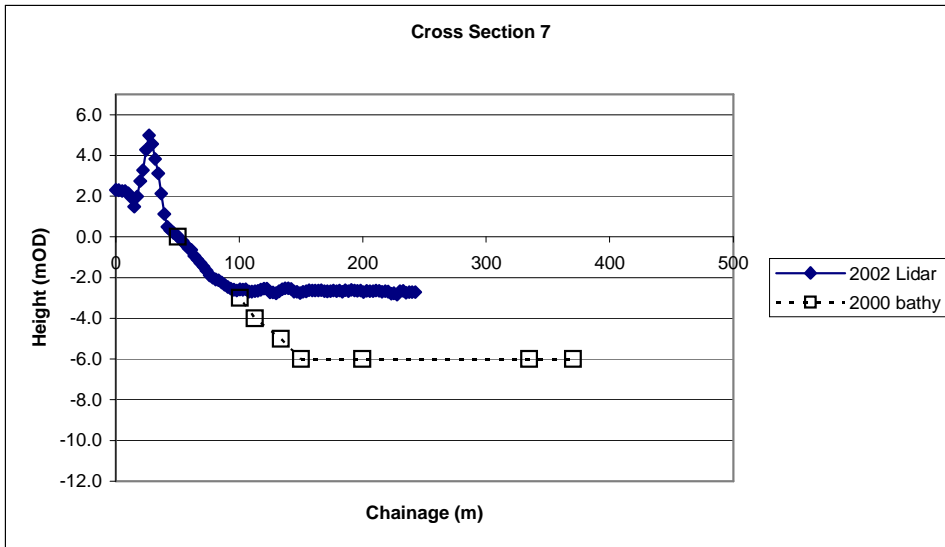


Figure B10 Lidar and Bathymetry for Immingham Cross Sections 7 – 9

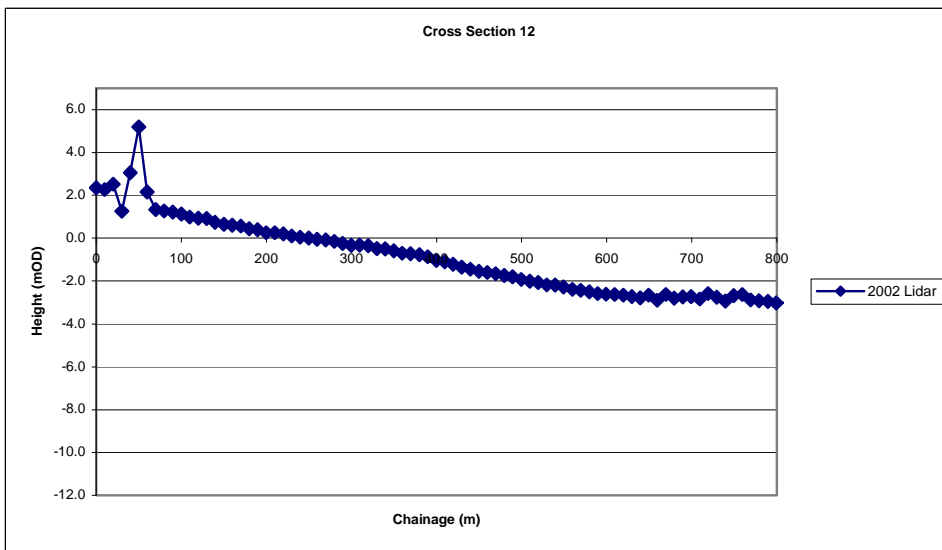
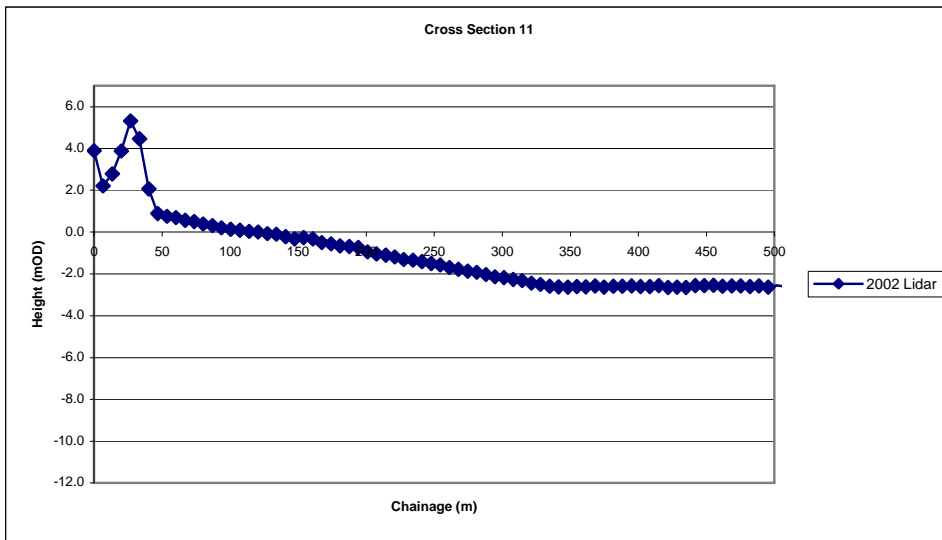
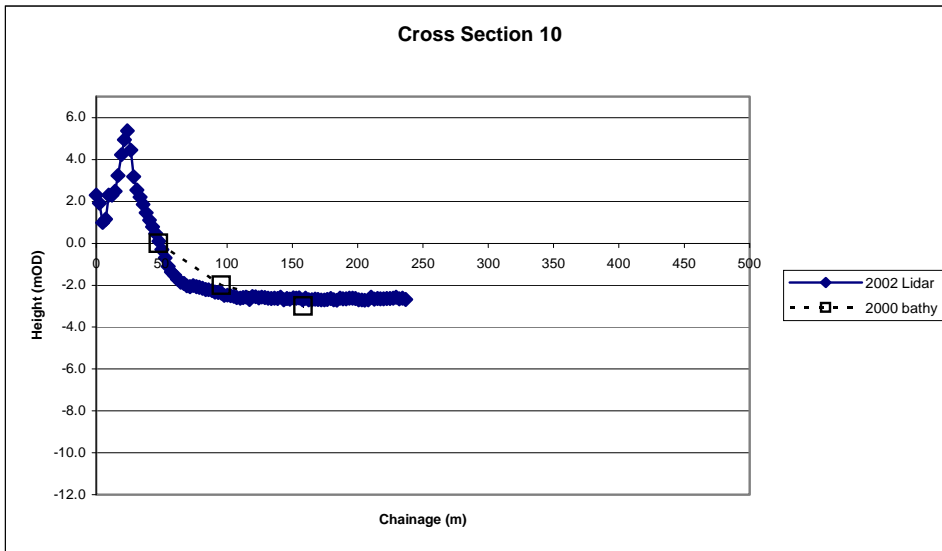


Figure B11 Lidar for Immingham Cross Sections 10 – 12



AMEP
RULE 17 FURTHER INFORMATION
APPLICANT'S RESPONSE

By:
Date: 01-11-2012

ANNEX 4

Draft lease for Humber Estuary Foreshore

DATED _____ 20[]

ASSOCIATED BRITISH PORTS

to

ABLE HUMBER PORTS LIMITED

Draft/

UNDERLEASE

- of -

areas of riverbed and foreshore of the River Humber

For the term of [] years

Commencing: { }

Expiring: { }

Rent - £ per annum

(exclusive of Value Added Tax)

(Subject to increase and review)

Andrew Jackson

Solicitors

HULL

PRESCRIBED LEASE CLAUSES

<p>LR1. Date of lease</p>	<p>20[]</p>
<p>LR2. Title number(s)</p>	<p>LR2.1 Landlord's title number(s)</p> <p>[None]</p> <p>LR2.2 Other title numbers</p> <p>None</p>
<p>LR3. Parties to this lease</p> <p><i>Give full names, addresses and company's registered number, if any, of each of the parties. For Scottish companies use a SC prefix and for limited liability partnerships use an OC prefix. For foreign companies give territory in which incorporated.</i></p>	<p>Landlord</p> <p>Associated British Ports a statutory body corporate constituted under the Transport Act 1981 with Company Reference Number ZC000195 whose principal place of business is at Aldwych House 71-91 Aldwych London WC2B 4HN</p> <p>Tenant</p> <p>Able Humber Ports Limited (Jersey Company Registration Number 107029) whose registered office is at Ogier House The Esplanade St Helier Jersey JE4 9WG and whose registered U.K. branch is at []</p> <p>Other parties</p> <p>Guarantor</p> <p>[] (Company Registration Number []) whose registered office is at []</p>
<p>LR4. Property</p> <p><i>Insert a full description of the land being leased</i></p> <p>or</p> <p><i>Refer to the clause, schedule or paragraph of a schedule in this lease in which the land</i></p>	<p>In the case of a conflict between this clause and the remainder of this lease then, for the purposes of registration, this clause shall prevail.</p> <p>The land at [] as described in clause 1 of this lease</p>

<p><i>being leased is more fully described.</i></p> <p><i>Where there is a letting of part of a registered title, a plan must be attached to this lease and any floor levels must be specified.</i></p>	
<p>LR5. Prescribed statements etc.</p> <p><i>If this lease includes a statement falling within LR5.1, insert under that sub-clause the relevant statement or refer to the clause, schedule or paragraph of a schedule in this lease which contains the statement.</i></p> <p><i>In LR5.2, omit or delete those Acts which do not apply to this lease.</i></p>	<p>LR5.1 Statements prescribed under rules 179 (dispositions in favour of a charity), 180 (dispositions by a charity) or 196 (leases under the Leasehold Reform, Housing and Urban Development Act 1993) of the Land Registration Rules 2003.</p> <p>None</p> <p>LR5.2 This lease is made under, or by reference to, provisions of:</p> <p>None</p>
<p>LR6. Term for which the Property is leased</p> <p><i>Include only the appropriate statement (duly completed) from the three options.</i></p> <p><i>NOTE: The information you provide, or refer to, here will be used as part of the particulars to identify the lease under rule 6 of the Land Registration Rules 2003.</i></p>	<p>The term as specified in this lease at clause 4</p>
<p>LR7. Premium</p> <p><i>Specify the total premium, inclusive of any VAT where payable.</i></p>	<p>None</p>
<p>LR8. Prohibitions or restrictions on disposing of this lease</p> <p><i>Include whichever of the two statements is appropriate.</i></p> <p><i>Do not set out here the wording of the provision.</i></p>	<p>This lease contains a provision that prohibits or restricts dispositions.</p>
<p>LR9. Rights of acquisition etc.</p> <p><i>Insert the relevant provisions in the sub-clauses or refer to the clause, schedule or paragraph of a schedule in this lease which contains the provisions.</i></p>	<p>LR9.1 Tenant's contractual rights to renew this lease, to acquire the reversion or another lease of the Property, or to acquire an interest in other land</p> <p>None</p> <p>LR9.2 Tenant's covenant to (or offer to)</p>

	<p>surrender this lease</p> <p>None</p> <p>LR9.3 Landlord's contractual rights to acquire this lease</p> <p>None</p>
<p>LR10. Restrictive covenants given in this lease by the Landlord in respect of land other than the Property</p> <p><i>Insert the relevant provisions or refer to the clause, schedule or paragraph of a schedule in this lease which contains the provisions.</i></p>	<p>None</p>
<p>LR11. Easements</p> <p><i>Refer here only to the clause, schedule or paragraph of a schedule in this lease which sets out the easements.</i></p>	<p>LR11.1 Easements granted by this lease for the benefit of the Property</p> <p>The easements as specified in clause 1 of this lease</p> <p>LR11.2 Easements granted or reserved by this lease over the Property for the benefit of other property</p> <p>The easements as specified in clause 3 of this lease</p>
<p>LR12. Estate rentcharge burdening the Property</p> <p><i>Refer here only to the clause, schedule or paragraph of a schedule in this lease which sets out the rentcharge.</i></p>	<p>None</p>
<p>LR13. Application for standard form of restriction</p> <p><i>Set out the full text of the standard form of restriction and the title against which it is to be entered. If you wish to apply for more than one standard form of restriction use this clause to apply for each of them, tell us who is applying against which title and set out the full text of the restriction you are applying for.</i></p> <p><i>Standard forms of restriction are set out in Schedule 4 to the Land Registration Rules 2003.</i></p>	<p>The Parties to this lease apply to enter the following standard form of restriction {against the title of the Property} or {against title number {****}}</p> <p>Not applicable</p>

<p>LR14. Declaration of trust where there is more than one person comprising the Tenant</p> <p><i>If the Tenant is one person, omit or delete all the alternative statements.</i></p> <p><i>If the Tenant is more than one person, complete this clause by omitting or deleting all inapplicable alternative statements.</i></p>	<p>Not applicable</p>
--	-----------------------

THIS LEASE made the _____ day of _____ Two thousand
and [_____]

Parties:

BETWEEN ASSOCIATED BRITISH PORTS (a statutory body corporate constituted under the Transport Act 1981 with Company Reference Number ZC000195) (hereinafter called "ABP") which expression shall where the context so admits include the person for the time being entitled to the reversion immediately expectant on the determination of the term hereby created of the first part ABLE HUMBER PORTS LIMITED (Jersey Company Registration Number 107029) whose registered office is situate at Ogier House The Esplanade St Helier Jersey JE4 9WG and whose registered U.K. branch is at [

_____] (hereinafter called "the Lessee" which expression shall where the context so admits include its successors in title) of the second part and [

_____] (Company Registration Number [_____]) whose registered office is situate at [_____] (hereinafter called "the Guarantor") of the third part

WHEREAS:-

(a) By a Lease (hereinafter called "the Head Lease") dated the First day of January One thousand eight hundred and sixty-nine and made between The Queen's Most Excellent Majesty of the first part the Board of Trade of the second part and The Humber Conservancy Commissioners of the third part for the consideration therein mentioned certain premises (including the demised premises the subject of this Lease) were granted demised and leased to the said Humber Conservancy Commissioners for the term of Nine hundred and ninety nine years from the First day of January One thousand eight hundred and sixty-nine upon the terms and subject to the covenants conditions and provisions therein contained

(b) The benefit of the Head Lease is now vested in ABP

(c) The reversion immediately expectant upon the term of years created by the Head Lease is now vested in The Queen's Most Excellent Majesty (hereinafter called "the Head

Landlord")

WITNESSETH as follows:-

Parcels

1. AT the request of the Guarantor and in consideration of the rents and the Lessee's covenants hereinafter reserved and contained ABP hereby demises unto the Lessee ALL THOSE parcels of land comprising parts of the bed and foreshore of the River Humber as the same are delineated on Plan 1 and thereon coloured pink and magenta (all such premises being hereinafter called "the demised premises" which expression shall where the context so admits include all additions or improvements hereafter made to the demised premises (including the Works) and all buildings fixtures drains and other works now or hereafter thereon and the fences or walls and gates now or hereafter erected on the boundaries of the demised premises) But subject to the Subjections Together with (subject to the Lessee (i) so far as not already obtained as at the date of this Lease first obtaining from any Competent Authority and any other relevant third party all licences consents approvals permissions and other authorisations in so far as requisite for the exercise of the particular right in question (ii) subject to the Subjections and in relation to the rights only insofar as and to the extent that ABP can lawfully grant the same (iii) in every case subject to and in compliance with the Order and (iv) in common with ABP and persons authorised by ABP) the rights detailed below:

- (1) the right to berth vessels within the Berthing Pocket for the purposes of control of the Lessee's operations to be carried out from the demised premises
- (2) the right to use the Dock Master's jurisdiction for the purposes of the control of the Lessee's operations to be carried out from the demised premises
- (3) the right to discharge foul/surface water into the River Humber via the outfall shown at point [] on Plan 1 subject to complying with the Lessee's covenants in this Lease relating to such (including without limitation Clause 7(g)) and obtaining the relevant Environmental Permits and all other necessary consents in relation thereto

Mines and Minerals

2. THE mines and minerals in and under the demised premises are excepted and there is also excepted any right of support from mines and minerals

Exceptions and Reservations

3. THERE IS ALSO EXCEPTED AND RESERVED unto ABP and all persons claiming under it or permitted by it or any other person for the time being entitled to the same:-

- (a) The right from time to time and at all times during the term hereby granted to carry out any works by ABP under the Order together (without limitation) with the right to carry out (whether on or from any part or parts of the demised premises including without limitation the Quay Area and/or the Rock Revetment Area) any works which may in the opinion of ABP be necessary for the proper operation of ABP's Statutory Undertaking
- (b) The right at all reasonable times on prior notice (or in case of emergency at any time) to enter on the demised premises including without limitation the Quay Area and the Rock Revetment Area for the purpose of repairing maintaining or inspecting any adjoining property of ABP and of exercising the rights reserved by Clause 3(a) and of carrying out any alterations or improvements to the River Humber and its navigation or any adjoining or neighbouring land or interests of ABP that ABP considers necessary and of carrying on of its undertaking in exercise of its powers
- (c) All rights whatsoever enjoyed by ABP and its predecessors and by all others authorised by them whether by statute regulation bye-law or any other Enactment right or entitlement over under and contiguous to the demised premises
- (d) All the rights reserved to the Head Landlord by the Head Lease
- (e) All such rights as are necessary to enable ABP to carry out its obligations and duties or to exercise its rights under the Head Lease
- (f) All such rights as are necessary to enable the Harbour Master to carry out his obligations and duties
- (g) The right on prior written notice (except in an emergency) to enter on the demised

premises:-

- (i) to inspect the condition of the demised premises and take schedules of condition and inventories of fixtures and other items to be yielded up on the expiration or sooner determination of the term hereby granted
 - (ii) to carry out work or do anything reasonably and properly comprised within the obligations of ABP in this Lease
 - (iii) to exercise any of the rights reserved to ABP by this Lease in accordance with the provisions governing the exercise of such rights
 - (iv) to execute any works on the demised premises which ABP may be statutorily liable to carry out
 - (v) for any reasonable purpose connected with ABP's interest in the demised premises
- (h) The power and liberty at any time hereafter to stop up or otherwise affect any rights of way or other easements or privileges whether now in existence or not which the Lessee may at any time during the term hereby granted be using or enjoying (other than by virtue of an express grant made by these presents or of any Grant or Licence in writing from ABP) over any adjoining land as appurtenant or belonging to the demised premises
- (i) Full right and liberty from time to time to use its adjoining and neighbouring lands in such manner as it may think fit and to build or execute works upon such lands and to carry out whatever improvements or alterations to the River Humber and its navigation or to any adjoining or neighbouring land or interests of ABP that ABP may deem necessary for the proper operation of ABP's undertaking notwithstanding that the access of light and air to the demised premises may be thereby affected
- (j) (i) Nothing contained in this Lease shall affect or prejudice the statutory duties obligations and powers of ABP and/or its Harbour Master or the carrying out by ABP of any of its statutory undertakings in exercise of its powers

- (ii) ABP reserves the right to enter on the demised premises for the purpose of complying with its statutory duties and obligations

PROVIDED THAT ABP shall in the exercise of the said rights hereinbefore reserved to it cause as little damage to and interference with the demised premises and the Lessee's right of access thereto from the River Humber or the Lessee's operations therefrom as reasonably practicable and shall make good as soon as reasonably practicable all damage caused by or in the exercise of such rights to the fabric of the demised premises or the land comprised in the demised premises

Habendum

4. THE Lessee shall HOLD the demised premises (subject to all rights and easements affecting the same including without limitation the Subjections) for the term of [sixty] years commencing on the { } day of { } Two thousand {and } determinable nevertheless as hereinafter provided

Rent

5. THE Lessee shall PAY therefor:-

- (a) (subject as hereinafter provided) the yearly rent of { } pounds (£{ }) (exclusive of Value Added Tax) payable by equal quarterly payments in advance by Banker's Order on the First day of January the First day of April the First day of July and the First day of October in every year (hereinafter called the "quarter days") without any deduction the first payment (being in respect of the period from and including the date of commencement of the term hereby granted to and including the day before the next quarter day) to be made on the date hereof and
- (b) (subject as provided in the Fourth Schedule) the Outfall Discharge Rent at the times and in the manner detailed in the Fourth Schedule
- (c) by way of further rent on demand:-
- (i) all costs charges and expenses which ABP may from time to time incur in connection with or procuring the remedying of any breach by the Lessee of

any of the covenants on the part of the Lessee contained in this Lease

- (ii) all other sums payable by the Lessee to ABP pursuant to this Lease

Review of Rent

6. AT any time during the period of six months next before or on or at any time after the { } day of { } Two thousand and { } and each fifth yearly anniversary thereof (each such date being hereinafter called a "Rent Review Date") ABP may serve on the Lessee a notice in writing (hereinafter called a "Rent Notice") providing for the increase of the rent payable hereunder as from the Rent Review Date then current to an amount specified in the Rent Notice and thereupon the following provisions shall have effect:-

- (a) The Lessee within one month after the service upon the Lessee of the Rent Notice but not otherwise may serve on ABP a counter-notice in writing in accordance with Clause 12 hereof and calling upon ABP to negotiate with the Lessee the amount of the rent to be paid hereunder as from the Rent Review Date then current
- (b) If the Lessee shall fail to serve a counter-notice within the period aforesaid the amount of the rent to be paid hereunder as from the Rent Review Date then current shall be conclusively fixed at the amount of rent specified in the Rent Notice
- (c) If the Lessee shall serve on ABP a counter-notice calling upon ABP to negotiate with it as aforesaid then the parties hereto shall forthwith consult together and use their best endeavours to reach agreement as to the amount of the rent to be paid hereunder as from the Rent Review Date then current but failing agreement within one month after service of such counter-notice (or within such extended period as the parties hereto shall mutually agree) the question of whether any and if so what increase ought to be made in the rent payable hereunder as from the Rent Review Date then current shall be referred to the arbitration of a single arbitrator who (failing agreement between the parties hereto) shall be nominated on the joint application of the parties hereto (or if either of them shall neglect forthwith to concur in such

application then on the sole application of the other of them) by the President for the time being of the Royal Institution of Chartered Surveyors

(d) The Arbitrator shall determine the question so referred to him by ascertaining in accordance with the Arbitration Act 1996 or any statutory modification or re-enactment thereof for the time being in force the yearly rent which would reasonably be expected to become payable in respect of the demised premises after the expiry of a rent free period of such length as would be negotiated in the open market between a willing lessor and a willing lessee upon a letting of the demised premises as a whole with vacant possession without a fine or premium in the open market as between a willing lessor and willing lessee as at the Rent Review Date then current for a term equal to the length of the term hereby granted commencing on the Rent Review Date then current and in all other respects on the terms of this Lease (other than as to user and as to the amount of rent but including the provisions for rent review herein contained) and assuming that:-

- (i) the demised premises are fit and available for immediate beneficial occupation and may lawfully be used for any of the purposes permitted by this Lease (as varied or extended by any licence granted pursuant thereto) or any other dock related user
- (ii) all the covenants herein contained on the part of the Lessee have been fully performed and observed and
- (iii) no work has been carried out to the demised premises which has diminished the rental value thereof and that in case the demised premises have been destroyed or damaged they have been fully restored
- (iv) the demised premises enjoy full and adequate facilities for access and services required both for development and subsequent use of the demised premises for all such uses as hereinbefore detailed

but disregarding:-

- (i) any effect on rent of the fact that the Lessee has been in occupation of the demised premises
 - (ii) any goodwill which shall have become attached to the demised premises since the commencement of the term hereby granted by reason of the carrying on thereat of the business of the Lessee
 - (iii) any effect on rent of any improvement or the execution of any works effected or carried out by the Lessee during the term hereby granted other than any such carried out pursuant to an obligation to ABP and
 - (iv) any rent free period and other rent concessions granted to the Lessee at the commencement of the term hereby granted
- (e) If the rent so ascertained exceeds the rent payable hereunder the difference shall be the increase in the rent payable hereunder
- (f) If the rent so ascertained is less than or equal to the rent payable hereunder then the rent payable as from the Rent Review Date then current shall be an amount equal to the rent payable hereunder immediately prior to the Rent Review Date then current
- (g) If the revised rent payable on and from any Rent Review Date has not been ascertained by that Rent Review Date rent shall continue to be payable at the rate previously payable (such payments being on account of the rent subject to review) and forthwith upon the revised rent being ascertained (that is to say the date when the same has been agreed between the parties or the date of the Arbitrator's award) the Lessee shall pay to ABP any shortfall between what would have been paid on the Rent Review Date then current and on any subsequent quarter days had the revised rent been ascertained before the Rent Review Date then current and the payments made by the Lessee on account together with interest at the prescribed rate (as defined in Clause 7(b) hereof) on the difference between each instalment of rent which would have been payable on the Rent Review Date then current and on any subsequent quarter days had the revised rent been ascertained before the Rent

Review Date then current and the amount paid on account interest being payable for the period from that date upon which the instalment was due up to the date of payment of the shortfall

- (h) If the Lessee shall fail to pay any costs awarded by the Arbitrator against the Lessee in the case of an arbitration carried out pursuant to the provisions of this Clause 6 within twenty one days of the same being demanded by the Arbitrator ABP shall be entitled to pay the same and the amount so paid and all incidental expenses shall be repaid by the Lessee to ABP on demand

Lessee's Covenants

7. THE Lessee for itself and its assigns hereby covenants with ABP as follows:-

To pay rent

- (a) To pay to ABP the yearly and other rents hereby reserved at the times and in manner aforesaid

To pay interest

- (b) If any rent or other sum payable by the Lessee to ABP pursuant to this Lease shall remain unpaid for more than twenty one days after becoming due (whether formally demanded or not and without prejudice to any other right or remedy to which ABP may be entitled) to pay to ABP interest thereon at a rate of four per centum per annum above the base rate of National Westminster Bank plc or such other bank being a member of the Committee of London and Scottish Bankers as ABP may from time to time nominate (or such other rate or rates for the time being replacing the same by reference to which prime clearing banks determine their own rates of interest) from time to time ("the prescribed rate") calculated on a day to day basis from the date of the same first becoming due down to and including the date of payment and the amount thereof shall be recoverable in like manner as rent in arrear

To pay outgoings

- (c) To pay and indemnify ABP against all rates (including without limitation any business

rates which are at any time separately assessed as applying to the demised premises or any part thereof) charges taxes assessments duties impositions and outgoings whatsoever (whether or not of a capital or non-recurring nature or of a wholly novel character) which are now or shall during the term hereby granted be assessed charged imposed upon or payable in respect of the demised premises or upon the owner or occupier thereof excluding (save as otherwise provided in this Lease) any payable by ABP occasioned by receipt of the rents or by any dealing with any interest reversionary to this Lease

Electricity and other services

- (d) (i) To pay all sewer and drainage rates and all other rates water rates electricity and all other charges duties impositions assessments and outgoings whatsoever now or hereafter imposed charged or assessed upon or payable in respect of the demised premises
- (ii) To pay to the suppliers and to indemnify ABP against all charges for electricity and other services consumed or used at or in connection with the demised premises and all charges for meters insofar as such charges are not levied under Clause 7(d)(i) hereof and to observe and perform all regulations and requirements of the supplying authorities

Planning

- (e) (i) To observe and comply with the provisions and requirements of the Planning Acts, the Transport and Works Act 1992 and the Harbours Act 1964 affecting the demised premises and their use
- (ii) At its own expense to obtain any planning permissions orders or other consents and serve any notices that may be required to carry out any development on or at the demised premises
- (iii) Notwithstanding any consent that may be granted by ABP under this Lease the Lessee must not carry out any development on or at the demised premises until

all necessary notices under the Planning Acts have been served and copies produced to ABP all necessary permissions under the Planning Acts or orders under relevant Enactments have been obtained and produced to ABP and ABP has acknowledged that every planning permission and order is acceptable to it

(iv) Where a condition of any planning permission or order granted for development begun before the end of the term hereby granted requires works to be carried out to the demised premises by a date after the end of the term hereby granted the Lessee must unless ABP directs otherwise finish those works before the end of the term hereby granted

(v) In any case where a planning permission or order is granted subject to conditions and if ABP so requires the Lessee must provide sufficient security for its compliance with the conditions and must not implement the planning permission or order until that security has been provided

(vi) The Lessee shall consult with ABP on the form and content of any Application and submit full details of any Application to ABP (including without limitation all drawings plans and specifications for the proposed development to be submitted with the Application) and shall take account of any representations or comments by and amendments required by or on behalf of ABP and no Application shall be submitted to the relevant planning or other authority or Competent Authority until ABP has given its approval thereto in writing (such approval not to be unreasonably withheld or delayed)

(vii) The Lessee may not vary or amend any Application without ABP's consent which shall not be unreasonably withheld or delayed and shall submit to ABP sufficient information to enable ABP to determine the extent and scope of any variation or amendments to any Application

(viii) In prosecuting any appeal against:

(aa) a deemed refusal of any Application; or

(bb) an actual refusal of any Application; or

(cc) a grant of a planning permission or consent or approval or order subject to conditions that are not acceptable to the Lessee

the Lessee will keep ABP fully informed of all relevant information with respect to the appeal including all correspondence notifications instructions to and advice of Counsel evidence of expert and other witnesses and the dates of any inquiry hearing or for the submission of written representations

(ix) Prior to making any Application to inform ABP of its intention to do so and to produce to ABP for noting:

(aa) within 14 days of obtaining notice of the result of such Application the document granting or refusing the same and

(bb) in the case of an order under the Harbours Act 1964 the Transport and Works Act 1992 or the Planning Act 2008 as soon as reasonably practicable after the making of the order a Queen's Printer's copy of the order

and as soon as reasonably practicable following the receipt of any enforcement or other notice or order (including without prejudice to the generality of the foregoing in relation to any planning application or decision) or any proposal for the same from a Planning Authority or other Competent Authority to give full particulars thereof to ABP and if required to produce such notice or order (including as aforesaid) or proposal and any and all information in connection therewith to ABP and at the request of ABP to make or join with ABP in making any objection or representation against or in respect of any such notice or order (including as aforesaid) or proposal as ABP shall deem expedient

(x) Subject only to any statutory direction to the contrary to pay and satisfy any tax charge or levy (including without limitation any community infrastructure levy) that may be imposed under the Planning Acts or any other Enactment in respect of the

carrying out or maintenance of any development on or at the demised premises and/or arising from and/or in respect of any planning permission or order obtained pursuant to the provisions of this Clause 7(e) and/or its and/or their implementation

User

- (f) To use the demised premises and every part thereof only as and for:
 - (i) the mooring of vessels
 - (ii) the loading and unloading of such vessels and
 - (iii) the storage and handling of cargoes on the Quay Area subject to such cargoes being only items associated with marine energy infrastructure and any cargo that is incidental or ancillary to such items

Statutes and Bye-Laws etc.

- (g)
 - (i) The Lessee will at all times keep itself informed of and comply with all Applicable Laws
 - (ii) The Lessee will at all times keep itself informed of and comply with all ABP Regulations relevant to its activities at the demised premises and/or the exercise of the rights granted by this Lease
 - (iii) The Lessee will, without limitation to the other provisions of this Lease, carry out risk assessments of its activities at the demised premises and the Berthing Pocket and the Dock Master's jurisdiction and in the exercise of the rights granted by this Lease to the full extent required by Applicable Laws (in particular, but not limited to, those concerned with environmental protection and health and safety and safety of navigation) and will ensure that appropriate action is taken on the basis of those risk assessments
 - (iv) The Lessee will procure that its contractors, sub-contractors, agents and any other persons whom the Lessee invites onto the demised premises or to exercise any of the rights granted by this Lease including without limitation any underlessee or other occupier conduct their own activities in compliance

with the obligations in this Clause 7(g)

- (v) The Lessee will, where relevant:
 - (aa) apply for and secure all Environmental Permits necessary in connection with any activity carried out by it at the demised premises and/or in the exercise of the rights granted by this Lease;
 - (bb) comply with all conditions or limitations imposed by any such Environmental Permit;
 - (cc) upon request provide a copy of any such Environmental Permit to ABP and where such Environmental Permit has been so provided, notify ABP as soon as practical in the event that there is any material variation to any such Environmental Permit or if the Lessee ceases to hold such Environmental Permit
- (vi) The Lessee will conduct its activities at the demised premises and/or in the exercise of the rights granted by this Lease at all times in such a way as to minimise any nuisance or disturbance to ABP or its tenants or users of the River Humber or ABP's docks or the owners or occupiers of neighbouring lands and property
- (vii) The Lessee will conduct its activities at the demised premises and/or in the exercise of the rights granted by this Lease at all times in such a way as to:
 - (aa) prevent any escape of Cargo or any other substance (in whatever form and whether alone or in combination with any other substance) within the possession or control of the Lessee from the demised premises or from any vessel or other means of transport in the possession or under the control of the Lessee or its contractors, sub-contractors or agents;
 - (bb) ensure that no Hazardous Materials or substance or matter of which the discharge passage or escape would be contrary to the

Environmental Permitting (England and Wales) Regulations 2010 (SI 675) or any other substance or material which may cause an obstruction or damage or pollution is permitted to pass or escape into any sewer, drain or watercourse serving the demised premises or into the River Humber or into the sea or into or onto any other land or premises or water areas

- (viii) If a Pollution Incident should occur as a result of the activities of the Lessee at the demised premises and/or in the exercise of the rights granted by this Lease, including but not limited to the escape of any Cargo which might cause damage to the Environment or discharge of any Hazardous Materials or other substance matter or material referred to in Clause 7(g)(vii)(bb) in breach of that Clause 7(g)(vii)(bb) or any other substance or material which may cause an obstruction or damage or pollution, the Lessee shall, upon becoming aware of the Pollution Incident:
- (aa) take immediate steps to prevent further pollution occurring as a result of the Pollution Incident;
 - (bb) notify ABP as soon as reasonably practicable and provide ABP with a copy of any notice that has been given to any Competent Authority in connection with the incident;
 - (cc) as soon as reasonably practicable remediate the consequences of the Pollution Incident to the reasonable satisfaction of ABP and/or any Competent Authority
- (ix) The Lessee irrevocably and unconditionally agrees to indemnify ABP in full and on demand and hold harmless and keep ABP so indemnified against all damage damages losses costs expenses actions demands proceedings claims and liabilities made against or incurred or suffered by ABP as a result of the breach of Clauses 7(g)(vii) or 7(g)(viii) by the Lessee, its contractors,

sub-contractors, agents or any other person who the Lessee invites onto the demised premises or to exercise any of the rights granted by this Lease including without limitation any underlessee or other occupier

- (x) Subject to any written agreement with ABP to the contrary:
 - (aa) the Lessee will make proper and adequate arrangements for the removal from the demised premises and disposal of all trade and other waste in accordance with the requirements of Applicable Laws as often as may be necessary or as reasonably directed by ABP
 - (bb) if the Lessee fails to remove trade and other waste from the demised premises to the reasonable satisfaction of ABP then ABP reserves the right to remove and dispose of the trade or other waste itself and the Lessee will reimburse ABP in full for all costs or expenses incurred by ABP in undertaking such removal;
 - (cc) the Lessee will maintain proper and full records of all waste disposal that it undertakes and will, upon request, provide a copy of any such records to ABP
- (xi) The Lessee will be responsible for ensuring that any Dangerous Substances stored at the demised premises as a result of the activities of the Lessee do not exceed any limits permitted under the Dangerous Substances Regulations, or any limits imposed under any other Applicable Laws

Maintenance

- (h) (i) To keep the demised premises (including all or any buildings structures fencing and gates which by virtue of Clause 1 hereof shall have been embraced by the expression "demised premises") in good and substantial repair and condition to the satisfaction of ABP and to keep the perimeter of the demised premises neat and tidy
- (ii) To procure that:-

- (aa) if requested by ABP and in any event no less frequently than annually throughout the term hereby granted the structure of the quay wall of the demised premises is fully inspected by a structural engineer (a member of The Institution of Structural Engineers) and that a Structural Engineers Report is produced by the structural engineer
- (bb) all requirements and recommendations contained in the Structural Engineers Report are promptly carried out and
- (cc) a copy of each Structural Engineers Report and details of any works or actions to be carried out pursuant to any such requirements or recommendations are forthwith supplied in writing to ABP

Painting and Decoration

- (i) To keep the exterior of all buildings and structures situated on the demised premises properly painted and decorated at all times

Yielding up

- (j) (i) At the expiration or sooner determination of the term hereby granted with reasonable despatch to ensure that all waste (as defined in Section 75 of the Environmental Protection Act 1990) or material contaminated by waste on the demised premises is removed and to remediate and decontaminate the demised premises in accordance with all Environmental Laws and to demolish and remove any/or all buildings structures erections and works on the demised premises including any piled foundations to a level [] metres below ground level (whether or not constructed or placed thereon in performance of a covenant or obligation to ABP) excluding save as aforesaid the Quay and the Rock Revetment all to the extent to which ABP shall specify in a written notice sent to the Lessee and to make good to the reasonable satisfaction of ABP all damage occasioned by or in such remediation decontamination demolition and removal or the demolition and removal of any other buildings erections and works to the remaining parts of the

demised premises and the Retained Land Provided That any such removal remediation decontamination and demolition shall be carried out by the Lessee only in accordance with a method statement and/or remediation plan approved in writing by ABP (such approval not to be unreasonably withheld or delayed) and the Lessee shall procure that there is provided to ABP for approval such method statement and/or remediation plan no later than six weeks after receipt of the written notice from ABP hereinbefore referred to

(ii) Subject to the provisions of Clause 7(j)(i) and 7(j)(iii) hereof at the expiration or sooner determination of the term hereby granted quietly and peaceably to deliver up the demised premises leaving the same in good and substantial repair and condition and (for the avoidance of doubt) remediated and decontaminated in accordance with Clause 7(j)(i) to the reasonable satisfaction of ABP

(iii) Not later than 4 months prior to the expiration or sooner determination of the term hereby granted to commission at the cost and expense of the Lessee a survey report in respect of the demised premises recording (as at the date of its issue) the state of repair and condition (including without limitation environmental condition) of the demised premises Provided That the terms of engagement of any prospective provider of such survey report shall have received the prior approval in writing of ABP (such approval not to be unreasonably withheld or delayed) and within 10 Working Days of the receipt by the Lessee of such survey report the Lessee shall provide to ABP a certified copy thereof

Inspection

(k) To permit ABP or its agents at all reasonable times to enter on the demised premises for the purposes of viewing and seeing the condition thereof and forthwith (so far as the Lessee is liable) to execute all repairs and works required to be done by written notice given by ABP Provided that if such notice be not complied with within one month time being of the essence it shall be lawful for ABP to carry out the work

referred to in such notice and the expense of carrying out such work shall be repaid by the Lessee to ABP on demand

Notices

- (l) To pay all expenses (including Solicitors costs and Surveyors fees) incurred by ABP incidental to the preparation and service of a notice under Section 146 of the Law of Property Act 1925 notwithstanding forfeiture is avoided otherwise than by relief granted by the Court

Insurance

- (m) (i) Forthwith to insure and thereafter to keep insured in the name of the Lessee and with the interest of ABP noted thereon at its own expense the demised premises from loss or damage by an "All Risks" policy in a form and with an Insurance Company or office approved by ABP (or their approved agents) to the full replacement cost thereof at least as at the commencement of the term hereby granted and adjusted at each subsequent renewal to take account of current rebuilding and other related costs and to produce to ABP the Policy of Insurance and whenever required to produce to ABP or its agents the receipts for the current year's premium thereon Provided Always that if the Lessee shall at any time fail to insure the demised premises or pay the premium on the Policy in accordance with this covenant ABP shall be at liberty to insure the demised premises as aforesaid and thenceforth to pay the premium payable from time to time on the Policy and the amount thereof shall be repaid by the Lessee to ABP on demand and shall be recoverable in like manner as rent in arrear
- (ii) If the demised premises or any part thereof shall be destroyed or damaged through any of the risks required to be covered by the Policy of Insurance required to be maintained under Clause 7(m)(i) then forthwith to the satisfaction of ABP to rebuild and reinstate the demised premises and the amount received from the said Insurer shall be applied to that purpose and if such amount shall be insufficient for that

purpose to make good any deficiency out of its own money

(iii) Forthwith to effect and thereafter to maintain insurance in respect of public and third party liability in respect of the demised premises and/or the grant and/or exercise of the rights hereby granted in such sum which is not less than [[] million pounds (£[],000,000.00)] as may be approved by ABP in respect of each and every claim and with ABP's interest noted on the insurance policy/policies either specifically or generically and whenever required (but not more than once a year) to produce to ABP a copy of the policies of such insurance and whenever required to produce to ABP copies of the receipts for or other evidence of payment of the current premiums thereon Provided Always that if the Lessee shall at any time fail to effect such insurance or pay the premiums on the insurance policy/policies in accordance with this covenant ABP shall be at liberty to insure against such liabilities as aforesaid and thenceforth to pay the premiums payable from time to time on the insurance policy/policies and the amount thereof shall be repaid by the Lessee to ABP within 5 Working Days of demand and shall be recoverable in like manner as rent in arrear

To observe Conditions of Policy not to increase fire risks

(n) To observe and perform the conditions of the Policies of Insurance and not without the previous consent in writing of ABP and the sanction of the said Insurer (such sanction to be produced to ABP) to do or suffer on the demised premises anything which would be likely to increase the risk of fire or explosion

Advertisements

- (o) (i) That no sign placard or advertisement whatsoever shall be fixed or placed on the demised premises other than a Notice of the Lessee's name and business in a form to be approved by ABP
- (ii) Not to erect and/or install on any part of the demised premises any pole mast wire or telecommunication dish or other communication apparatus (all

together hereinafter referred to as "Telecommunications Apparatus") without the prior consent in writing of ABP (such consent not to be unreasonably withheld or delayed) and subject to compliance with the provisions hereinafter detailed in Clause 7(o)(iii)

- (iii) To submit to ABP with any application for consent made pursuant to the provisions of Clause 7(o)(ii) full and complete details of the Telecommunications Apparatus the Lessee proposes to erect and/or install together with if reasonably requested by ABP a specialist technical report detailing to the reasonable satisfaction of ABP that the Telecommunications Apparatus will not interfere with any other telecommunications apparatus in use on the River Humber
- (iv) Immediately on receipt of notice from ABP detailing that any Telecommunications Apparatus is causing interference with any other telecommunications apparatus in use on the River Humber to procure the cessation of the use of the Telecommunications Apparatus until such time as ABP agrees that such interference has ceased and/or been remediated to ABP's reasonable satisfaction
- (v) To procure that the Telecommunications Apparatus is used solely and exclusively by the Lessee for the purposes of its own operations and activities conducted at the demised premises

Alterations

- (p) Not to make any alterations or additions to the demised premises nor to carry out on or at or in the demised premises any works amounting to development within the meaning of the Town and Country Planning Act 1990 or any statutory modification or re-enactment thereof without the previous licence by deed or in writing of ABP as ABP may require such licence if required by ABP to provide for the Lessee to reinstate the demised premises to their former state at the expiration or sooner

determination of the term hereby granted if ABP shall then so require

Assignment

- (q) (i) Not to assign or charge part only of the demised premises or save as hereinafter provided assign or charge the whole of the demised premises or sublet or part with or share the possession or occupation of the whole or any part of the demised premises or part with these presents
- (ii) Not to assign the whole of the demised premises without first:-
- (aa) obtaining the licence in writing of ABP which shall not be unreasonably withheld
- (bb) satisfying the circumstances specified for the purposes of Section 19(1A) of the Landlord and Tenant Act 1927 as set out in Clause 7(q)(iii) hereof and
- (cc) complying with the condition specified for the purposes of Section 19(1A) of the Landlord and Tenant Act 1927 as set out in Clause 7(q)(iv) hereof
- (iii) The circumstances referred to in Clause 7(q)(ii)(bb) are that:-
- (aa) the Lessee shall have provided to ABP's solicitors a solicitors' undertaking to pay the proper costs and disbursements of ABP's solicitors (including any Value Added Tax) in dealing with the application for the licence to assign and any deed of indemnity and guarantee required in accordance with Clause 7(q)(iv) hereof (whether or not licence is granted or is granted subject to lawful conditions) together with ABP's reasonable administration costs in relation thereto (including any Value Added Tax)
- (bb) all sums due from the Lessee under this Lease have been paid at the date of the application for the licence to assign
- (cc) in ABP's reasonable opinion there are at the date of the application for the licence to assign no material outstanding breaches of any lessee covenant of this Lease or any personal covenants undertaken by the Lessee
- (dd) in ABP's reasonable opinion the assignee is a person who is at the date of the

application for licence to assign likely to be able to comply with the lessee covenants of this Lease and to continue to be such a person following assignment

- (iv) The conditions referred to in Clause 7(q)(ii)(cc) hereof are that:-
 - (aa) upon or before any assignment and before giving occupation to the assignee the Lessee shall covenant by way of indemnity and guarantee with ABP in the terms set out in the First Schedule hereto with such amendments as ABP shall reasonably require
 - (bb) (if ABP reasonably so requires) upon or before any assignment and before giving occupation to the assignee the Lessee shall procure that a guarantor or (if ABP reasonably so requires) more than one guarantor for the assignee reasonably acceptable to ABP covenants by way of indemnity and guarantee with ABP in similar terms to those set out in the Second Schedule hereto with such amendments as ABP shall reasonably require
 - (cc) if required by ABP upon or before any assignment and before giving occupation to the assignee the Lessee shall procure that the guarantor or guarantors hereinbefore referred to in Clause 7(q)(iv)(bb) have agreed with ABP prior to the execution and delivery to ABP of the covenants by way of indemnity and guarantee hereinbefore referred to in Clause 7(q)(iv)(bb) that the provisions of Sections 24-28 inclusive of the Landlord and Tenant Act 1954 shall be excluded in relation to any tenancy which may be created pursuant to the covenants to be made by such guarantor or guarantors with ABP and that such agreement has been rendered valid by the proper implementation of the procedure laid down in Schedules 1 and 2 of the 2003 Order or other relevant Enactment
 - (dd) if required by ABP upon or before any assignment and before giving occupation to the assignee the Lessee shall prior to the execution and

delivery to ABP of the covenant by way of indemnity and guarantee hereinbefore referred to in Clause 7(q)(iv)(aa) agree with ABP that the provisions of Sections 24-28 inclusive of the Landlord and Tenant Act 1954 shall be excluded in relation to any tenancy to be created pursuant to the provisions of the deed of indemnity and guarantee aforesaid and implement such procedures as are required by ABP to procure that such agreement has been rendered valid by the proper implementation beforehand of the procedure laid down in Schedules 1 and 2 of the 2003 Order or other relevant Enactment

(v) Not without the previous licence in writing of ABP (such licence subject as hereinafter provided not to be unreasonably withheld where the Lessee satisfies the circumstances set out in Clause 7(q)(iii) hereof (mutatis mutandis and as if reference to licence to assign read licence to underlet and in the case of Clause 7(q)(iii)(dd) hereof as if reference to the lessee covenants of this Lease read the lessee covenants contained or to be contained in the underlease)

to sublet the whole or any part of the demised premises or permit the assignment of any underlease thereof Provided That:-

- (1) any permitted subletting shall be at a rent which is not less than the greater of the open market rent without a fine or premium of the premises to be sublet as at the time of the grant of the proposed underlease and the yearly rent then payable hereunder (or a due proportion previously approved in writing by ABP (such approval not to be unreasonably withheld) of it where only part of the demised premises is to be sublet)
- (2) any permitted subletting shall be granted without a fine or premium and
- (3) any permitted subletting shall be on terms the same mutatis mutandis as those contained in this Lease
- (4) any permitted subletting shall contain provisions to ensure that where ABP

exercises any right contained in this Lease to determine this Lease or this Lease otherwise determines the term granted by such underlease will also determine (without any right of the underlessee to remain in possession or occupation of any part of the demised premises) on a date not later than the date upon which this Lease will determine as a consequence of the exercise by ABP of any such right to determine this Lease or the date this Lease otherwise determines

- (5) any permitted subletting shall contain provisions to ensure that where the Lessee exercises any right contained in this Lease to determine this Lease or this Lease otherwise determines the term granted by such underlease will also determine (without any right of the underlessee to remain in possession or occupation of any part of the demised premises) on a date not later than the date upon which this Lease will determine as a consequence of the exercise by the Lessee of any such right to determine this Lease or the date this Lease otherwise determines
- (6) prior to the grant of any permitted subletting the necessary procedure shall be followed in order to procure that the operation of the provisions of Sections 24 - 28 inclusive of the Landlord and Tenant Act 1954 are excluded in relation to the tenancy to be created by the proposed underlease and evidence produced to ABP that such Sections will be validly excluded in relation to such tenancy
- (7) the form of the proposed underlease has been approved in writing by ABP (such approval not to be unreasonably withheld or delayed)

And Provided Further That any such licence shall be by deed and include a covenant by the proposed underlessee or assignee as the case may be with ABP to observe and perform the covenants on the part of the underlessee and the conditions to be contained in the proposed underlease or contained therein as the case may be until

such time as the underlessee or assignee as the case may be shall be released from liability therefor by an assignment thereof in accordance with the terms thereof

(vi) Not without the previous consent in writing of ABP (such consent not to be unreasonably withheld or delayed) to charge the whole of the demised premises

(vii) Within one month after the date of the happening of any event for which licence is given as aforesaid or of any devolution of the leasehold title to give ABP notice and full particulars thereof in writing

(viii) Notwithstanding the other provisions of this Lease nothing herein contained shall prevent the Lessee from sharing occupation of the demised premises or any part thereof with another company within the same group of companies as the Lessee as defined in Section 42 of the Landlord and Tenant Act 1954 for so long as both companies remain members of the same group and provided that no relationship of landlord and tenant is thereby created

Sale by Auction

(r) That no public sale or sale by auction shall be held on the demised premises

Easements and Encroachments

(s) (i) Not to give any third party any acknowledgement that the Lessee enjoys the access of light or air to any of the windows or openings in the demised premises by the consent of such third party nor to pay any sum of money to or enter into any agreement with such third party for the purpose of inducing or binding him to abstain from obstructing the access of light or air to any such windows or openings And in the event of such third party doing or threatening to do anything which obstructs or would obstruct such access of light or air to notify the same forthwith in writing to ABP

(ii) To take all necessary steps to prevent and not to suffer any encroachment upon the demised premises or the acquisition of any right to light or air passage drainage or other easement over or upon or under the demised premises and

forthwith to give notice in writing to ABP of any threatened encroachment or attempt to acquire any such easement

(iii) To permit ABP to enter upon the demised premises for the purpose of taking such of the necessary steps as are referred to in Clause 7(s)(ii) hereof and to permit ABP to bring all such actions as it may think fit in the name of the Lessee in respect of the obstruction of the access of light or air to any of the windows or openings in the demised premises or in respect of any such encroachment or easement as aforesaid Provided Always that ABP shall indemnify the Lessee from and against all costs losses or damage which it may suffer by reason of any act or action which ABP may do or bring under this Clause 7(s)(iii)

Excavations and Nuisances

- (t) (i) That no earth clay or other substance shall be excavated upon the demised premises and that no act shall be done upon the demised premises which may endanger the safety or stability of ABP's property or of any neighbouring property and that no inflammable dangerous or explosive substance liquid or gas shall be stored or placed upon the demised premises
- (ii) That nothing shall be done upon the demised premises which may be or become or grow to be a public or private nuisance or a danger annoyance or disturbance to ABP or its tenants or users of ABP's or other docks and neighbouring property or persons
- (iii) That all structures and erections situated on the demised premises shall be kept in a safe condition

Indemnity

- (u) To be responsible for and to keep ABP fully indemnified against all damage damages losses costs expenses actions demands proceedings claims and liabilities made against or suffered or incurred by ABP arising directly or indirectly out of:-
- (i) the grant of the demise herein contained or

- (ii) the user of the demised premises or
- (iii) the exercise of the rights granted by this Lease or
- (iv) any act omission or negligence of the Lessee or any persons at the demised premises expressly or impliedly with the Lessee's authority or
- (v) any breach or non-observance by the Lessee of the covenants on its part and the conditions contained in this Lease or
- (vi) any Contamination existing or arising at the demised premises and/or at any part or parts of the Retained Land where any part or parts of the Works are or have been carried out and/or any of the rights granted by this Lease are or have been exercised or
- (vii) any Migration or
- (viii) any obligations to remediate Contamination from the demised premises and/or from any part or parts of the Retained Land where any part or parts of the Works are or have been carried out and/or any of the rights granted by this Lease are or have been exercised or
- (ix) complying with any environmental notices served by any Competent Authority in respect of the demised premises and/or any part or parts of the Retained Land where any part or parts of the Works are or have been carried out and/or any of the rights granted by this Lease are or have been exercised

Spillages etc.

- (v) To ensure that any storage of equipment and materials in connection with the Lessee's business as authorised pursuant to this Lease is confined to the demised premises and does not encroach upon or spill on to any adjoining lands and/or water areas including without limitation the River Humber

To pay Value Added Tax

- (w) (i) To be responsible for pay and keep ABP fully indemnified against all Value Added Tax which may be chargeable in relation to any supply made or deemed to be

made by ABP to the Lessee as a result of or in connection with this Lease

- (ii) Whenever in this Lease provision is made for the Lessee:-
 - (aa) to pay any sum on which Value Added Tax is chargeable (including rents) then (without prejudice to the generality of Clause 7(w)(i) hereof) to pay in addition to such sum (including rents) Value Added Tax thereon at the rate appropriate at the time of supply
 - (bb) to repay to ABP or indemnify ABP against any sum then to repay in addition any Value Added Tax borne by ABP (except to the extent to which ABP in respect of services rendered to ABP recovers the same as input tax)

Environmental Matters

- (x) (i) Without prejudice to the generality of Clause 7(g) hereof:-
 - (aa) not to use the demised premises in such a way or to store anything thereon which causes or may cause a breach or violation of or otherwise offends Environmental Laws and to ensure that the demised premises and the activities carried out at the demised premises comply with Environmental Laws at all times
 - (bb) not to permit to be released or to be discharged into the Environment whether upon or from the demised premises or otherwise any Relevant Substance causing contamination or pollution or otherwise causing any further contamination or pollution of or to the Environment including without limitation the demised premises
 - (cc) to obtain all consents as may be required to comply in all aspects with all Environmental Laws and to keep ABP indemnified in respect of any breach thereof

Land Registration Act 2002

- (y) (i) Within two months of completion of this Lease to take all necessary steps to lodge at the land registry an application for registration of this Lease in

accordance with the Land Registration Act 2002 (hereinafter called “the 2002 Act”) and to pursue such application diligently

- (ii) To deliver to ABP within ten days of completion of such registration official copies of the title of the Lessee evidencing that the Lessee is registered at the land registry as proprietor of this Lease
- (iii) On the expiration or sooner determination of the term hereby granted to deliver to ABP the original of this Lease and any other documentation in the Lessee’s possession or control necessary to procure the closure of the registered title of this Lease
- (iv) To indemnify and keep indemnified the person who originally granted this Lease and any subsequent person for the time being entitled to the reversion immediately expectant on the determination of the term hereby granted from liability suffered or properly incurred by the person who originally granted this Lease or any subsequent person for the time being entitled to the reversion immediately expectant on the determination of the term hereby granted due to any failure of the Lessee to register this Lease

Head Lease

- (z) (i) To observe and perform all the covenants and conditions on the part of the tenant contained in the Head Lease so far as they relate to the demised premises and are still subsisting and capable of taking effect (except only the covenants to pay the rents reserved by the Head Lease)
- (ii) Not to do or allow any act or thing in relation to the demised premises which is inconsistent with or in breach of the provisions of the Head Lease or which if done omitted or suffered by ABP would constitute a breach of the covenants on the part of the tenant and the conditions binding on the tenant contained in the Head Lease
- (iii) To permit the Head Landlord (with or without others as provided in the Head Lease) to exercise any right to enter the demised premises granted or allowed to the

Head Landlord pursuant to the Head Lease

(iv) Wherever consent or approval of the Head Landlord is required under the terms of the Head Lease not to do or omit to do anything for which such consent or approval is so required without first obtaining ABP's consent or approval thereto

Costs

(aa) To pay on the grant of this Lease the fair and reasonable fees and disbursements of ABP's Solicitors in relation to the negotiation preparation execution and grant of this Lease

Subjections

(bb) To comply with all matters subject to which this demise and the rights granted by this Lease take effect (including without limitation the Subjections) and to comply with the agreements covenants obligations and stipulations contained in the deeds and documents referred to in the Third Schedule hereto insofar as such matters agreements covenants obligations and stipulations relate to the demised premises and/or the exercise of the rights hereby granted and to comply with the obligations contained in the provisos governing the exercise of the rights granted by this Lease

Outfall Discharge Rent

(cc) To observe and perform the obligations on the part of the Lessee contained in the Fourth Schedule

Provisos

8. PROVIDED ALWAYS AND IT IS EXPRESSLY AGREED as follows:-

Re-entry

(a) (i) That if at any time during the term hereby granted:-
(aa) the said yearly rents or any part thereof shall be in arrear for twenty one days next after any of the said days whereon the same ought to be paid as aforesaid whether the same shall or shall not have been legally demanded or
(bb) there shall be a breach non-performance or non-observance of any of the

covenants on the part of the Lessee or conditions herein contained or

(cc) an Act of Insolvency occurs

then it shall be lawful for ABP at any time thereafter into or upon the demised premises or any part thereof in the name of the whole to re-enter and the same to have possess and enjoy as of ABP's former estate but without prejudice to any right or remedies of ABP then subsisting

(ii) In the event that ABP becomes entitled to terminate this Lease pursuant to Clause 8(a)(i) ABP will not without first giving any Lender not less than 30 Working Days' previous notice in writing exercise any right it may have to terminate this Lease

(iii) ABP shall not terminate this Lease if within the 30 Working Days notice period referred to in Clause 8(a)(ii) the Lender shall give notice in writing to ABP of its intention to step in (either itself or through a Lender's Appointee) and the Lender or the Lender's Appointee delivers to ABP a perfected deed of covenant within the said period of 30 Working Days in such form as is required by ABP acting reasonably whereby it assumes the obligations of the Lessee under this Lease and covenants to remedy any existing breaches of this Lease within a reasonable period after ABP's notice given pursuant to Clause 8(a)(ii) and following receipt by ABP of any such deed of covenant and subject to the remediation of such breaches within such reasonable period and the provisions hereinafter contained this Lease shall thereafter continue in full force and effect but subject always and without prejudice to the provisions of Clause 8(a)(i) and shall be construed as though the name of the Lender or the Lender's Appointee was substituted for the name of the Lessee

(iv) Where the deed of covenant is provided by a Lender or a Lender's Appointee it shall be a requirement of the deed of covenant that within 40 Working Days of the date of ABP's notice given pursuant to Clause 8(a)(ii) the Lender or the Lender's Appointee procures the assignment of this Lease to a Lender's Appointee which can include the Lender's Appointee which has delivered to ABP the perfected deed of

covenant pursuant to the provisions of Clause 8(a)(iii)

(v) Neither the Lender nor any Lender's Appointee shall have any liability to ABP under this Lease unless and until the Lender gives notice to ABP and the Lender or the Lender's Appointee provides the deed of covenant referred to at Clause 8(a)(iii) whereupon the Lender or the Lender's Appointee (as appropriate) shall be liable for the performance of the Lessee's obligations under this Lease and ABP shall be liable to the Lender or the Lender's Appointee (as appropriate) for the performance of ABP's obligations under this Lease

(vi) ABP shall not be concerned or required to enquire whether and shall be bound to assume that as between the Lessee and the Lender sufficient events have occurred to permit the Lender or the Lender's Appointee to provide the deed of covenant as referred to in Clause 8(a)(iii)

Rights of parties on determination

(b) That where at the date on which the Lessee is to quit the demised premises they have been occupied for a period less than five years immediately preceding that date for the purposes of the business carried on by the Lessee or other the occupier the right to compensation conferred by Sections 37 and 59 of the Landlord and Tenant Act 1954 shall be wholly excluded

Exclusion of implied rights

(c) This demise shall not confer upon or be deemed to include (by implication or otherwise) in favour of the Lessee any rights or privileges heretofore enjoyed by it or by any other person previously in the occupation of the demised premises or any part thereof in relation thereto not expressly herein set out nor any right of light or air liberties privilege easements or advantages (except such as may be specifically granted in this Lease) in through over and upon any land or premises adjoining or near to the demised premises

Rights of Third Parties

- (d) (i) Unless the right of enforcement is expressly provided it is not intended that any third party is to have the right to enforce any of the terms of this Lease pursuant to the Contracts (Rights of Third Parties) Act 1999 but this provision does not affect any rights which are available apart from that Act
- (ii) The parties to this Lease may determine or vary this Lease without the consent of a third party to whom an express right to enforce any of its terms may have been provided

2002 Act

- (e) The person who originally granted this Lease and any subsequent person for the time being entitled to the reversion immediately expectant on the determination of the term hereby granted shall not be liable to the Lessee for any liability suffered or incurred by the Lessee due to any failure of the Lessee to register this Lease

Legislation

- (f) (i) Unless otherwise specified, a reference in this Lease to a particular law or statutory instrument is a reference to it as it is in force for the time being taking account of any amendment extension application consolidation or re-enactment and includes any subordinate laws or legislation for the time being in force made under it and all orders notices instruments directions regulations bye-laws consents permissions conditions schemes codes of practice and guidance made under it
- (ii) A reference in this Lease to laws in general is to all local national and directly applicable supra-national laws in force for the time being taking account of any amendment extension application consolidation or re-enactment and includes any subordinate laws and legislation for the time being in force made under them and all orders notices instruments directions regulations bye-laws consents permissions conditions schemes codes of practice and guidance made under them

Joint and several liability

- (g) In this Lease words that indicate the singular include the plural and vice versa and

where any party to this Lease for the time being comprises two or more persons obligations expressed or implied to be made by or with that party are deemed to be made by or with the persons comprising that party jointly and severally

Definitions and Interpretation

(h) (i) In this Lease the terms defined in this clause shall for all the purposes hereof have the meanings specified unless the context otherwise requires:-

"ABP Regulations" means all bylaws, codes of practice or other directions or regulations issued from time to time by ABP in connection with the River Humber;

"Act of Insolvency" means:

- (a) the taking of any step in connection with any voluntary arrangement or any other compromise or arrangement for the benefit of any creditors of the Lessee or any guarantor; or
- (b) the making of an application for an administration order or the making of an administration order in relation to the Lessee or any guarantor; or
- (c) the giving of any notice of intention to appoint an administrator, or the filing at court of the prescribed documents in connection with the appointment of an administrator, or the appointment of an administrator, in any case in relation to the Lessee or any guarantor; or
- (d) the appointment of a receiver or manager or an administrative receiver in relation to any property or income of the Lessee or any guarantor; or
- (e) the commencement of a voluntary winding-up in respect of the Lessee or any guarantor, except a winding-up for the purpose of amalgamation or reconstruction of a solvent company in respect of which a statutory declaration of solvency has been filed with the Registrar of Companies; or
- (f) the making of a petition for a winding-up order or a winding-up order in

- respect of the Lessee or any guarantor; or
- (g) the striking-off of the Lessee or any guarantor from the Register of Companies or the making of an application for the Lessee or any guarantor to be struck-off; or
 - (h) the Lessee or any guarantor otherwise ceasing to exist (but excluding where the Lessee or any guarantor dies); or
 - (i) the presentation of a petition for a bankruptcy order or the making of a bankruptcy order against the Lessee or any guarantor

The paragraphs above shall apply in relation to a partnership or limited partnership (as defined in the Partnership Act 1890 and the Limited Partnerships Act 1907 respectively) subject to the modifications referred to in the Insolvent Partnerships Order 1994 (*SI 1994/2421*) (as amended), and a limited liability partnership (as defined in the Limited Liability Partnerships Act 2000) subject to the modifications referred to in the Limited Liability Partnerships Regulations 2001 (*SI 2001/1090*) (as amended)

Act of Insolvency includes any analogous proceedings or events that may be taken pursuant to the legislation of another jurisdiction in relation to a Lessee or guarantor incorporated or domiciled in such relevant jurisdiction;

"Agreement for Lease" means the agreement dated [] made between ABP (1) and the Lessee (2) relating to the demised premises and the grant of this Lease;

"Applicable Laws" means all applicable law and legislation of any jurisdiction including all or any statutes, rules, regulations, statutory guidance, treaties, directives, decisions, directions, recommendations, codes of practice (including the ISPS Code), guidance notes, circulars, bylaws, orders, notices, demands, regulations

or official guidance issued by any Competent Authority which are applicable to the Lessee and/or the demised premises and/or the Works and/ or the exercise of the rights granted by this Lease and/or the Lessee's activities at the demised premises and/or in the exercise of the rights granted by this Lease including without limitation its use and occupation of the demised premises as the same may be amended or modified from time to time;

"Application" means an application for planning permission or for any order under the Harbours Act 1964 or the Transport and Works Act 1992 or the Planning Act 2008 or any other statutory consent affecting the demised premises;

"Authorised Guarantee Agreement" includes a deed of covenant by way of indemnity and guarantee completed pursuant to the condition detailed in clause 7(q)(iv)(aa);

"Berthing Pocket" means the water area comprising [] acres or thereabouts shown hatched blue on Plan 1;

"Cargo" means any goods passing to and from the demised premises under the control of the Lessee its contractors, sub-contractors or agents;

"Competent Authority" means any supranational, national, regional, local or municipal government or regulatory authority, body, agency, court, ministry, inspectorate or department, or any official, public or statutory person or body, police, customs or port authority, in each case acting in accordance with its or their statutory or legal authority in any jurisdiction having authority over the parties to this Lease or having responsibility for the regulation or governance of any aspect of the performance of this Lease and/or the demised premises and/or the Works and/or the exercise of the

rights granted by this Lease and/or the Lessee's activities at the demised premises and/or in the exercise of the rights granted by this Lease including without limitation its use and occupation of the demised premises;

"Contamination" means the presence of any Relevant Substance and/or Hazardous Materials in on or under the demised premises or the Retained Land or any structure thereon (or emanating from in on or under the demised premises or any structure thereon or from in on or under the Retained Land or any structure thereon) and/or its disturbance and/or exposure;

"Contractual Term" means the term granted by this Lease;

"Dangerous Substances" means a substance or article described in regulation 3 of the Dangerous Substances Regulations;

"Dangerous Substances Regulations" means the Dangerous Substances in Harbour Areas Regulations 1987;

"Dock Master's jurisdiction" means the water area comprising [] acres or thereabouts shown coloured blue on Plan 1;

"Enactment" means any Act of Parliament law statute rule regulation treaty directive bye-law code of practice circular guidance note and any notice order direction or requirement given or made pursuant thereto for the time being in force;

"Environment" includes the following (whether alone or in combination):-

- (i) ecological systems and living organisms (including humans);

- (ii) air (including air within buildings or other structures and whether below or above ground);
- (iii) land and soil (including buildings and any other structures in, on or under land and soil, anything below the surface of the land and land covered with water);
and
- (iv) water (including water under or within land or within pipe or sewage systems);

"Environmental Laws" means all laws statutes byelaws regulations directions directives decisions orders notices demands or any mandatory obligation duty or liability or any sanction for non-observance or breach relating to Environmental Matters including any codes of practice circulars and guidance notes issued by United Kingdom regulatory authorities or by any supranational authority;

"Environmental Matters" means any matters affecting the Environment including without limitation:-

- (i) the release emission entry or introduction of any Relevant Substance into the air
- (ii) the release of any Relevant Substance into ground waters as defined in the Environmental Protection Act 1990 controlled waters as defined in the Water Resources Act 1991 or in to drains or sewage or waste water systems
- (iii) the release deposit storage or disposal of any Relevant Substance in or on land
- (iv) the handling treatment processing manufacture or collection of any Relevant Substance
- (v) nuisance litter noise or the abstraction of water;

"Environmental Permits" means any agreement, permission, permit, licence, consent, exemption or other approval required by the Lessee under any Applicable Laws in

order to lawfully carry out its activities at the demised premises and/or to exercise any of the rights granted by this Lease;

"Harbour Master" means the person who is for the time being the Harbour Master, Humber appointed by ABP in its capacity as conservancy authority for the River Humber;

"Hazardous Materials" means any substance in whatever form whether alone or in combination with any other substance known or reasonably believed to be harmful to human health or the Environment, whether or not for that reason it is subject to statutory controls on production, use, storage or disposal;

"Initial Liability Period" means:

- (a) in respect of the Guarantor herein named the period from and including the date of commencement of the term hereby granted until and including the date upon which the Lessee herein named makes an assignment of this Lease (or where such assignment is an excluded assignment within the meaning of the Landlord and Tenant (Covenants) Act 1995 the first subsequent assignment which is not such an excluded assignment) and "Further Liability Period" means in respect of the Guarantor herein named any further period (following the expiry of the Initial Liability Period) during which the Lessee herein named is liable under an Authorised Guarantee Agreement entered into in compliance with the requirements of this Lease; and
- (b) in respect of any guarantor for an assignee of this Lease the period from and including the date of the relevant assignment to that assignee until and including the date upon which that assignee itself makes an assignment of this Lease (or where such assignment is an excluded assignment within the

meaning of the Landlord and Tenant (Covenants) Act 1995 the first subsequent assignment which is not such an excluded assignment) and "Further Liability Period" means in respect of such guarantor any further period (following the expiry of the Initial Liability Period) during which such assignee is liable under an Authorised Guarantee Agreement entered into in compliance with the requirements of this Lease;

"Lender" means any mortgagee or chargee of the Lease who shall at the time of the grant of the mortgage or charge have been approved by ABP pursuant to the provisions of Clause 7(q)(vi);

"Lender's Appointee" means a reputable party approved by ABP for the purpose of such assignment such approval not to be unreasonably withheld or delayed subject to the same circumstances mutatis mutandis as set out in Clause 7(q)(iii) (excluding (but subject and without prejudice to the provisions of Clause 8(a)(iii)) Clause 7(q)(iii)(cc);

"Migration" means the leaching migration escape seepage or other movement through air land or water of any Relevant Substance and/or Hazardous Materials from the demised premises (including without limitation from any structure or substance in on or under the demised premises) and/or from any part or parts of the Retained Land where any part or parts of the Works are or have been carried out and/or any of the rights granted by this Lease are or have been exercised into the Environment

"Order" means the Able Marine Energy Park Development Consent Order [20] (SI[]);

"Plan 1" means the plan annexed to this lease marked Plan 1;

"Planning Acts" means the Town and Country Planning Act 1990 the Planning (Listed Buildings and Conservation Areas) Act 1990 the Listed Buildings Act 1990 the Planning (Hazardous Substances) Act 1990 the Planning (Consequential Provisions) Act 1990 and the Planning and Compensation Act 1991 the Planning Act 2008 and any other applicable town and country planning legislation;

"Policy of Insurance" means any insurance policy required to be maintained by the Lessee under clause 7(m); and "Policies of Insurance" means all such policies;

"Pollution Incident" means a discharge of any Relevant Substance and/or Hazardous Materials to the Environment in breach of any Applicable Laws;

"Quay" means [];

"Quay Area" means [the part of the demised premises shown coloured pink on Plan 1];

"Relevant Substance" means any substance or noise which causes or is capable of causing pollution of the Environment or harm to man or any other living organism supported by the Environment or any waste of a type or whose disposal handling keeping or treatment is controlled by any Environmental Laws;

"Renewed Subject Documents" means any lease agreement licence or other arrangement or deed which is a renewal of any of the Subject Documents and/or any other lease agreement licence or other arrangement or deed which relates to the

whole or part of the subject matter of any of the Subject Documents;

"Rents" means the yearly rent payable pursuant to Clause 5(a) (subject to review) and the other rents and sums payable pursuant to Clause 5(b)-(c) (inclusive) (subject to review);

"Retained Land" means all those the premises demised pursuant to the Head Lease (excluding the demised premises) and all that the property of ABP as statutory harbour authority for the Port of Immingham and the Port of Grimsby

"Rock Revetment" means [];

"Rock Revetment Area" means [the part of the demised premises shown coloured magenta on Plan 1];

"Statutory Undertaking" in relation to ABP means (unless expressly stated otherwise) ABP in its capacity as conservancy authority for the River Humber and includes all the functions of the Harbour Master;

"Structural Engineers Report" means a report by a structural engineer (a member of The Institution of Structural Engineers);

"Subject Documents" means the documents detailed in and/or otherwise referred to in the Third Schedule;

"Subjections" means the agreements covenants obligations conditions rights easements stipulations and other matters contained in the documents detailed in

and/or otherwise referred to in the Third Schedule and other matters detailed in the Third Schedule;

"Working Day" means any day from Monday to Friday (inclusive) which is not Christmas Day Good Friday or a statutory Bank Holiday;

"Works" means the Tenant's Works as defined in the Agreement for Lease the Berthing Pocket the Dock Master's jurisdiction and any premises forming part of the Able Marine Energy Park authorised by the Order;

(ii) Unless the context otherwise requires, where the words "include(s)" or "including" are used in this Lease they are deemed to have the words "without limitation" following them

(iii) Any obligation on the Lessee not to do or omit to do anything shall include an obligation not to allow that thing to be done or omitted to be done by another person

(iv) Any reference to ABP's consent or approval being required under this Lease is to a consent or approval which must be obtained before the relevant act is taken or event occurs

(v) Nothing contained in this Lease shall imply or warrant that the demised premises may lawfully be used for any of the purposes herein authorised or the rights granted hereunder may be lawfully exercised whether pursuant to the Planning Acts or otherwise howsoever and the Lessee hereby acknowledges that ABP has not given or made at any time any representation or warranty that any such uses are or will be or will remain lawful uses or the rights granted hereunder may be lawfully exercised whether pursuant to the Planning Acts or otherwise howsoever and that notwithstanding that any such uses as aforesaid may not be lawful uses or rights granted hereunder may not be lawfully exercised whether pursuant to the Planning Acts or otherwise howsoever the Lessee shall remain bound and liable to ABP in

respect of the obligations undertaken by the Lessee in this Lease without being entitled to any compensation recompense or relief of any kind whatsoever

(vi) The expression "tenant covenant" has the meaning given to it by the Landlord and Tenant (Covenants) Act 1995

(vii) A reference to a guarantor includes a reference to the Guarantor and to any other guarantor of the tenant covenants of this Lease including a guarantor who has entered into an Authorised Guarantee Agreement made in respect of this Lease

Head Lease

(i) (i) Any rights or reservations reserved to or exercisable by ABP or any right exercisable by the Lessee in common with ABP are to be construed as including where appropriate reference to the exercise of the right or reservation by the Head Landlord and all persons authorised by her or in common with all persons having a like right

(ii) Where the consent or approval of the Head Landlord is required under the terms of the Head Lease then the consent or approval of ABP is also required under the terms of this Lease

(iii) Where under the terms of this Lease the consent or approval of ABP is required and consent or approval is also required from the Head Landlord under the terms of the Head Lease ABP is entitled to withhold the giving of consent or approval until the consent of the Head Landlord has been given and nothing in this Lease is to be construed as:-

(aa) imposing on ABP any obligation not to unreasonably refuse consent or approval in so far as it requires the obtaining of such consent or approval from the Head Landlord where such consent or approval is not forthcoming provided that ABP shall use all reasonable endeavours to obtain the same

(bb) imposing on the Head Landlord any obligation not unreasonably to refuse any such consent or approval or construed as implying or indicating that any such

obligation is imposed on the Head Landlord by virtue of the terms of the Head Lease

Disputes under the Head Lease

- (j) Any issue question or matter arising out of under or relating to the Head Lease that also affects or relates to the provisions of this Lease is to be determined as provided in the Head Lease and the determination of that issue question or matter pursuant to the provisions of the Head Lease is to be binding on the Lessee as well as ABP for the purposes both of the Head Lease and this Lease

Restrictions in this Lease Prevail Over Matters Permitted by the Head Lease

- (k) Where this Lease restricts or prohibits matters which are otherwise permitted by the Head Lease with or without qualifications (including but not limited to the restrictions upon dealings in this Lease) the terms of this Lease prevail to restrict or prohibit such matters

Governing Law and Jurisdiction

- (l) (i) This Lease and any dispute or claim arising out of or in connection with it or its subject matter or formation (including non-contractual disputes or claims) shall be governed by and construed in accordance with the law of England and Wales
- (ii) ABP the Lessee and the Guarantor irrevocably agree that the courts of England and Wales shall have exclusive jurisdiction to settle any dispute or claim that arises out of or in connection with this Lease or its subject matter or formation (including non-contractual disputes or claims). Nothing in this Clause 8(l) shall limit the right of ABP to take proceedings against the Lessee and/or the Guarantor in any other court of competent jurisdiction nor shall the taking of proceedings in any one or more jurisdictions preclude the taking of proceedings in any other jurisdictions whether concurrently or not to the extent permitted by the law of such other jurisdiction
- (iii) Able Humber Ports Limited (Jersey Company Registration Number

[] irrevocably appoints [] of [] as its agent to receive on its behalf in England or Wales service of any proceedings under Clause 8(l)(ii). Such service shall be deemed completed on delivery to such agent (whether or not it is forwarded to and received by Able Humber Ports Limited (Jersey Company Registration Number [])) and shall be valid until such time as ABP has received prior written notice from Able Humber Ports Limited (Jersey Company Registration Number []) that such agent has ceased to act as agent. If for any reason such agent ceases to be able to act as agent or no longer has an address in England or Wales Able Humber Ports Limited (Jersey Company Registration Number []) shall forthwith appoint a substitute acceptable to ABP and deliver to ABP the new agent's name and address within England and Wales

Guarantee

9.(1) THE Guarantor hereby covenants with ABP to observe and perform the provisions of the Second Schedule and the obligations on the part of the Guarantor contained in the Second Schedule or otherwise arising by virtue of this Lease

(2) If an Act of Insolvency occurs in relation to a guarantor or if any guarantor (being an individual) dies or becomes incapable of managing his affairs the Lessee shall if ABP requests procure that a person of standing acceptable to ABP enters into a replacement or additional guarantee and indemnity of the tenant covenants of this Lease in the same form as that entered into by the former guarantor

(3) For so long as any guarantor remains liable to ABP the Lessee shall if ABP requests procure that that guarantor joins in any consent or approval required under this Lease and consents to any variation of the tenant covenants of this Lease

ABP's Covenant for Quiet Enjoyment

10. ABP hereby covenants with the Lessee that the Lessee paying the rents hereby reserved as and when the same ought to be paid and observing and performing all the

covenants and conditions herein contained and on the part of the Lessee to be performed and observed shall peaceably hold and enjoy the demised premises without any disturbance or interruption by ABP or any person or persons rightfully claiming through under or in trust for it But Subject to all rights of navigation affecting the same Provided Always that the carrying on by ABP of its undertaking in exercise of its powers and subject to its statutory and common law obligations shall be deemed not to be in breach of this covenant and not to be in derogation from ABP's grant

Exclusion of Security of tenure

11.(1) ABP has prior to the date of this Lease served on the Lessee a notice in the form (or substantially in the form) set out in Schedule 1 to the Regulatory Reform (Business Tenancies) (England and Wales) Order 2003 (hereinafter called "the 2003 Order") and:-

- (a) the Lessee has prior to the date of this Lease made a statutory declaration in the form (or substantially in the form) set out in paragraph 8 of Schedule 2 to the 2003 Order and
 - (b) ABP and the Lessee agree that the provisions of Sections 24 - 28 inclusive of the Landlord and Tenant Act 1954 shall be excluded in relation to the tenancy created by this Lease and
 - (c) where the statutory declaration was made by a person other than the Lessee the declarant was duly authorised by the Lessee to make the statutory declaration on the Lessee's behalf
- (2) ABP and the Guarantor confirm that:
- (a) ABP served a notice on the Guarantor as required by section 38A(3)(a) of the Landlord and Tenant Act 1954 and which applies to the tenancy to be entered into by the Guarantor pursuant to paragraph 3 of the Second Schedule before this Lease was entered into; and
 - (b) the Guarantor made a statutory declaration dated [] in accordance with the requirements of section 38A(3)(b) of the Landlord and Tenant Act

1954; and

- (c) ABP and the Guarantor agree that the provisions of Sections 24-28 inclusive of the Landlord and Tenant Act 1954 shall be excluded in relation to the tenancy to be entered into by the Guarantor pursuant to paragraph 3 of the Second Schedule; and
 - (d) where the statutory declaration was made by a person other than the Guarantor the declarant was duly authorised by the Guarantor to make the statutory declaration on the Guarantor's behalf
- (3) ABP and the Guarantor confirm that:
- (a) ABP served a notice on the Guarantor as required by section 38A(3)(a) of the Landlord and Tenant Act 1954 and which applies to the tenancy to be entered into by the Guarantor pursuant to paragraph 4 of the Second Schedule before this Lease was entered into; and
 - (b) the Guarantor made a statutory declaration dated [] in accordance with the requirements of section 38A(3)(b) of the Landlord and Tenant Act 1954; and
 - (c) ABP and the Guarantor agree that the provisions of Sections 24-28 inclusive of the Landlord and Tenant Act 1954 shall be excluded in relation to the tenancy to be entered into by the Guarantor pursuant to paragraph 4 of the Second Schedule; and
 - (d) where the statutory declaration was made by a person other than the Guarantor the declarant was duly authorised by the Guarantor to make the statutory declaration on the Guarantor's behalf

Notices

12. ANY notice in writing that under the terms of these presents is to be given to ABP shall only be deemed effectively served if delivered by hand or sent by recorded delivery post addressed to ABP's Regional Property Manager – Hull and Goole at Riverside House King George Dock Hull HU9 5PS or upon such other person as ABP may from time to time appoint for that purpose And any notice in writing that is to be given by ABP to the Lessee

shall be deemed effectively served if delivered by hand or sent by recorded delivery post addressed to the Lessee at the demised premises or its last known place of business or abode in the United Kingdom or (if the Lessee shall be a company) to its Secretary at its registered office as the case may require

IN WITNESS whereof the parties hereto have duly executed this document as a Deed and delivered it upon its dating

THE FIRST SCHEDULE hereinbefore referred to:-

THIS GUARANTEE is made the _____ day of _____ Two thousand {and _____ }

BETWEEN:-

(1) { _____ } {of} {whose registered office is at} { _____ } {(Company Registration Number { _____ })} ("the Guarantor") and

(2) {ASSOCIATED BRITISH PORTS} of {{Aldwych House 71-91 Aldwych London WC2B 4HN} ("{ABP}")

WHEREAS:-

(1) Lease

By a lease ("the Lease") made the { _____ } day of { _____ } Two thousand {and _____ } between (1) ABP and (2) [_____] the premises { _____ }

{ _____ } ("the demised premises") were demised for a term of { _____ } years from the { _____ } day of { _____ } Two thousand {and _____ } ("the Contractual Term") subject to the payment of the rents reserved by and the observance and performance of the covenants on the tenant's part and the conditions contained in the Lease

(2) Consent to Assignment

The Lease contains provisions prohibiting the tenant from assigning the demised premises without the consent of the landlord and {ABP} has agreed at the request of the Guarantor to grant such consent upon the terms hereinafter set out to enable the Guarantor to assign the

demised premises to { } ("the Assignee")

(3) Agreement to enter into Guarantee

The Guarantor has agreed with {ABP} to enter into this deed of guarantee as a condition of {ABP}'s permitting the assignment of the Lease to the Assignee and as required by the Lease

NOW THIS DEED WITNESSES that:-

1. The Guarantor covenants with {ABP} and without the need for any express assignment with all its successors in title that:-

(1) from the date of the assignment of the demised premises to the Assignee and until such time as the Assignee shall be released from liability therefor by an assignment of the demised premises in accordance with the terms of the Lease the Assignee shall punctually pay the rents and observe and perform the covenants and other terms of the Lease and if the Assignee shall make any default in payment of the rents or in observing or performing any of the covenants or other terms of the Lease the Guarantor will pay the rents and observe and perform the covenants or terms in respect of which the Assignee shall be in default and make good to {ABP} on demand and indemnify {ABP} against all losses damages costs and expenses arising or incurred by {ABP} as a result of such non-payment non-performance or non-observance notwithstanding:-

(a) any time or indulgence granted by {ABP} to the Assignee or any neglect or forbearance of {ABP} in enforcing the payment of the rents or the observance or performance of the covenants or other terms of the Lease or any refusal by {ABP} to accept rents tendered by or on behalf of the Assignee at a time when {ABP} was entitled (or would after the service of a notice under the Law of Property Act 1925 Section 146 have been entitled) to re-enter the demised premises

(b) that the terms of the Lease may have been varied by agreement between the parties

(c) that the Assignee shall have surrendered part of the demised premises in which event the liability of the Guarantor under the Lease shall continue in respect of the part of the demised premises not so surrendered after making any necessary apportionments

under the Law of Property Act 1925 Section 140 and

(d) any other act or thing by which but for this provision the Guarantor would have been released

(2) it will pay to {ABP} on demand and indemnify {ABP} against all costs charges fees disbursements and expenses including those of professional advisers and agents and including in each case VAT incurred by {ABP} in connection with this deed of guarantee

2. The Guarantor covenants with {ABP} and without the need for any express assignment with all its successors in title that if at any time during the Liability Period the Lease is disclaimed under any Enactment or other power or the Lease shall be forfeited under the provisions of the Lease or the Assignee shall cease to exist the Guarantor will take from {ABP} (but only if so required by {ABP} by written notice to the Guarantor within six months after such disclaimer or forfeiture or ceasing to exist (as the case may be and as to which time shall be of the essence)) a grant of a new lease of the demised premises for the residue of the Contractual Term unexpired at the date of such disclaimer or forfeiture or ceasing to exist (as the case may be) at rents the same as are then reserved by the Lease and subject to the like covenants conditions and provisos (including the provisions for rent review) as are contained in the Lease (mutatis mutandis) and the Guarantor will on the grant of such new lease execute and deliver to {ABP} a counterpart thereof and will pay the reasonable and proper legal costs and disbursements of {ABP} in connection with the preparation and completion of such new lease and the counterpart thereof

3. The Guarantor covenants with {ABP} and without the need for any express assignment with all its successors in title that if {ABP} shall not require the Guarantor to take a new lease of the demised premises pursuant to Clause 2 of this deed of guarantee the Guarantor shall nevertheless within fourteen days of written demand pay to {ABP} a sum equal to the rents and all other outgoings that would have been payable under the Lease but for the disclaimer or forfeiture or ceasing to exist as aforesaid in respect of the period from and including the date of the disclaimer or forfeiture or ceasing to exist (as the case may be) until the expiration

of six months therefrom or until the demised premises shall have been re-let by {ABP} (whichever shall first occur)

4. The Guarantor waives any right to participate in any review of rents under the Lease
5. All payments to be made by the Guarantor under the provisions of this deed of guarantee shall be made without deduction set-off or counterclaim
6. These covenants on the part of the Guarantor are given:-
 - (a) as a primary obligation; and
 - (b) with the intent that they shall enure for the benefit of all persons who are from time to time entitled to the reversion immediately expectant on the determination of the term created by the Lease
7. Where there are two or more persons included at any time in the expression "the Guarantor" covenants made by the Guarantor shall be deemed to be made by such persons jointly and severally
- 8.(1) Unless the right of enforcement is expressly provided it is not intended that any third party is to have the right to enforce any of the terms of this deed of guarantee pursuant to the Contracts (Rights of Third Parties) Act 1999 but this provision does not affect any rights which are available apart from that Act
 - (2) The parties to this deed of guarantee may determine or vary this deed of guarantee without the consent of any third party to whom an express right to enforce any of its terms may have been provided
9. In this deed of guarantee the terms defined in this Clause shall for all the purposes hereof have the meanings specified unless the context otherwise requires:
 - (a) "Enactment" means any Act of Parliament law statute rule regulation treaty directive bye-law code of practice circular guidance note and any notice order direction or requirement given or made pursuant thereto for the time being in force
 - (b) "Liability Period" means the period from and including the date of the assignment of the demised premises to the Assignee until such time as the Assignee shall be released

from liability therefor by an assignment of the demised premises in accordance with the terms of the Lease

IN WITNESS whereof the parties hereto have duly executed this document as a deed and delivered it upon its dating

EXECUTED (but not delivered until the date hereof) AS A DEED by {

affixing its Common Seal

hereunto in the presence of:-

Director

Secretary

SIGNED (but not delivered until the date hereof) AS A DEED by the said {

in the presence of:-

EXECUTED (but not delivered until the date hereof) AS A DEED by {Associated British Ports}

affixing its Common Seal

hereunto in the presence of:-

{Assistant Secretary}

(END OF SCHEDULE)

THE SECOND SCHEDULE hereinbefore referred to:-

(Covenants by Guarantor)

1. The Guarantor hereby covenants with ABP:
 - 1.1 during the Initial Liability Period the Lessee will duly pay the Rents with interest thereon at the prescribed rate (if applicable) on the days and in the manner hereinbefore appointed for payment and will duly perform and observe all the covenants and conditions on the part of the Lessee contained in this Lease and
 - 1.2 during the Further Liability Period the Lessee will duly perform and observe the covenants and conditions on the part of the Lessee contained in the Authorised Guarantee Agreement made by itand in either circumstance in case of default in such payment or in the performance or observance of any of the covenants and conditions as aforesaid the Guarantor will indemnify and will pay and make good to ABP on written demand all losses damages costs and expenses thereby arising or incurred by ABP
2. It is hereby agreed and declared that (subject to the provisions of the Landlord and Tenant (Covenants) Act 1995) any neglect or forbearance of ABP in endeavouring to obtain payment of the Rents when the same become due and payable or to enforce performance or observance of any of the covenants and conditions as referred to in paragraph 1 of this Schedule and any time or other concessions which may be given by ABP to the Lessee or the taking or holding of or varying realising releasing or not enforcing any other security for the liabilities of the Lessee or any variation in the terms of this Lease (including any consent given hereunder or any reviews of any of the Rents) or the transfer of ABP's reversion or the assignment of this Lease or the invalidity or unenforceability of the obligations of the Lessee or any legal limitation or incapacity relating to the Lessee or the release of any one of the

persons acting as the Guarantor (if more than one) from liability under this Lease or any other act omission matter or thing whatsoever whereby (but for this provision) the Guarantor would be released or exonerated either wholly or in part from the covenants and indemnity in this Schedule (other than a release by deed given by ABP) shall not release or exonerate or in any way affect the liability of the Guarantor under the covenants and indemnity in this Schedule

3. If at any time during the Initial Liability Period this Lease is disclaimed under any Enactment or other power or the Lease shall be forfeited or the Lessee shall cease to exist the Guarantor will take from ABP (but only if so required by ABP by written notice to the Guarantor within six months after such disclaimer or forfeiture or ceasing to exist (as the case may be)) a grant of a new lease of the demised premises for the residue of the Contractual Term unexpired at the date of such disclaimer or forfeiture or ceasing to exist (as the case may be) at Rents the same as all those which are then reserved by this Lease and subject to the like covenants conditions and provisos (including the provisions for rent review) as are contained in this Lease mutatis mutandis and the Guarantor will on the grant of such new lease execute and deliver to ABP a counterpart thereof and will pay ABP's reasonable and proper legal costs and disbursements in connection with the preparation and completion of such new lease and the counterpart thereof

4. If during the Further Liability Period this Lease is disclaimed under any Enactment or other power or the Lease is forfeited or the lessee in whom this Lease is then vested shall cease to exist and if the Lessee shall then be required by ABP pursuant to the Authorised Guarantee Agreement made by it to take from ABP a new lease of the demised premises in accordance with that Authorised Guarantee Agreement:-

4.1 the Guarantor will on the grant of such new lease to the Lessee execute and deliver to ABP a deed of covenant and guarantee in respect of the obligations of the Lessee under such new lease or arising therefrom such deed of covenant and guarantee to contain covenants and other provisions in the form of those contained in this

Schedule mutatis mutandis or

- 4.2 then should the Lessee fail to complete such new lease of the demised premises in accordance with the Authorised Guarantee Agreement made by it the Guarantor will take from ABP (but only if so required by ABP by written notice to the Guarantor within three months after such failure by the Lessee) a grant of a new lease of the demised premises for the residue of the Contractual Term unexpired at the date of such disclaimer or forfeiture or ceasing to exist (as the case may be) at Rents the same as all those which are then reserved by this Lease and subject to the like covenants conditions and provisos (including the provisions for rent review) as are contained in this Lease mutatis mutandis and the Guarantor will on the grant of such new lease execute and deliver to ABP a counterpart thereof
- and in either case the Guarantor will pay ABP's reasonable and proper legal costs and disbursements in connection with the preparation and completion of such deed of covenant and guarantee or new lease (as the case may be) and the counterpart thereof
5. If ABP shall not require the Guarantor to take a new lease of the demised premises pursuant to paragraphs 3 or 4.2 of this Schedule the Guarantor shall nevertheless within 21 days of written demand pay to ABP a sum equal to the Rents and all other outgoings that would have been payable under this Lease but for the disclaimer or forfeiture or ceasing to exist as aforesaid in respect of the period from and including the date of the disclaimer or forfeiture or ceasing to exist (as the case may be) until the expiration of six months therefrom or until the date on which the demised premises are re-let (if earlier)
6. The Guarantor waives any right to participate in any review of any of the Rents under this Lease
7. ABP shall be entitled to enforce this guarantee and the covenants on the part of the Guarantor without first making demand of or taking any proceedings against the Lessee
8. All payments to be made by the Guarantor under this Schedule shall be made

without deduction set-off or counterclaim

9. These covenants on the part of the Guarantor are given:-

9.1 as a primary obligation and as principal debtor and

9.2 with the intent that they shall be for the benefit of ABP and its successors in title without the need for any express assignment

10. Where there are two or more persons included at any time in the expression "the Guarantor" covenants made by the Guarantor shall be deemed to be made by such persons jointly and severally

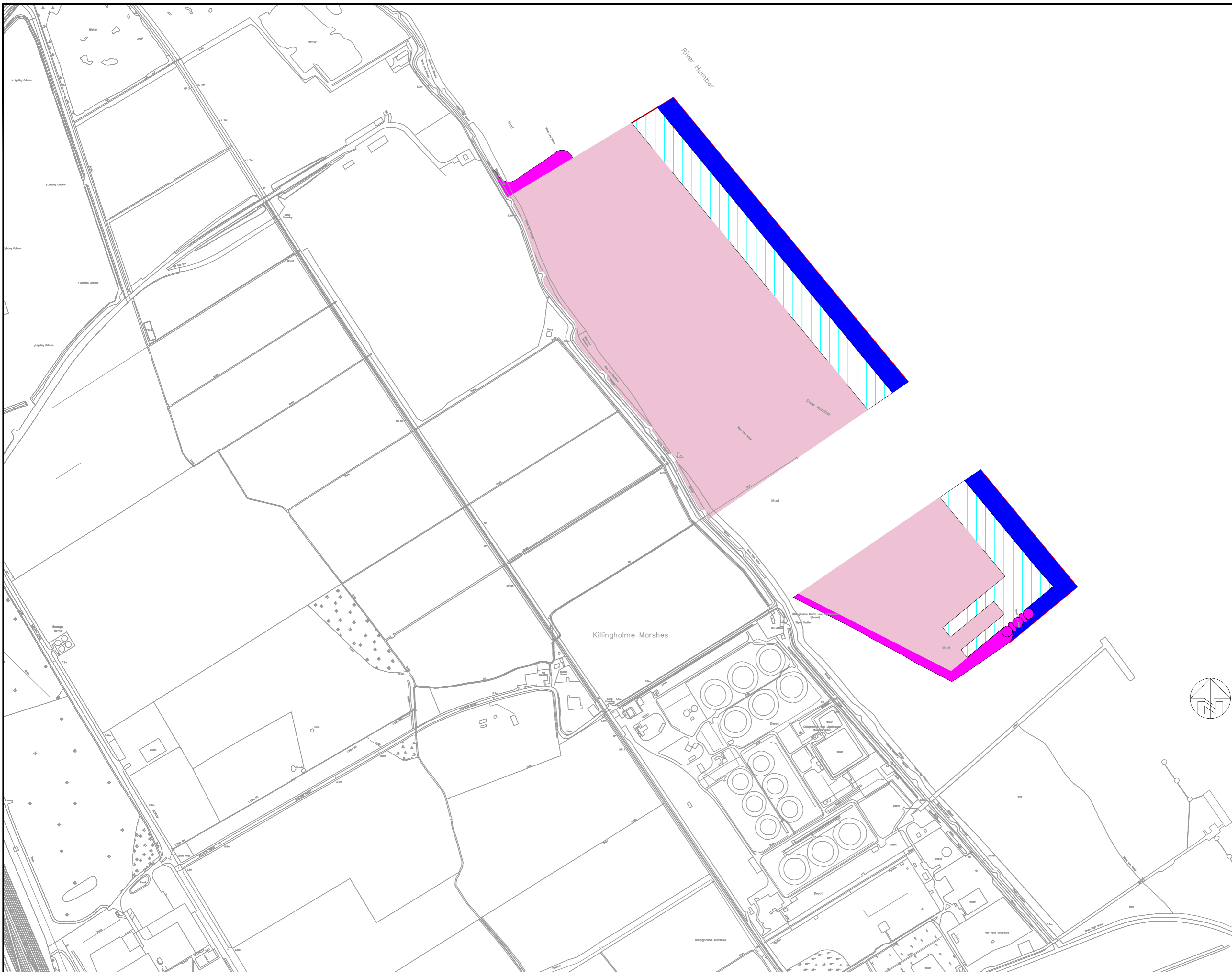
THE THIRD SCHEDULE hereinbefore referred to:-

1. The Head Lease

[]

THE FOURTH SCHEDULE hereinbefore referred to:-

[]



Revision	Date

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