SQUIRE SANDERS

PLANNING ACT 2008

AND

THE INFRASTRUCTURE PLANNING (EXAMINATION PROCEDURE) RULES 2010

THE ABLE MARINE ENERGY PARK DEVELOPMENT CONSENT ORDER 2012

(PINS REFERENCE NUMBER: TR030001)

SUMMARY WRITTEN REPRESENTATIONS OF E.ON UK PLC

(UNIQUE REFERENCE NUMBER: 10015527)

June 2012

1 INTRODUCTION AND BACKGROUND

1.1 These written representations are submitted by E.ON UK Plc ("E.ON") pursuant to Regulation 10 of the Infrastructure Planning (Examination Procedure) Rules 2010 in respect of The Able Marine Energy Park Development Consent Order 2012 (the "DCO") promoted by Able Humber Ports Ltd ("the undertaker").

1.2 E.ON is the second largest generator of electricity in the UK, with over 10GW (gigawatts) of existing capacity, producing electricity from gas, coal and renewable energy sources. E.ON is also a major retailer of electricity and gas and has over seven million customer accounts nationwide.

1.3 E.ON is the owner and occupier of Killingholme Power Station, an operational power station providing up to 900 MW (megawatts) of electricity on to the National Grid electricity transmission system. The power station represents a strategic asset within the overall UK electricity system, and is a nationally significant infrastructure project in its own right. It is also located adjacent to the site of the proposed Able Marine Energy Park ("AMEP"), and it is essential that its continued safe operation is not jeopardised by AMEP's proposals.

1.4 E.ON is a statutory undertaker as a consequence of its interests at Killingholme for the purposes of Sections 127, 128 and 138 of the Planning Act 2008.

1.5 The key issues which are of concern to E.ON are:

(a) Land acquisition and the extent of the proposed easement corridor

(b) The impact of construction activities on the operation of the power station

(c) Sedimentation and its effect on the operation of E.ON's intake and outfall pipelines

(d) The proposed dredging strategy.

1.6 E.ON Climate & Renewables UK Humber Wind Ltd (a subsidiary of E.ON Climate & Renewables UK Ltd) has written separately to the Planning Inspectorate regarding its concerns with the AMEP proposals in the context of the Humber Gateway offshore wind farm.

1.7 E.ON is supportive, in principle, of the AMEP proposal and has had some, albeit limited, discussions with the undertaker to seek to address its concerns.

2 THE KILLINGHOLME POWER STATION AND ITS COOLING WATER SYSTEM

2.1 Killingholme Power Station is a Combined Cycle Gas Turbine (CCGT) power station. Electricity is generated at the power station in two ways which are explained in full in the written representations.

2.2 The CW intake and outfall pipelines are constructed of glass reinforced plastic ("GRP") and are generally buried in the ground at an original depth of up to 2m. They are situated parallel to each other with a separation of approximately 0.5m and represent an 'umbilical cord' in terms of the cooling water system, essential in order for Killingholme to be able to operate efficiently as a CCGT power station.

2.3 The pipelines are potentially vulnerable to locally disturbing effects e.g. piling or other construction impacts, or by movement of heavy vehicles across unprotected ground above them.

2.4 Crucially, the whole cooling system was designed taking into account the specific flow characteristics and water quality within this area of the Humber Estuary. Changes to these parameters have the potential to significantly affect the cooling system, and the ability of the power station to function. To date, there have been no problems with sedimentation, erosion, suspended solids or siltation at the CW intake or outfall at Killingholme affecting the efficient operation of the power station.

3 THE STATUTORY UNDERTAKER'S LAND

3.1 E.ON UK plc granted a long lease dated 9 July to Able UK Limited and on the same date a Deed of Easement was entered into by the parties.

3.2 The easement protects the cooling water intake and outfall pipes which serve the power station.

3.3 E.ON objects to the compulsory acquisition of its operational land associated with the CW pipeline and pumphouse.

4 COOLING WATER PIPELINE – ACCESS AND EASEMENT

4.1 The CW pipeline easement corridor contains a number of components which lie side by side within it including intake and outfall pipes, electrical cable and potable water supply.

4.2 It is an essential requirement for E.ON to be able to maintain, repair or replace the existing CW intake and outfall pipelines and other services in a safe and timely

manner to maintain the ability to operate the power station as a strategic national asset.

CW pipeline easement width

4.3 The current easement varies in width from approximately 130m at its widest point to 50m at its narrowest.

4.4 E.ON only became aware of the undertaker's intention to acquire land which would restrict the CW pipeline easement at a meeting on 10 November 2011. Initially a 6m wide replacement easement was proposed by the undertaker.

4.5 In February 2012, E.ON commissioned an internal desk based study to consider an appropriate minimum easement width which might be technically achievable on the basis of the information available at that time. This recommended a 23m minimum width for the easement corridor.

4.6 On 17th May 2012 the undertaker proposed a 12.5m easement corridor albeit with no supporting explanation.

4.7 E.ON has commissioned Capita Symonds to consider in more detail the adequacy of the 12.5m easement proposed by the undertaker and, in the event that it was insufficient, to propose and justify a safe, workable alternative. In carrying out the work, Capita Symonds considered three scenarios

4.8 E.ON believes that the easement width should not be set below 32.5m following receipt of the Capita Symonds Report.

CW pipeline deed of agreement

4.9 The undertaker is seeking power under Articles 29, 33 and 41 to acquire land and rights over which an easement runs which carries the intake and outfall pipes connecting the Killingholme Power Station to the River Humber. Without these pipes, the power station cannot function as a CCGT power station thereby causing serious detriment to the carrying on of E.ON's undertaking.

4.10 The undertaker has indicated a willingness to grant E.ON a new easement but the parties are in dispute as to the width of the easement and the terms upon which it can operate.

4.11 The DCO can only authorise the acquisition of land and rights and the creation of new rights for the undertaker, it cannot create new rights for E.ON. These must be negotiated with the undertaker by E.ON.

4.12 It is E.ON's position that the compulsory acquisition of all the land sought in the DCO would be to the serious detriment of the carrying out of its undertaking, namely the operation of Killingholme Power Station. Furthermore, this cannot be remedied by providing land elsewhere and E.ON must be allowed to retain its pipes in situ.

4.13 Consent should be withheld under Section 138 until agreement has been reached between E.ON and the undertaker for the retention of the pipes. Any general powers which may be granted by the DCO should not allow the undertaker to subsequently override any such agreement.

4.14 As a statutory undertaker, E.ON's land and equipment is protected by Sections 127 and 138 of the Planning Act 2008 and E.ON continues to maintain its objection to the AMEP proposals as indicated.

4.15 The undertaker is proposing to put in place a new deed of easement. E.ON maintains that the provisions within the current deed of agreement should be maintained, with changes only to reflect any change in the easement width.

5 CONCERNS DURING CONSTRUCTION AND OPERATION (ONSHORE)

5.1 E.ON's written representations focus on:

- The proximity of proposed buildings and structures to the E.ON pipeline;
- Crossing points (to include safeguarding during construction);
- The diversion of the Anglian sewage outfall pipe.

6 CONCERNS DURING CONSTRUCTION AND OPERATION (OFFSHORE)

6.1 The scope for interference with the operation of the power station as a result of offshore activities is most likely to be as a result of the following:

- damage occurring to E.ON's critical offshore infrastructure by vessels or by offshore construction activities
- short term changes in water quality around E.ON's intake and outfall, particularly increases in suspended sedimentation concentrations (SSC) as a result of dredging operations

- changes in flow characteristics due to the imposition of the quay within the estuary, causing longer term impacts at the intake and outfall.

6.2 The written representations set out E.ON's specific concerns under a number of headings:

- Dredging operations (method including safeguarding, and likely effects);
- Increases in SSC affecting power station performance;
- Likelihood of significant deposition at outfall;
- Potential for seabed erosion and longer term deposition at CW intake; and
- Thermal effects of Anglian sewage water outfall on CW intake.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 The undertaker is proposing to construct the AMEP on land near E.ON's existing CCGT Power Station at Killingholme and to extinguish the easement for the cooling water pipelines and other services which are essential for the operation of the power station.

7.2 A reduced easement of 12.5m has been offered with no justification given for the 12.5m width. 12.5 m is totally insufficient and a study by Capita Symonds demonstrates that a 32.5m easement should be the minimum required to ensure safe working practices.

7.3 E.ON objects strongly to the proposed acquisition of its operational land associated with the CW pipeline and pumphouse.

7.4 If compulsory powers are granted without an appropriate easement in place then E.ON's position is that this would be to the serious detriment of the carrying on of its undertaking in accordance with s.127 Planning Act 2008 and consent should also be withheld under s.138 until an agreement has been reached between the parties.

7.5 There is also real potential for E.ON's power station to be adversely affected by the undertaker's development during construction and operation and E.ON has, therefore, requested protective provisions.

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CONTENTS

Appendices submitted separately:

1 INTRODUCTION AND BACKGROUND

1.1 These written representations are submitted by E.ON UK Plc ("E.ON") pursuant to Regulation 10 of the Infrastructure Planning (Examination Procedure) Rules 2010 in respect of The Able Marine Energy Park Development Consent Order 2012 (the "DCO") promoted by Able Humber Ports Ltd ("the undertaker"). They should be read alongside the relevant representations dated 30 March 2012 ("relevant representations") which are enclosed for ease of reference at **Appendix 1**.

1.2 E.ON is the second largest generator of electricity in the UK, with over 10GW (gigawatts) of existing capacity, producing electricity from gas, coal and renewable energy sources. E.ON is also a major retailer of electricity and gas and has over seven million customer accounts nationwide.

1.3 E.ON is the owner and occupier of Killingholme Power Station, an operational power station providing up to 900 MW (megawatts) of electricity on to the National Grid electricity transmission system. The power station represents a strategic asset within the overall UK electricity system, and is a nationally significant infrastructure project in its own right. It is also located adjacent to the site of the proposed Able Marine Energy Park ("AMEP"), and it is essential that its continued safe operation is not jeopardised by AMEP's proposals.

1.4 By virtue of the Electricity Act 1989 Section 112(1) and Schedule 16 paragraph 2(2), E.ON as a licence holder is deemed to be a statutory undertaker for the purposes of the Acquisition of Land Act 1981.

1.5 By virtue of Section 127(8) Planning Act 2008 a statutory undertaker includes undertakers deemed by Section 8 of the Acquisition of Land Act 1981 to be a statutory undertaker for the purposes of that Act by virtue of another enactment.

1.6 E.ON is therefore a statutory undertaker as a consequence of its interests at Killingholme for the purposes of Sections 127, 128 and 138 of the Planning Act 2008.

1.7 E.ON's relevant representations included an objection on the basis of outstanding information being required to address concerns regarding the effect that the proposed AMEP development could have on the operation of the power station. The key issues which are of concern to E.ON and which are expanded upon in these written representations are:

(a) Land acquisition and the extent of the proposed easement corridor

(b) The impact of construction activities on the operation of the power station

(c) Sedimentation and its effect on the operation of E.ON's intake and outfall pipelines

(d) The proposed dredging strategy.

1.8 E.ON, through its Climate and Renewables business also develops, constructs and operates wind farms, including the Humber Gateway Offshore Wind Farm which is currently under construction. The undertaker's plans could have a negative effect on the laying and subsequent maintenance of onshore cables across an area of land which the undertaker proposes as temporary compensation land at Old Little Humber Farm. E.ON Climate & Renewables UK Humber Wind Ltd (a subsidiary of E.ON Climate & Renewables UK Ltd) has written separately to the Planning Inspectorate regarding this.

1.9 E.ON is supportive, in principle, of the AMEP proposal and has had some, albeit limited, discussions with the undertaker, and has assisted them where possible in the development of their plans. For example, the agreed notes of the most recent meeting with the undertaker held on Tuesday 19th June (**Appendix 2**) show that E.ON has agreed to cooperate on the translocation of newts to an area of land near Chase Hill Wood and for this to be incorporated into E.ON's existing environmental management plan for the area.

2 THE KILLINGHOLME POWER STATION AND ITS COOLING WATER SYSTEM

2.1 Killingholme Power Station is a Combined Cycle Gas Turbine (CCGT) power station. Electricity is generated in two ways. Firstly, gas is combusted in a gas turbine which provides motive power to drive an electrical generator to produce electricity. Secondly, the energy in the exhaust gases from the gas turbine is recovered and used to create steam for a steam turbine which then provides the motive power for a further electrical generator. When generating in this configuration of two cycles (gas turbine and steam cycle) the result is a very efficient means of producing electricity from gas.

2.2 Steam which has passed through the steam turbine must be condensed back to water before being passed back to the boiler. At Killingholme, this is achieved by means of a condenser (a large heat exchange vessel containing a very large number of horizontal tubes) through which cooling water ("CW") extracted from the Humber Estuary is passed. In condensing the steam the CW also picks up energy which leads to an increase in temperature.

2.3 The warmed CW must in turn be cooled, and Killingholme uses an indirect means of cooling involving cooling towers on site. To function, the CW system requires an additional continuous supply of cold water from the Humber Estuary to make-up the system, and the ability to discharge water back to the Humber Estuary. This gives rise to the need for the intake and outfall pipelines between the power station and the Humber Estuary.

2.4 The CW intake protrudes 70m beyond the outfall position within the estuary in order to prevent recirculation of warm water from the outfall back into the intake.

2.5 The CW intake and outfall pipelines are constructed of glass reinforced plastic ("GRP") and are generally buried in the ground at an original depth of up to 2m. They are situated parallel to each other with a separation of approximately 0.5m and represent an 'umbilical cord' in terms of the cooling water system, essential in order for Killingholme to be able to operate efficiently as a CCGT power station.

2.6 Being GRP, the pipelines are relatively flexible, but this creates issues where they are jointed since the joints are more rigid. As such, the pipeline is potentially vulnerable to local disturbance which could be caused by piling or other construction activities or by movement of heavy vehicles across them unless they are protected by suitable crossing points.

2.7 Crucially, the whole cooling system was designed taking into account the specific flow characteristics and water quality within this area of the Humber Estuary. Changes to these parameters resulting from the construction and operation of the AMEP proposal have the potential to significantly affect the cooling system, and the ability of the power station to function. To date, there have been no problems with sedimentation, erosion, suspended solids or siltation at the CW intake or outfall at Killingholme affecting the efficient operation of the power station.

3 THE STATUTORY UNDERTAKER'S LAND

3.1 E.ON UK plc granted a long lease dated 9th July 2004 to Able UK Limited ("the Lease"). A copy is included at Appendix 3.1

3.2 The freehold of this land was retained to give E.ON flexibility in dealing with future development of the power station and in order to provide access to the Humber for new pipelines for intake or outfall purposes including, for example, carbon capture.

3.3 In the Lease there are provisions for E.ON for access purposes and for the parking of vehicles adjacent to the Pump House and E.ON would wish to retain all of this land identified as plots 04017, 04018, 04021 in The Book of Reference.

3.4 E.ON UK plc also entered into a Deed of Grant of Easement on 9th July 2004 with Able UK. A copy of the easement is at Appendix 3.2.

3.5 The easement is for the protection of the cooling water intake and outfall pipes which serve the power station. It contains necessary provisions for access, maintenance, repair and protection of the operational asset and constitutes operational land needed to allow E.ON UK to carry out its statutory undertakings. The easement covers plots 04023, 04024, 04027, 04028, 04029, 05003 to 05016 inc., 05019, 05026, 05027, 05028, 05036, 05037, 05038, 05044 and 06006 in The Book of Reference, and E.ON objects to the compulsory acquisition of these plots.

3.6 E.ON also objects to the compulsory acquisition of land associated with plots 05039, 05040, 05041 which is land adjacent to our pumphouse and considered operational land in respect of any possible future maintenance requirements such as the need to replace the CW pumps.

3.7 At Appendix 3.3 there is a schedule reviewing all of the relevant plots contained in The Book of Reference.

4 COOLING WATER PIPELINE – ACCESS AND EASEMENT

4.1 The CW pipeline easement corridor (referred to in Section 3 above) contains a number of components which lie side by side within it. These include:

- a 0.7 m diameter GRP CW intake pipe
- a 0.9 m diameter GRP CW outfall pipe
- a 6.6 kilovolt (kV) buried cable which provides electrical power to the CW pump house
- a potable water supply and a number of cables associated with equipment in the pump house and monitoring equipment located along the pipeline.

4.2 It is an essential requirement for E.ON to be able to maintain, repair or replace the existing CW intake and outfall pipelines and other services in a safe and timely manner to maintain the ability to operate the power station as a strategic national asset.

CW pipeline easement width

4.3 The current easement, which forms **Appendix 3** varies in width from approximately 130m at its widest point to 50m at its narrowest, based upon the original 'red line area' when the power station was originally consented under Section 36 of the Electricity Act 1989.

4.4 E.ON agrees that there would be scope to reduce this easement, provided that it permits access to the pipeline and other services to allow for safe maintenance, repair or replacement of these assets which are essential to the operation of the power station.

4.5 E.ON only became aware of the undertaker's intention to acquire land which would restrict the CW pipeline easement at a meeting on 10 November 2011, around one month before the application was submitted.

4.6 Initially, the undertaker proposed an easement width of six metres, without any justification as to how practical this might be for E.ON. The six metre easement was rejected by E.ON at a meeting held on 23 April 2012. The note of this meeting is included at **Appendix 4**.

4.7 In February 2012, E.ON commissioned an internal desk based study to consider an appropriate minimum easement width which might be technically achievable on the basis of the information available at that time. This recommended a 23m minimum width for the easement corridor. This was referred to in E.ON's relevant representations.

4.8 On 17th May 2012, the undertaker provided two plans in an e-mail to E.ON : AME-03033 B 'E.ON pipeline typical section' and AME 08093 C 'E.ON AMEP Easement corridor'. This e-mail and drawings proposed a 12.5m easement corridor, again without any explanation as to how workable this might be for E.ON in practice. These drawings are included within **Appendix 5**.

4.9 Until Friday 22 June 2012, the undertaker had failed to provide E.ON with any justification of how a 12.5m easement would work. On that date, drawing AME-03033 Rev C was received which superimposed a schematic of a lorry and a JCB on to the aforementioned E.ON pipeline typical section drawing. This drawing is included within **Appendix 6**. No further information was included to explain how this was arrived at and how practical and safe this working arrangement might be, and E.ON's view was that it appeared to represent an unworkable and unsafe practice.

4.10 E.ON then commissioned Capita Symonds, a leading consultancy in managing pipeline construction projects, to consider in more detail the adequacy of the 12.5m easement proposed by the undertaker and, in the event that it was insufficient, to propose and justify a safe, workable alternative. In carrying out the work, Capita Symonds considered three scenarios:

- Scenario (a) assumed only non-intrusive or visual inspections for which the proposed 12.5m width would be more than sufficient;
- Scenarios (b) and (c) considered localised repairs and full length or partial replacement of all of the buried services.

4.11 Capita Symonds notes that a 12.5m easement would be suitable for non-intrusive or visual inspections without the need to uncover the pipes under Scenario (a), but does not agree that this would be a suitable width for maintenance or repair activity as set out in scenarios (b) and (c).

4.12 The Capita Symonds report, which is included within **Appendix 7**, generally concurs with E.ON's own recommendations of a 23m minimum easement width in so far as a box trenching excavation might be used, but recommends that this is restricted to short, localised repairs. Importantly, it goes on to consider in more detail the health and safety aspects of a more significant excavation, taking on board the need to consider ways of reducing or eliminating risk from the outset, as required under the Construction (Design and Management) Regulations (CDM). It concludes that an open excavation with sloping sides (battered excavation) would be preferable in that it entails less risks to personnel.

4.13 Capita Symonds also note that for a full replacement scenario, the battered trench operation would be quicker, and this is an important consideration bearing in mind the need to maintain the availability of the power station in its capacity as a strategic asset within the electricity supply network.

4.14 E.ON takes its health and safety considerations extremely seriously, and would not wish to compromise on safety in setting a minimum width for an easement. As such, whilst recognising that further work would be helpful to establish with greater certainty a suitable width, and noting that the undertaker has to date failed to provide any meaningful information to assist in this matter, E.ON believes that the easement width should not be set below 32.5m along the route of the pipeline.

4.15 In relation to any pinch points along the route that cannot be relieved through adjustments to the undertaker's plans, E.ON would be open to further discussion.

CW pipeline deed of agreement

4.16 The undertaker is seeking power under Articles 29, 33 and 41 to acquire land and rights over which an easement runs which carries the intake and outfall pipes connecting the Killingholme Power Station to the River Humber. Without these pipes, the power station cannot function as a CCGT power station thereby causing serious detriment to the carrying on of E.ON's undertaking. The undertaker has indicated a willingness to grant E.ON a new easement but the parties are in dispute as to the width of the easement and the terms upon which it can operate as is noted above.

4.17 The DCO can only authorise the acquisition of land and rights and the creation of new rights for the undertaker, it cannot create new rights for E.ON. These must be negotiated with the undertaker by E.ON. To date no agreement has been reached.

4.18 Accordingly, it is E.ON's position that the compulsory acquisition of all the land sought in the DCO would be to the serious detriment of the carrying out of its undertaking, namely the operation of Killingholme Power Station. Furthermore, this cannot be remedied by providing land elsewhere and E.ON must be allowed to retain its pipes in situ.

4.19 As currently drafted, the powers of compulsory acquisition under Articles 29, 33 and 41 are disproportionate in that they authorise powers to acquire the land upon which the easement is situated and power to remove the pipelines. These powers should not be granted and consents should be withheld under Section 138 until agreement has been reached between E.ON and the undertaker for the retention of the pipes. Any general powers which may be granted by the DCO should not allow the undertaker to subsequently override any such agreement.

4.20 As a statutory undertaker, E.ON's land and equipment is protected by Sections 127 and 138 of the Planning Act 2008. Although discussions have taken place between E.ON and the undertaker no agreement has been reached between the parties and E.ON, as a statutory undertaker, continues to maintain its objection along the lines set out within these written representations.

4.21 The undertaker is proposing to put in place a new deed of agreement with the terms of a revised easement. In this respect, the undertaker has proposed a form of agreement to E.ON, and E.ON is working with the undertaker to try and reach agreement on an acceptable form of wording. However, E.ON believes that the

undertaker is seeking to diminish other rights and benefits which E.ON currently benefits from beyond the width of the easement such as the right for the undertaker to relocate the easement strip.

4.22 E.ON maintains that the provisions within the current deed of agreement should be maintained, with changes only to reflect any change in the easement width.

5 CONCERNS DURING CONSTRUCTION AND OPERATION (ONSHORE)

Proximity of proposed buildings and structures

5.1 Within its application, the undertaker has provided an indicative Masterplan drawing AME-02006 (revision A). EON has superimposed the route of the CW pipelines on this drawing which is included within **Appendix 8**. The route, which appears on the drawing as a dark grey line, can be seen beginning at the power station to the west of the map, and passing through the proposed AMEP development before continuing to the CW pump house and beyond the sea wall to the intake and outfall structures located offshore on the river bed. The route from the pump house to the intake and outfall structures is somewhat obscured on this drawing by the undertaker's red line boundary. (For the avoidance of doubt, the more obvious intake and outfall pipelines to the north belong to Centrica).

5.2 The drawing appears to show a number of buildings and structures located within very close proximity to the E.ON pipeline. E.ON has concerns in two respects. Firstly, E.ON needs to be satisfied that buildings being so close do not affect the ability to maintain, repair or replace the pipeline or other services as already discussed in section 4 above.

5.3 Secondly, E.ON need to be satisfied that the proposed foundations and construction techniques do not place the pipelines and other services at risk, either during or after construction as a result of building works and any resulting settlement.

5.4 However E.ON is not clear on the exact level of flexibility that the undertaker is prepared to accommodate in finalising this development. E.ON requests that buildings and structures should not be in close proximity to the pipeline. To the extent that this is not possible, E.ON believes that suitable safeguards could be included within a protective provision, and has suggested wording for such a protective provision in **Appendix 11**.

Crossing points *(to include safeguarding during construction)*

5.5 There is already one established point of crossing of E.ON's CW pipelines. The undertaker is proposing an additional four points as part of the AMEP proposal. These can be seen on the Masterplan drawing included within **Appendix 8**.

5.6 To the extent that there is flexibility within the arrangement of the undertaker's proposals, E.ON request that the number of crossing points is minimised. Where this is not possible, E.ON believes that safeguards could be included via a protective provision to:

- ensure that any crossing points are designated as such, and suitably reinforced to protect the pipelines and other services below
- put in place safeguards to ensure that crossing points which are designated are then used during both construction and operation, with appropriate measures to prohibit crossing of the pipeline at non designated points where this would increase the risk of damage to the pipelines, and
- Notification procedure to ensure that E.ON are notified prior to any works commencing near to the pipeline and agreement sought from E.ON for works to start, notification to be received at least 48 hours before works needed to be commenced.

Suggested wording for such a protective provision is included in **Appendix 11.**

Anglian sewage outfall pipe

5.7 In a meeting on 23 April 2012 (refer to **Appendix 4**), the undertaker talked about the likely requirement for diversion of the Anglian Water pipeline, which is currently placed in the middle of the proposed quay location. It is understood that the diversion would involve crossing the Killingholme power station CW pipelines, but no further information was, or has been, made available to clarify the position. Anglian water have been contacted directly (28th May 2012) but no information has yet been forthcoming.

5.8 E.ON believe that the Anglian Water pipeline referred to is the main outlet from the Killingholme Waste Water Treatment Works.

5.9 E.ON has serious concerns about the potential implications of another pipeline crossing the CW pipeline, and requires further information from the undertaker in order to assess the details and the risks involved.

5.10 E.ON requires that a protective provision be included in the draft DCO requiring submission of information for its approval prior to any such works to the Anglian Water pipeline being undertaken. A draft provision is included within **Appendix 11**.

6 CONCERNS DURING CONSTRUCTION AND OPERATION (OFFSHORE)

6.1 The proposed AMEP development is very significant in terms of its nature and scale. As a result, the potential for impacts on the power station due to offshore activities is also significant during both its construction and longer term operation, particularly given the close proximity of the AMEP development to E.ON's intake and outfall pipelines.

6.2 The scope for interference with the operation of the power station as a result of offshore activities is most likely to be as a result of the following:

- damage occurring to E.ON's critical offshore infrastructure by vessels or by offshore construction activities
- short term changes in water quality around E.ON's intake and outfall, particularly increases in suspended sedimentation concentrations (SSC) as a result of dredging operations
- changes in flow characteristics due to the imposition of the quay within the estuary, causing longer term impacts at the intake and outfall.

6.3 E.ON has reviewed related reports submitted with the AMEP application, and produced a short report 'Further issues related to modelling the impact of the Able Marine Energy Park on the Killingholme CW intake and Outfall – 20 June 2012' ("Further Issues Report") which is included at **Appendix 9**. This report highlights many concerns, not least that the integrity of some of the key modelling work undertaken by HR Wallingford is thrown into doubt on the basis that the quay location was moved 50m back towards the shore between the modelling work being undertaken and the DCO application being submitted. The undertaker's own reports also reveal some potentially significant and detrimental impacts at E.ON's intake and outfall structures, including:

- After 30 weeks of simulation, approximately 0.9m of bed erosion in the vicinity of the E.ON intake and continuing

- After 30 weeks of simulation approximately a 2.3m rise in bed level at the E.ON outfall and continuing
- Inshore of the E.ON outfall up to 3.8m of deposition is predicted.

6.4 E.ON and the undertaker have had meetings since the submission of the application and various suggestions for mitigations have been discussed – refer especially to the note of the meeting on 19 June 2012 within **Appendix 2**. The undertaker has not been able to state when a revised HR Wallingford modelling report will be available, and has advised that it is likely to be October or November 2012 before detailed engineering mitigation solutions are available. This appears contrary to the requirements of the Planning Act in the need to consult upon and dealing with key issues prior to an application being made.

6.5 Given the potential for such detrimental impacts affecting the Killingholme power station, and the lack of information available, E.ON finds itself at a distinct disadvantage in providing meaningful assessment on the undertaker's plans for the purposes of the examination process. As such, E.ON is being forced to maintain an objection and to reserve its position until sufficient information becomes available.

6.6 Since the application was submitted, the undertaker has provided a report – 'Review of Risks to the E.ON Inlet and Outfall During Construction & Maintenance of the AMEP Quay', June 2012 ("Review of Risks Report") which is provided at **Appendix 10**. Whilst E.ON welcomes this as a step in the right direction, it is clear that there is still much more to be done in understanding potentially significant impacts upon the power station and identifying mitigations, and in this respect the report has not served to alleviate E.ON's concerns to the extent that it is able to remove its objection.

<u>Dredging operations (method inc safeguarding, and likely effects)</u>

6.7 The AMEP proposal would give rise to a very significant capital dredging operation, particularly in the creation of a berthing channel and approach channels. In the case of the berthing channel, the undertaker is proposing to dredge between 7m and 9m of additional depth across a 60 m width over the length of the quay.

6.8 In its Review of Risks Report, the undertaker has proposed a number of mitigations to safeguard E.ON's infrastructure during capital dredging and maintenance dredging.

6.9 E.ON takes the view that whilst the initial safeguarding proposals appear sensible, there is insufficient information to provide confidence at this stage, and E.ON would therefore wish to approve mitigation plans to safeguard E.ON's CW infrastructure before any dredging takes place. Accordingly, a protective provision is proposed within **Appendix 11**.

Increases in SSC affecting power station performance

6.10 As set out earlier, the power station cooling system is designed around the flow characteristics and water quality within this area of the estuary. Significant changes could cause real detriment to the ability of the power station to operate.

6.11 E.ON's Further Issues Report (**Appendix 9**) notes that there have been no previous problems with sedimentation, erosion suspended solids or siltation at the CW intake or outfall at Killingholme. Therefore, it would be reasonable to assume that any problems that are encountered after the Able Marine works commence are as a result of the AMEP development.

6.12 It is also noted that the undertaker has only measured Suspended Solids Concentration ("SSC") in a single tidal cycle during a neap and a spring tide and is then applying the HR Wallingford modelling work (whose credibility was brought into question earlier) to try and reach firm conclusions about the likely increase in sediments.

6.13 E.ON would need to be satisfied based on modelling work for the 'as applied for' proposal that the sediment levels would not be significantly increased in the vicinity of the intake for the power station. It would also need to agree appropriate monitoring.

Likelihood of significant deposition at outfall

6.14 The AMEP proposals are predicted to give rise to significant deposition at E.ON's CW outfall – a point acknowledged by the undertaker in their Review of Risks report, and also raised within E.ON's Further Issues Report. E.ON is concerned that the outfall could become completely blocked in periods in which the station is not operating, for example during statutory maintenance outages or periods of low electrical demand. This situation would be completely unacceptable since the power station must maintain its availability to operate as required.

6.15 The undertaker is considering mitigations, but insufficient information exists at the current time to understand or assess any proposal. In the meeting held on 19th June, it was noted that a range of possible mitigations might be applicable subject to further

investigation. Some further relevant information was only received at close of play on 28 June 2012, the day before the deadline for the written representations. This provides further information to follow up on the discussions of 19 June with additional information on potential mitigations. E.ON has not been able to make any meaningful assessment of this information within this submission given how late it was received and we reserve our position to make further representations in light of this new information.

6.16 Ultimately, E.ON seeks a reassurance that measures will be put in place to ensure that the outfall is kept clear of deposits, and that monitoring is included with appropriate triggers to initiate a means of remediation if and when deposition reached levels that could impede normal operation of the power station.

6.17 In the event that some form of dredging is required, it is not known how often this would need to be carried out and a suitable scheme will need to be submitted to and approved by E.ON. The DCO would have to give the undertaker the appropriate powers to undertake the dredging and these would have to be agreed by the conservancy authority.

<u>Potential for seabed erosion and longer term deposition at CW intake</u>

6.18 Aside of the question about increases in SSC being entrained within the intake and affecting the power station, E.ON has two further concerns based upon the information to date.

6.19 The first issue is the potential for morphological changes to cause erosion of the sea bed at the intake, affecting its integrity. As can be seen from the note of the meeting with the undertaker on 19th June, there is considerable uncertainty around this matter, and potential mitigations are not clear.

6.20 The second issue concerns possible long term changes to the sea bed which could lead to it becoming elevated near to the intake position. The intake is currently designed to abstract water from well above the sea bed to minimise entrainment of bottom dwelling fish and other organisms.

6.21 Appropriate mitigation has yet to be agreed in either case, monitoring and appropriate triggers should be included so that appropriate and timely steps can be taken to provide remediation.

Thermal effects of Anglian sewage water outfall on CW intake

6.22 As explained earlier, the undertaker has talked about diverting Anglian Water's outfall from the Killingholme Waste Water Treatment Works. Insufficient information is available to allow E.ON to better understand the implications of this diversion as noted earlier in section 5 of these written representations. In addition, a further concern is the extent to which the proposed new outfall position might lead to contamination of the CW intake pipe, particularly if it is discharging warm water which could adversely affect the operational efficiency of the power station.

6.23 E.ON would not the water quality or temperature affected in a way that it could adversely affect the operation of the power station. E.ON therefore requests that a protective provision is included in the DCO to ensure that the undertaker consults with E.ON, carries out any necessary modelling works and agrees an appropriate solution with E.ON prior to any diversion of the Anglian Water pipeline. A draft provision is included within **Appendix 11**.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 The undertaker is proposing to construct the Able Marine Energy Park (AMEP) on land near E.ON's existing CCGT Power Station at Killingholme. The 900MW power station, which is an important component within the national electricity supply system, relies upon cooling water from the Humber Estuary which is transferred through pipelines running through part of the land on which the undertaker is proposing to develop the AMEP.

7.2 The undertaker is proposing to extinguish the easement for these pipelines and other services in exchange for a reduced easement width of 12.5m. No credible justification has been given for the 12.5m width and, upon investigation, E.ON has concluded that this width is totally insufficient to accommodate safe working practices. A study by Capita Symonds, commissioned by E.ON, demonstrates that a 32.5m easement should be the minimum to ensure safe working practices in the event of the need for repair or replacement of the pipeline and other services in the future. E.ON objects strongly to the proposed acquisition of its operational land associated with the CW pipeline and pumphouse.

7.3 If compulsory acquisition powers are granted, without an appropriate easement being in place to protect E.ON's pipelines and services, then it is E.ON's position that this would be to the serious detriment of the carrying on of its undertaking in accordance

with s.127 Planning Act 2008. It is E.ON's position that consent should also be withheld under s.138 Planning Act 2008 until agreement has been reached between E.ON and the undertaker for the retention of the pipelines. Any general powers which may be granted by the DCO should not allow the undertaker to subsequently override any such agreement between the parties.

7.4 There is also a very real potential for E.ON's power station to be adversely affected by the undertaker's development, both during construction and operation. Meaningful information to explain the likely impact and to propose and agree mitigation measures is only now becoming available from AMEP, despite the DCO application now being in the examination phase.

7.5 Key areas in which E.ON has concerns are in relation to:

(a) the potential for damage to E.ON's assets (affecting the operation of the power station);

(b) changes in water quality and flow characteristics which could cause increases in suspended sediment, significant deposition of sediment, erosion of the sea bed affecting the intake and outfall infrastructure and other such effects, significantly affect the cooling system and thereby E.ON's right as a statutory undertaker to carry out its duties in electricity generation.

7.6 E.ON is concerned at the level of uncertainty that still prevails despite this application now being in the examination phase. In the event that a Development Consent Order is granted for this development, E.ON has no option but to request that a number of protective provisions are included requiring approval of certain further information, and to impose a number of controls and safeguards to help protect the operation of Killingholme power station.

Glossary

AMEP	Able Marine Energy Park
CDM	Construction (Design and Management) Regulations
CW	Cooling water
CCGT	Combined Cycle Gas Turbine
E.ON	E.ON UK Ltd
GW	Gigawatts (1 GW is 1,000 MW)
GRP	Glass reinforced plastic
kV	kilovolt (1kV is 1,000 volts)
MW	megawatt (1 MW is 1,000 kilowatts)
SSC	Suspended solids concentration

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(UNIQUE REFERENCE NUMBER: 10015527)

APPENDIX 1

E.ON Relevant Representations submitted on 30 March 2012

E.ON UK Plc is the owner and operator of Killingholme Power Station. The power station is adjacent to the site of the proposed Able Marine Energy Park ("AMEP"). E.ON is a statutory undertaker for the purposes of this application. Able's application seeks the compulsory acquisition of part of E.ON's landholding with a proposal to grant a further easement back to E.ON for its existing intake and outfall cooling water pipes from the Humber to the power station.

E.ON wishes to register its objection to the proposed AMEP application. This objection is submitted due to outstanding information being required to address concerns regarding the effect that the proposed development could have on the operation of the power station. The key issues which are of concern to E.ON are:

(1) Land Acquisition and the extent of the proposed Easement Corridor

Able propose to compulsorily acquire a number of parcels of land from E.ON including an easement strip through which E.ON's intake and outfall pipelines and associated services pass. The pipelines enable the transfer of water between Killingholme Power Station and the Humber – an integral part of the operation of the plant.

The current easement strip (granted by a Deed of Grant of Easement entered into on 9 July 2004 between Able and E.ON) is estimated to be 130m wide (at its widest point) and 50m wide (at its narrowest point). Able are proposing to compulsorily acquire the full extent of E.ON's existing easement and simultaneously grant E.ON a new easement comprising a strip 6m wide which they contend is the minimum needed to contain, access and maintain the pipeline. The 6m easement is inadequate. E.ON require an easement strip of circa 23m (minimum) to enable the safe and efficient repair of E.ON's existing buried assets without which there could be a serious detriment to the operation of the plant. In the absence of an agreed solution, it is noted that Able will need to make an application for a certificate in accordance with s.127 Planning Act 2008.

Able also propose to acquire land to the east of the Killingholme pump house (Plot 05041 – Land Plan Sheets 4 & 5 of 14). This is operational land and is required for vehicular access to the pumping station.

(2) The impact of construction activities on the operation of the power station

E.ON notes that Able proposes to raise the ground levels over and along parts of the length of the E.ON intake and outfall pipelines and then to erect a number of buildings along the length of the proposed 6m wide easement. This raises significant concerns as to the loading that may arise on the pipeline due to both short-term construction activities and future long-term operational use. For example, Able propose to extend the existing E.ON pumphouse access road over the top of the glass-fibre reinforced plastic (GRP) pipelines in order to provide site access for construction of the quay structure (i.e. for piling operations and reclamation works). Limited consideration has been given to provision of a relieving slab over E.ON's pipelines or any other form of protective measure and any proposals to protect E.ON's pipelines only extend to the 6m easement strip. These issues

must be resolved to E.ON's satisfaction otherwise the operation of the power station could be detrimentally affected.

(3) Sedimentation and its effect on the operation of E.ON's Intake and Outfall pipelines

E.ON's intake and outfall pipes lie immediately adjacent to the northern return wall of the proposed quay. E.ON requires clarification of the distance between the alignment of E.ON's intake/outfall and the proposed northern return wall and confirmation that the placement of rock revetment adjacent to the northern wall (along with associated dredging work) will not compromise the physical integrity of the E.ON intake and outfall pipelines.

There is considerable concern that sediment could become drawn into the pipelines reducing their efficiency or causing an operational failure. Alternatively, long term increases in suspended sediment concentration or a relatively large and sudden temporary increase in suspended sediment could cause severe damage to, and potentially failure of, the pipelines.

(4) The proposed dredging strategy

It is understood that dredging is proposed during the construction stage of the development but also post-construction during the life-time of the AMEP due to predicted increases in sedimentation (ES Chapter 8 refers). E.ON requires:

- an assurance that the proposed piling and dredging works will not adversely affect the integrity of the E.ON pipelines or the associated river bed structures; and
- agreement that any Trailing Suction Hopper Dredger carrying out the dredging of alluvium at the site will not be allowed to operate with an overflow hopper; and
- information regarding tracking accuracy of plough vessels in order that E.ON can assess the level of risk of damage to the intake/outfall structures resulting from the proposed maintenance dredging works.

Chapter 8 of the ES states that maintenance dredging will be carried out once the development is operational. E.ON requires details of how Able will be obligated to carry out this dredging, how often it will be carried out and by whom. There is no Requirement set out in Schedule 11 of the draft DCO which binds Able to a dredging strategy and no development consent order obligation has been submitted with the suite of DCO application documents.

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APPENDIX 2

Agreed notes of meeting with undertaker held 19 June 2012

www.ableuk.com	**MINUTES OF MEETING** **Revision A**	**19th June 2012**

Present:	Peter Stephenson	(PMS)	-	Able UK
	Ian Whitfield	(IW)	-	Able UK
	Sönke von Fintel	(SF)	-	Hochtief
	Tim Fifoot	(TF)	-	E.ON
	Tom Staff	(TS)	-	E.ON
	Matthew Brown	(MB)	-	E.ON
	Steve Wilson	(SW)	-	E.ON
	Richard Rogers	(RR)	-	E.ON

Date & Time: 1pm 19th June 2012

Location: E.ON Killingholme Power Station

Subject: **E.ON Outfall & Inlet Structures**

ACTION

1. **General**

1.1 The purpose of the meeting was to discuss the potential risks to the power station's cooling water inlet and outlet structures due to the construction and operation of the AMEP quay and to review possible mitigation measures.

1.2 Any other matters between E.ON and Able UK would also be summarised.

1.3 The three main concerns regarding the cooling water apparatus are:

- Bed erosion to intake structure
- High suspended silt levels
- Accretion (build up of sediment) over outfall

2. **Bed Erosion to Structure**

2.1 MB stated that HR Wallingford report (DHR4808-01) had an error, mixing up the locations of the intake and outfall and the potential impact. IW outlined the position and location of the structures in relation to the pumping station and proposed works. The wording of the report would be checked by Able. — Able

2.2 MB stated that the HR Wallingford report indicates that the slopes will be unstable due to the close proximity of the dredged berthing pocket to the intake and undermine the structure. IW provided a copy of a scaled drawing showing a 1 in 4 slope from the toe of the dredged berthing pocket to existing bed level. IW highlighted that the top of the slope is in excess of 70m from the intake structure.

2.3 The HR Wallingford report states that their model results indicate that 0.9m of erosion could occur at the intake structure location. Able to confirm what level is being referred to i.e. bed level or below structure? — Able

2.4	Able to confirm what the current silt bed level is at the intake (and outlet) structures to determine if the predicted erosion would undermine the structure	Able
2.5	Able to confirm what ground conditions and depth of silt (erodible deposits) are in the vicinity	Able
2.6	Potential erosion to intake structure to be reviewed by Able and include any protection measures as deemed necessary	Able

3. Suspended Solids

3.1	The greatest risk of additional suspended solids will occur when capital and maintenance dredging is carried out.	
3.2	Monitoring of the levels of suspended solids has been carried out albeit only over two separate tidal cycles. A longer term monitoring period was suggested by TF to enable greater confidence in the results for average and upper ranges of suspended solids within the river. Able have carried out a similar process on Hartlepool Power Station. The report has been forwarded to TS.	Able
3.3	Able to consider monitoring options and forward proposals for discussion with E.ON by the end of June.	Able

4. Accretion (sedimentation) of Outfall

4.1	The outfall currently discharges on average 750 litres per second with a maximum rate of 1110 litre per second. The flows are not pumped and still discharge satisfactorily during high tides.	
4.2	Accretion is likely within the vicinity of the outfall structure however greatest risk will occur if flow is stopped	
4.3	Options to consider	
4.3.1	Moving northern quay edge southwards by say 50m. Will this prevent accretion to the outfall?	
4.3.2	Agitation system – use of pumped water jetting similar to dock gates, for disturbing silt and preventing sediment build up in immediate vicinity of structure when the main cooling system is not in operation	
4.3.3	Moving outfall – pipeline currently proposed within AMEP quay. Diversion may require a full habitat assessment and other planning issues may be problematical and time consuming	

4.3.4	Protection of outfall by placing concrete rings in stages to match silt build up. Able to review further and forward proposals to E.ON.	Able
5.	**Construction of Quay**	
5.1	SvF briefly informed both Able and E.ON how and where the plant for piling would operate and measures which would be taken to help protect the inlet and outfall structures.	
5.2	The piling for the northern return wall would be carried out by piling barge set behind the line of the installed piles.	
5.3	A temporary dolphin may be installed between the northern edge of the main quay line and the inlet structure to moor vessels and reduce the risk of craft floating onto and damaging the structure.	
5.4	A visual reference line will be provided for both E.ON and for craft associated with the construction of the quay by placing temporary buoys at an offset to be agreed approximately 30m from the pipelines.	
6.	**Indemnity**	
6.1	Position and way forward currently under review by E.ON	E.ON
7.	**Provision of Information**	
7.1	Written representations to IPC are imminent. Any information relating to discussed issues to be forwarded to E.ON asap to enable a considered and suitable representation to be produced	Able / E.ON
7.2	Points of contact to be Ian Whitfield for Able and Matthew Brown for E.ON	
8.	**Easement Corridor**	
8.1	E.ON are reviewing the agreement for easement corridor	E.ON
9.	**Purchase of Land on Lease to Able**	
9.1	The purchase of land is still under consideration by E.ON	E.ON

10. **Chase Hill Road Wood**

10.1 Able need to translocate great crested newts from the AMEP site and have identified the parcel of land owned by Able between Chase Hill Road Wood and Chase Hill Road as a suitable area to create a suitable habitat.

10.2 Humber INCA on behalf of E.ON has prepared a draft consultation document for a local nature reserve and management plan for Chase Hill Wood and Fox Covert. Able wish to incorporate the proposed great crested new habitat into the Chase Hill Wood and Fox Covert nature reserve.

10.3 E.ON stated that they had no objection to incorporating the two sites within a single management plan. Able and E.ON to liaise regarding way forward with Humber INCA — Able / E.ON

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APPENDIX 3

3.1 - Lease dated 9 July 2004 between E.ON UK Plc (1) and Able UK Plc

3.2 - Deed of Grant of Easement dated 9 July 2004 between Able UK Limited (1) and E.ON UK Plc (2)

3.3 - Table of land interests from the Book of Reference

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APPENDIX 3.1

Lease dated 9 July 2004 between E.ON UK Plc (1) and Able UK Plc

Dated 9th July 2004

E.ON UK PLC (1)

and

ABLE UK PLC(2)

Lease

of

7.2 Acre Site at Killingholme

robert muckle SOLICITORS

Norham House
12 New Bridge Street West
Newcastle upon Tyne
NE1 8AS

JWC

INDEX

JWC

Lease Particulars

1.	DATE	9th day of July 2004
2.	PARTIES	
2.1	LANDLORD	E.ON UK PLC (Company Number 2366970) whose Registered office is at Westwood Way Westwood Business Park Coventry CV4 8LG]
2.2	TENANT	ABLE UK LIMITED (Company Number 02079397) whose registered office is at Able House Billingham Reach Industrial Estate Haveton Hill Road Billingham Cleveland TS23
3.	DEMISED PREMISES	The land shown edged red on Plan 1 and any building or buildings for the time being during the Term erected on it
4.	TERM COMMENCEMENT DATE	the date hereof

JWC

THIS LEASE is made on the Date stated in the Particulars (as defined below) BETWEEN the Parties specified in the Particulars

WITNESSES as follows:

1. **Definitions**

In this Lease, unless the context otherwise requires, the following expressions shall have the following meanings:-

1.1 **"Adjoining Property"** means the freehold reversion to this Lease and the land and/or buildings adjoining or neighbouring the Demised Premises currently owned by or demised to the Landlord .

1.2 **"Conduits"** means all drains, pipes, gullies, gutters, sewers, ducts, mains, channels, subways, wires, cables, conduits, flues and any other conducting media of whatsoever nature.

1.3 **"Demised Premises"** means the Demised Premises as briefly described in the Particulars and each and every part of them and all the appurtenances belonging to them including:

1.3.1 all Conduits exclusively serving the same, save those of statutory undertakers; and

1.3.2 all additions, alterations and improvements to the same.

1.4 **"Landlord"** means the party named as "Landlord" in the Particulars, and includes the person for the time being entitled to the reversion immediately expectant on the determination of the Term.

1.5 **"Landlord's Equipment"** means all Conduits buildings plant and equipment belonging to the Landlord as are now or shall within the period of eighty (80) years from the date hereof be situated in over under through or on the Demised Premises and/or the Adjoining Property

1.6 **"this Lease"** means this Lease and any document which is made supplemental to it or which is entered into pursuant to, or in accordance with, its terms.

1.7 **"Particulars"** means the descriptions and terms appearing on the preceding pages headed "Lease Particulars" which comprise part of this Lease.

1.8 **"Plan 1"** means the plan numbered 1 annexed to this Lease.

1.9 **"Plan 2"** means the plan numbered 2 annexed to this Lease.

1.10 **"Pumping Station Site"** means that part of the Demised Premises agreed or determined in accordance with clause 6.4 as comprising the site of the new pumping station.

1.11 **"Reform Order"** means the Regulatory Reform (Business Tenancies)(England and Wales) Order 2003

1.12 **"Tenant"** means the party named as "Tenant" in the Particulars and includes the person in whom this Lease is vested from time to time.

1.13 **"Term"** means the term of nine hundred and ninety nine (999) years commencing on and from the Term Commencement Date

1.14 **"Utilities"** means water, soil, steam, air, gas, electricity, radio, television, telephone, telecommunications and other services and supplies of whatsoever nature

2. **Interpretation**

Unless there is something in the subject or context inconsistent with the same:

2.1 Where two or more persons are included in the expression the "Landlord" or the "Tenant" the covenants which are expressed to be made by the Landlord or the Tenant (as the case may be) shall be deemed to be made by such persons jointly and severally.

2.2 Words importing persons shall include firms, companies and corporations and vice versa and words importing the singular meaning include the plural meaning and vice versa.

2.3 Any reference to a statute (whether specifically named or not) shall include any amendment or re-enactment of such statute for the time being in force and all instruments, orders, notices, regulations, directions, bye-laws, permissions and plans for the time being made, issued or given under it or deriving validity from it.

2.4 Reference to any obligation on the Tenant not to do any act or thing shall include the obligation not to permit or suffer such act or thing to be done by another person.

2.5 The titles or headings appearing in this Lease are for reference only and shall not affect its construction.

2.6 Any reference to a clause or schedule shall mean a clause or schedule of this Lease.

3. **Demise and Rents**

In consideration of the payment of a premium of two hundred thousand pounds ([£200,000.00), together with Value Added Tax on such premium, receipt of which is hereby acknowledged, and of the rent and covenants reserved and contained in this Lease, the Landlord hereby demises the Demised Premises to the Tenant:

3.1 Except and reserving the rights and easements specified in the Second Schedule.

3.2 Subject to the matters contained or referred to in the deeds and documents listed in the Third Schedule and any condition, exception, reservation, right or other matter affecting the Demised Premises

3.3 to hold the Demised Premises for the Term yielding and paying during the Term to the Landlord (if demanded) the yearly rent of one peppercorn.

4. Tenant's Covenants

The Tenant hereby covenants as a continuing obligation during the Term with the Landlord as follows:

4.1 Rents and other Sums

The Tenant shall pay:

4.1.1 the rent reserved by this Lease (if demanded) and any other payments due to the Landlord under this Lease at the times and in the manner mentioned;

4.1.2 any Value Added Tax (or any tax replacing or supplementing the same) that may be payable in addition to the above and in every case where the Tenant covenants to pay an amount of money under this Lease such amount shall be regarded as being exclusive of all Value Added Tax which may from time to time be payable thereon;

4.1.3 in addition to any payments referred to in the Lease interest at the rate of four (4) per cent above the base rate from time to time of HBSC Bank plc on any payments not made on the due date from the due date to the date of payment

4.2 Outgoings

The Tenant shall pay the whole (or in the absence of a direct assessment on the Demised Premises a fair proportion properly attributable to the Demised Premises) of all rates water rates taxes assessments charges or other outgoings payable in respect of the Demised Premises or any part thereof by any estate owner landlord tenant or occupier thereof other than any tax or other outgoings payable by the Landlord occasioned by any disposition or dealing with the reversion to this Lease or the receipt of any rent consideration or payment by the Tenant hereunder

4.3 **Repairs**

The Tenant shall:-

4.3.1 Put and keep the Demised Premises in good and tenantable repair and (without prejudice to the generality of the foregoing) in sufficient state of repair and condition to ensure that the Landlord's Equipment and the Adjoining Property shall not suffer any physical damage

4.3.2 In the event of there being any defect or want of repair in the Demised Premises which could adversely affect the Landlord's Equipment or the Adjoining Property to comply with any notice of such defect or want of repair served by the Landlord on the Tenant and if the Tenant shall fail to comply with such notice within a reasonable period having regards to the nature of the defect or want of repair to permit the Landlord to enter the Demised Premises to remedy the defect or want of repair to the extent necessary to protect the Landlord's Equipment or the Adjoining Property and in that event such costs of repair shall be borne by the Tenant

4.4 **Contribution**

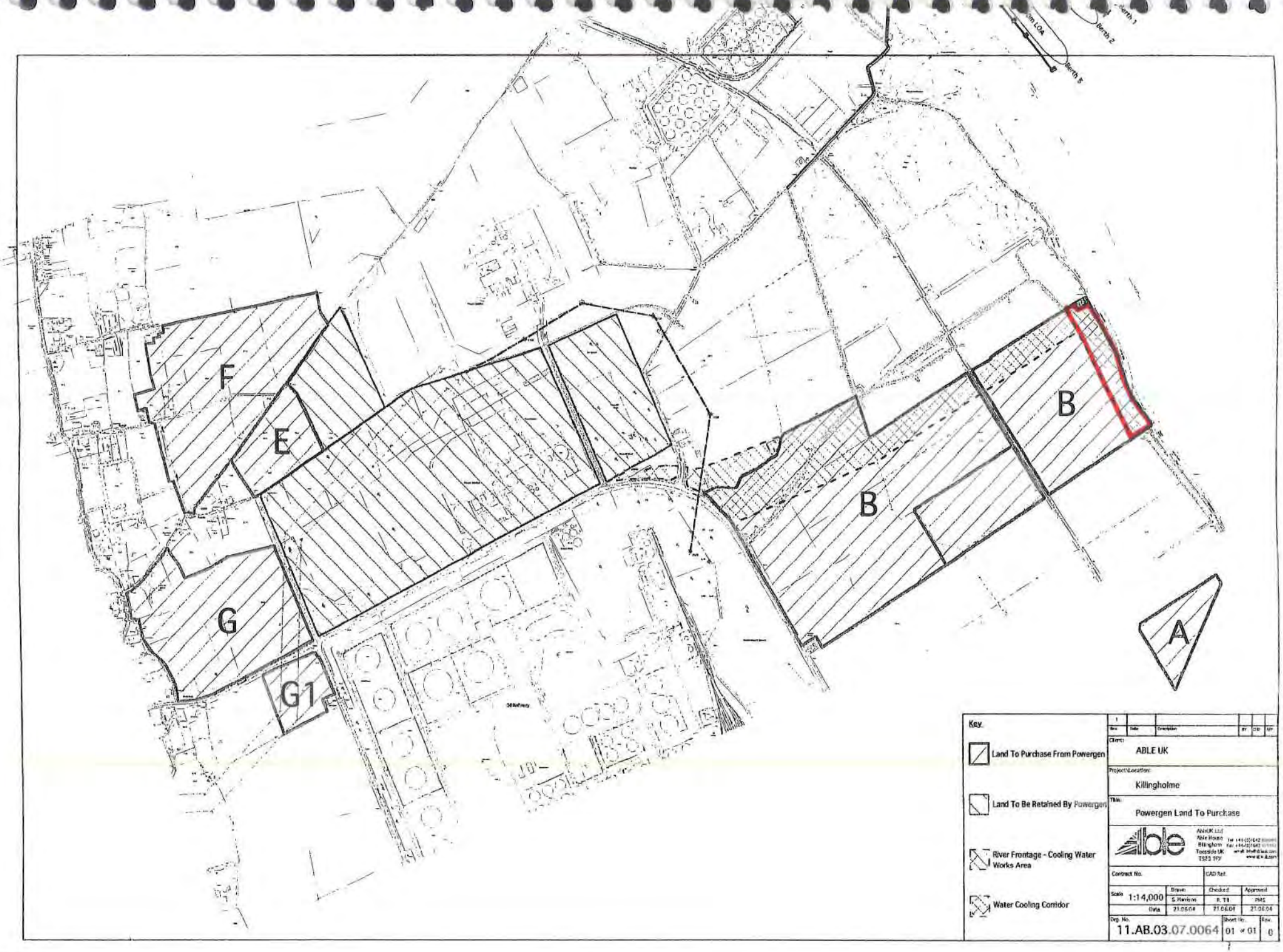
The Tenant shall pay to the Landlord on demand a fair and proper proportion of the costs properly incurred (or demanded on) by the Landlord towards the maintenance servicing cleaning repairing and (when necessary) renewing all roadways and paths over which the Tenant has use.

4.5 **Landlord's Access**

The Tenant shall permit the Landlord and all persons authorised by the Landlord to enter the Demised Premises and to remain thereon for all or any of the purposes specified in the First Schedule hereto

4.6 **Use**

The Tenant shall not do anything in or about the Demised Premises and/or use the Demised Premises for any purpose which may be or may become a legal nuisance or which may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cause damage to or interfere with the Landlord's Equipment, the Conduits or the Adjoining Property

4.7 **Yield Up**

At the expiration or sooner determination of the Term, the Tenant shall quietly yield up the Demised Premises to the Landlord in accordance with the covenants by the Tenant contained in this Lease and (without prejudice to the generality of the foregoing) to leave the same free from any hazardous structures and materials and electrically and chemically safe and in compliance with all relevant obligations relating thereto.

4.8 **Alterations**

4.8.1 Subject to clause 4.8.2 hereof the Tenant shall not erect any new buildings on the Demised Premises without the Landlord's prior written consent which shall be at the Landlord's absolute discretion.

4.8.2 The Tenant may subject to obtaining the prior written consent of the Landlord (such consent not to be unreasonably withheld or delayed) carry out the following works to the Demised Premises:-

4.8.2.1 surfacing or ground works to the Demised Premises to allow it to be used for external storage;

4.8.2.2 the laying and construction of access and other roads;

4.8.2.3 the laying of conducting and service media;

4.8.2.4 provision of lighting and CCTV towers;

4.8.2.5 the erection of fencing;

4.8.2.6 drainage works;

4.8.2.7 the construction of temporary buildings (without foundations).

Provided Always:-

(a) that any application by the Tenant for consent shall be accompanied by full proposals (including detailed specification and program) for such works and for the protection of any existing Conduits the Landlord's Equipment and the Adjoining Property (and access thereto).

(b) that the Tenant shall at its own cost and expense incorporate into the proposed works any additional works that the Landlord shall require for the protection of any existing Conduits the Landlord's Equipment and the Adjoining Property (and access thereto)

(c) that the Tenant shall not commence the works (after the consent of the Landlord has been obtained) without giving to the Landlord fifteen (15) Working days notice of the Tenant's proposals to commence such works

(d) that if required by the Landlord the Tenant shall not carry out any such works without a representative of the Landlord being afforded the opportunity to be in attendance

4.9 **Assignments/Subletting**

4.9.1 The Tenant shall not assign any part or parts (as distinct from the whole) of the Demised Premises.

4.9.2 The Tenant shall not assign the whole of the Demised Premises without first in every case before the assignment procuring that the assignee enters into a direct covenant in a form approved by the Landlord (such approval not to be unreasonably withheld or delayed) with the Landlord to observe and perform during the Term the covenants by the Tenant and the conditions contained in this Lease and furthermore the Tenant and any subsequent tenants of the Demised Premises shall upon assignment enter into an agreement with the Landlord whereby they guarantee the observance and performance of the Lease covenants and conditions for so long as the lease remains vested in their assignee.

4.9.3 To procure that any subletting of the Demised Premises or part thereof granted after the date of this Lease shall contain provisions regarding the surrender of the Demised Premises or part thereof on the same terms as set out in Clause 6.4 hereon

4.10 **Statutes/Planning**

4.6.1The Tenant shall observe and comply in all respects with the requirements of any statute so far as the same may relate to or affect the Demised Premises or their use or occupation and shall do any works or make or provide any arrangement required by any statute or by any government department, local, public or other competent authority or court.

4.6.2 The Tenant shall comply with all planning permissions from time in force and the requirements of any competent authority relating to the Demised Premises and its use and occupation

4.11 **Existing Matters**

The Tenant shall:-

4.11.1 Perform and observe all covenants restrictions provisions and stipulations affecting the Demised Premises of which the Tenant is aware or properly ought to be aware

4.12 **Indemnity**

The Tenant shall pay and indemnify the Landlord from and against all actions proceedings claims costs and demands incurred by the Landlord:-

4.12.1 in relation to the service of a notice under Section 146 of the Law of Property Act 1925 notwithstanding that forfeiture is avoided otherwise than by relief granted by the Court;

4.12.2 in connection with or procuring the remedying of any breach of covenant on the part of the Tenant contained herein

4.12.3 in connection with the application by the Tenant for the approval/consent of the Landlord hereunder

4.13 **Registration of Dispositions**

Within twenty one (21) days of every assignment or transfer of the Demised Premises the Tenant shall notify the Landlord or its solicitors of the same in writing giving the name of the assignee and its address.

5. **Landlord's Covenant**

The Landlord hereby covenants with the Tenant that the Tenant, paying the rents reserved by this Lease and performing and observing the covenants on the part of the Tenant and conditions contained in this Lease shall and may peaceably hold and enjoy the Demised Premises during the

Term without any interruption by the Landlord or any person lawfully claiming through, under or in trust for it.

6. **Provisos**

PROVIDED ALWAYS AND IT IS HEREBY AGREED AND DECLARED as follows:

6.1 **No Implied Easements**

Nothing contained in this Lease shall impliedly confer upon or grant to the Tenant any easement, right or privilege other than those expressly granted by this Lease.

6.2 **Representations**

The Tenant acknowledges that this Lease has not been entered into in reliance wholly or partly on any statement or representation made by or on behalf of the Landlord except any such statement or representation that is expressly set out in this Lease.

6.3 **Notices**

Any notice required to be given to or served on the Landlord or the Tenant shall be duly and validly given or served if sent by prepaid registered or recorded delivery mail facsimile or sent by telex addressed to the Landlord or the Tenant at their registered office (or at the address for service in England and Wales notified from time to time).

6.4 **Surrender of Part**

6.4.1 The Landlord may at any time during the first twenty five (25) years of the Term serve written notice upon the Tenant of its requirement to construct on any part of the Demised Premises a new pumping station in connection with the operation of Killingholme Power Station ("the Landlord's Notice") and the Landlord's Notice shall identify to the Tenant the proposed location of such new pumping station together with details of any new Conduits and roadways together with the position of any areas required to construct the same (together "the Pumping Station Site") affecting the Demised Premises that may need to be constructed by the Landlord to service the same.

6.4.2 Within 6 months of service by the Landlord of the Landlord's Notice the Tenant shall surrender the Pumping Station Site to the Landlord with vacant possession free from

encumbrances and the Landlord shall accept the surrender of the Pumping Station Site (at no cost to the Landlord save for the payment of its own costs as referred to below) and the parties shall instruct their respective solicitors to document as expeditiously as possible any documentation required in this regard including the granting of any new rights required by the Landlord with each party bearing its own costs in respect of the same and the Tenant shall at its own cost and expense within 6 months of service by the Landlord of the Landlord's Notice remove from the Pumping Station Site (unless notified by the Landlord otherwise) any works carried out to the same as approved by the Landlord pursuant to clause 4.8.2 hereof and in the event that the Tenant fails to do so within the said six (6) month period the Landlord shall be entitled to enter upon the Demised Premises with or without workmen plant and machinery and remain thereon for the purpose of removing any such items and the Tenant shall indemnify and keep indemnified the Landlord from and against all costs claims expenses damages and liabilities relating to the same.

6.5 The parties agree that the provisions of sections 24 to 28 inclusive of the Landlord and Tenant Act 1954 as amended by the Reform Order shall be excluded in respect of this Lease. The parties confirm that the Tenant has been served with a notice dated 5th July 2004 which applies to this Lease in the form, or substantially in the form, set out in Schedule 1 to the Reform Order and the Tenant has made a declaration dated 9th July 2004 (which the parties confirm precedes the date the Tenant became contractually bound to accept this Lease) in the form, or substantially in the form set out in Schedule 2 to the Reform Order and the Tenant confirms that the person who swore the declaration on the Tenant's behalf did so with the Tenant's authority

6.6

6.6.1 If any rent or other monies payable to the Landlord hereunder shall be unpaid for twenty one days after becoming payable (whether formally demanded or not) or if any covenant by the Tenant shall not be performed or observed then and in any such case it shall be lawful for the Landlord at any time thereafter to re-enter upon the Demised Premises or any part thereof in the name of the whole and thereupon this

Lease shall terminate but without prejudice to any right of action of the Landlord in respect of any breach of any of the Tenant's covenants.

6.6.2 The rights contained in this clause may be exercised by the Landlord provided that where the Landlord has received written notice of the existence of any mortgage or chargee of this Lease ("Mortgagee") then in the event of the Landlord being entitled to exercise its right of re-entry it will before exercising such rights give to the Mortgagee at least 30 working days notice in writing of the Tenant's default and of its intention to exercise such rights and provided that the Mortgagee then remedies such breach within a reasonable time following receipt of such notice then the Landlord will not exercise such rights and in the event that the right of re-entry shall have arisen hereunder and shall have been exercised by the Landlord in accordance with the foregoing provisions the Landlord shall immediately after re-entry offer and if required by the Mortgagee grant a new lease of the Demised Premises to the Mortgagee or such other third party (to be approved by the Landlord such approval not to be unreasonably withheld or delayed) as the Mortgagee may nominate and notify to the Landlord in writing for the residue of the term unexpired at the date of such re-entry at the rent then payable and subject to the same terms as this Lease in every respect (the rights and liabilities thereunder to take effect as from the date of such re-entry) subject to the payment by the Mortgagee of the Landlord's reasonable and proper costs and to the execution by the Mortgagee of a counterpart of such new lease.

6.6.3 In any case where the Landlord gives written notice to any Mortgagee under the provisions of clause 6.6.1 and the Landlord has previously received written notice of the existence of any undertenant of the Demised Premises or any mortgagee of any such undertenant the Landlord shall contemporaneously with giving the Mortgagee notice under clause 6.6.2 send a copy of such notice of any such undertenant and the undertenant's mortgagee.

6.7 **Disputes**

Any dispute arising as between the Tenant and the tenants or occupiers of neighbouring property belonging to the Landlord as to any easement right or privilege in connection with

the use of the Demised Premises and any neighbouring property or as to the walls separating the Demised Premises from the neighbouring property or as to the amount of any contribution towards the expenses of works or services used in common with any other property shall be decided by the Landlord's surveyor (acting reasonably) for the time being whose decision shall be binding on all parties (save in the case of manifest error or fraud) and whose costs shall be paid by such of the parties to the dispute and in such manner as he shall decide

6.8 **Acknowledgment Re Use**

The Tenant hereby acknowledges that no warranty is given or implied by the granting of this Lease or by the giving of any consent to a change of use hereunder by the Landlord or otherwise that neither the use to which the Tenant proposes now or hereafter to put the Demised Premises nor any alterations or additions which the Tenant may now or hereafter desire to carry out will require planning permission

6.9 **Freehold Transfer**

In the event that the Landlord advises the Tenant that it no longer requires a new pumping station to be constructed on any part or parts of the Demised Premises (as contemplated by clause 6.4 hereof) then the Landlord shall for a consideration of £1 but otherwise at the cost of the Tenant transfer to the Tenant its freehold title to the Demised Premises.

6.10 **Contracts (Rights of Third Parties) Act 1999**

The Contracts (Rights of Third Parties) Act 1999 shall not apply to this Lease and unless specifically herein provided no person other than the parties to this Lease shall have any rights under it nor shall it be enforceable by any person other than the parties to it.

IN WITNESS of which this deed has been executed by the parties and is intended to be and is delivered on the date first above written

[redacted]

SECOND

FIRST SCHEDULE

Exceptions and Reservations

The following rights and easements are excepted and reserved out of the Demised Premises to the Landlord and all those authorised by the Landlord for the benefit of the Adjoining Property and each and every part thereof :-

1. The free and uninterrupted passage and running of the Utilities through the Conduits which are now, or may at any time be in, under, or passing through or over the Demised Premises.

2. The right, at all reasonable times upon reasonable prior written notice, to enter the Demised Premises to view the condition of the Demised Premises and to execute repairs, decorations and alterations to the Adjoining Property or to renew replace or upgrade any Conduits (including the Conduits serving the Adjoining Property whether they are located on in over under or through the Demised Premises or on the Adjoining Land) and to lay new Conduits and to construct roadways and footpaths leading to any new pumping station facility subject to the following conditions:

2.1 the Landlord (or other person) shall give reasonable prior written notice to the Tenant and the occupier of the Demised Premises of the intention to exercise such rights;

2.2 the Landlord (or other person) shall only exercise the right to execute works insofar as it cannot reasonably carry out such works from outside the Demised Premises; and

2.3 the Landlord or the person exercising such rights shall cause as little inconvenience as possible to the occupiers of the Demised Premises and make good, without delay, to the reasonable satisfaction of the Tenant any damage caused as a result to the Demised Premises.

3. A right of way at all times and all purposes with or without vehicles over and along any roads paths or ways from time to constructed upon the Demised Premises for the purpose of access to and egress from the Adjoining Land in connection with the use of such land for power generation purposes

4. The right to use the area marked "12m x 5m" on Plan 2 for the parking of motor vehicles

PROVIDED THAT any rights or easements excepted and reserved in this Schedule over anything which is not in being at the date of this Lease shall be effective only in relation to any such thing which

comes into being before the expiry of eighty (80) years from the date of this Lease (which shall be the perpetuity period applicable to it)

THIRD SCHEDULE

Deeds and Documents containing matters to which the Demised Premises are subject

1.	13.04.65	Agreement to Exchange	(1) Total Oil Refineries Limited (2) Central Electricity Generating Board
2.	23.05.66	Deed of Exchange	(1) Lindsey Oil Refinery Limited (2) Central Electricity Generating Board
3.	24.03.76	Deed of Easement	(1) British Railways Board (2) Central Electricity Generating Board
4.	27.09.82	Agreement for letting of land	(1) Central Electricity Generating Board (2) D O Chapman
5.	27.09.82	Agreement for letting of land	(1) Central Electricity Generating Board (2) J and G Chapman
6.	22.09.88	Agreement for letting of land	(1) Central Electricity Generating Board (2) Lawrence Sydney Blanshard and Jennifer Blanshard
7.	31.03.90	Deed of Easement	(1) Powergen plc and (2) National Power plc
8.	14.09.94	Deed of Grant	(1) Powergen plc and (2) Anglian Water Services Limited
9.	08.07.97	Underlease	(1) Associated British Ports and (2) Powergen plc
10.	16.07.98	Licence to fly	Immingham Model Pilots model aircraft
11.	10.02.00	Deed of Covenant	(1) Nitrogen Limited and (2) Powergen UK plc (3) The National Grid Company plc
12.	04.04.00	Deed of Mutual Easement	(1) Powergen UK plc (2) National Power plc
13.	19.07.00	Deed of Covenant	(1) Npower and (2) Powergen UK plc
14.	22.10.01	Deed of Easement	(1) Powergen plc (2) Charles Birkett Waite a duly authorised officer of National Grid

[ON LEASE]

EXECUTED AS A DEED by)
E.ON UK PLC)
acting by one Director and)
its Secretary or by two)
Directors)

Director

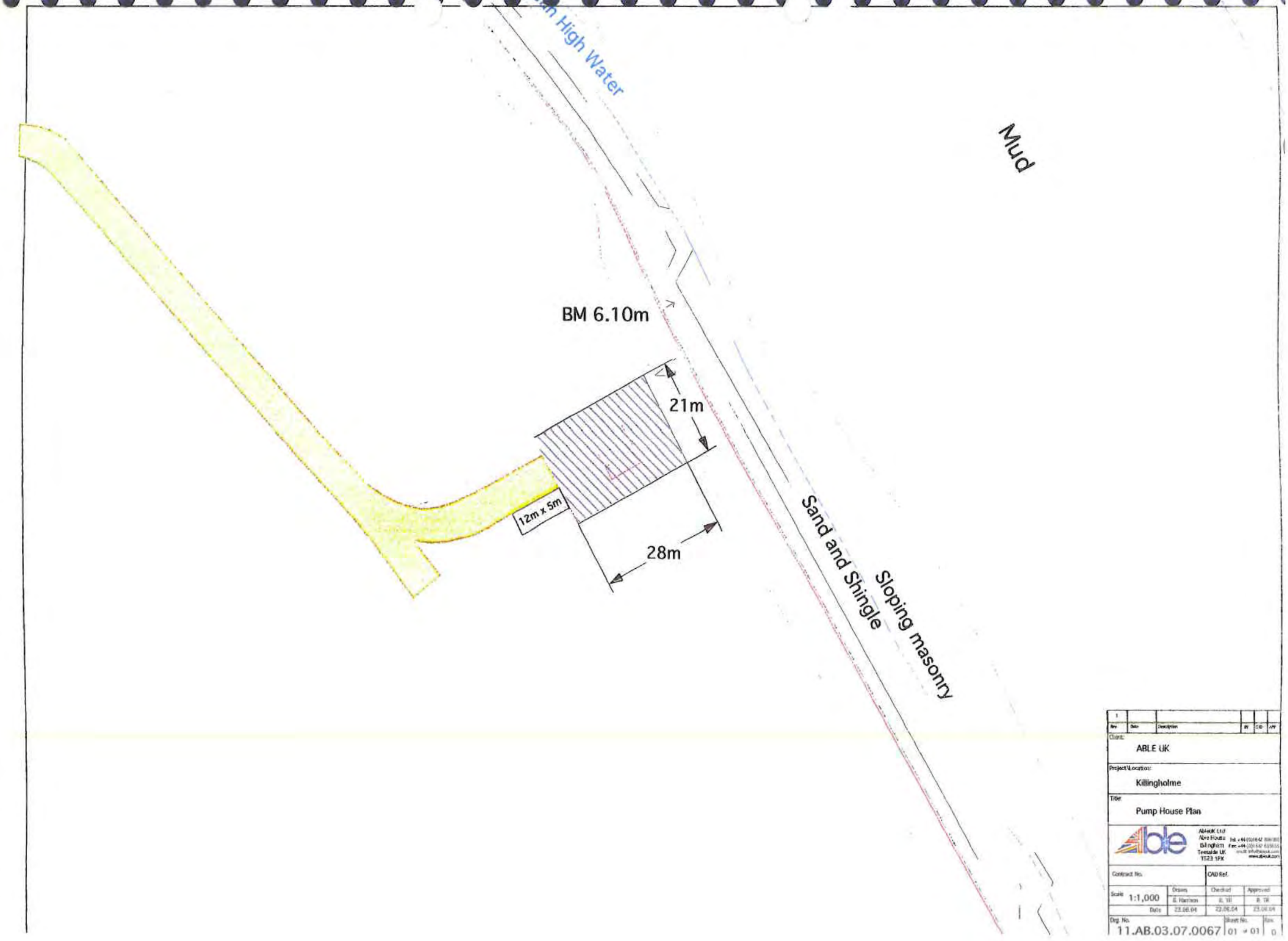
Director/Secretary

[ON COUNTERPART]
EXECUTED AS A DEED by)
[ABLE UK LIMITED)
acting by one Director)
and its Secretary or)
By two Directors)

Director [redacted]

Director/Secretary [redacted]

JWC



Rev	Date	Description	BY	CHD	APP
1					

Client: ABLE UK

Project\Location: Killingholme

Title: Pump House Plan

Able UK Ltd
Able House
Billingham
Teesside UK
TS23 1PX

Contract No. | CAD Ref.

Scale	Drawn	Checked	Approved
1:1,000	E. Harrison	R. Till	R. Till
Date	23.06.04	23.06.04	23.06.04

Dwg. No. 11.AB.03.07.0067 | Sheet No. 01 of 01 | Rev. 0

PLANNING ACT 2008

AND

THE INFRASTRUCTURE PLANNING (EXAMINATION PROCEDURE) RULES 2010

THE ABLE MARINE ENERGY PARK DEVELOPMENT CONSENT ORDER 2012

(PINS REFERENCE NUMBER: TR030001)

WRITTEN REPRESENTATIONS OF E.ON UK PLC

(UNIQUE REFERENCE NUMBER: 10015527)

APPENDIX 3.2

Deed of Grant of Easement dated 9 July 2004 between Able UK Limited (1) and E.ON UK Plc (2)

DATE 9th July 2004

ABLE UK LIMITED (1)

and

E.ONUK PLC (2)

DEED OF GRANT OF EASEMENT

relating to
land at Killingholme Power Station Lincolnshire

Needham & James
25 Meer Street
Stratford upon Avon
Warwickshire
CV37 6QB

THIS DEED is made this 9th day of July 2004

BETWEEN

(1) **Able UK Limited** (company registration number 02079397) whose registered office is at Able House Billingham Reach Industrial Estate Haveton Hill Road Billingham Cleveland TS23 1PY (**'the Grantor'**)

(2) **E.ON UK plc** (company registration number 2366970) whose registered office is at Westwood Way Westwood Business Park Coventry CV4 8LG (**'the Grantee'**)

THIS DEED WITNESSES THAT:

1. DEFINITIONS AND INTERPRETATION

1.1 In this deed, unless the context otherwise requires, the following expressions shall have the following meanings.

1.1.1 'Conducting Media' means the pipes, sewers, drains, mains, ducts, conduits, gutters, watercourses, wires, cables, laser optical fibres data or impulse transmission communication or reception systems, channels, flues and all other Conducting Media including any fixtures, louvres, cowls, covers and any other ancillary apparatus thereto

1.1.2 'Dominant Land' means the land described in Part I of Schedule 1 to this deed.

1.1.3 "Easement Strip" mean the strip of land forming part of the Servient Land and shown for the purpose of identification purposes only edged and hatched red on the Plan

1.1.4 'Level Crossing Roadway' means the roadway leading to the level crossing shown for the purposes of identification only coloured pink hatched green and the level crossing shown coloured dark green on the Plan

1.1.5 'Perpetuity Period' means the date which is eighty years from the date hereof

1.1.6 "Plan " means the plan annexed hereto

1.1.7 'the Pumping Station Roadway' means the roadway leading to the existing pumping station located on the Dominant Land from the public highway shown for the purposes of identification only coloured light green on the Plan.

1.1.8 'Rights' mean the rights set out in Schedule 2 to this deed.

1.1.9 'Servient Land' means the land described in Part II of Schedule 1 to this deed.

1.1.10 words importing one gender shall be construed as importing any other gender.

1.1.11 words importing the singular shall be construed as importing the plural and vice versa.

1.1.12 a reference to a person includes companies and all other legal entities.

1.1.13 unless this deed states otherwise, any reference to a statute, statutory instrument or other legislative provision includes any

amendments, extension or re-enactment of it for the time being in force.

1.1.14 where the Grantor or the Grantee comprises more than one person, the obligations and liabilities of that party under this deed shall be joint and several obligations and liabilities of those persons.

1.1.15 the clause headings do not form part of this deed and shall not be taken into account in its construction or interpretation.

2. GRANT OF RIGHTS

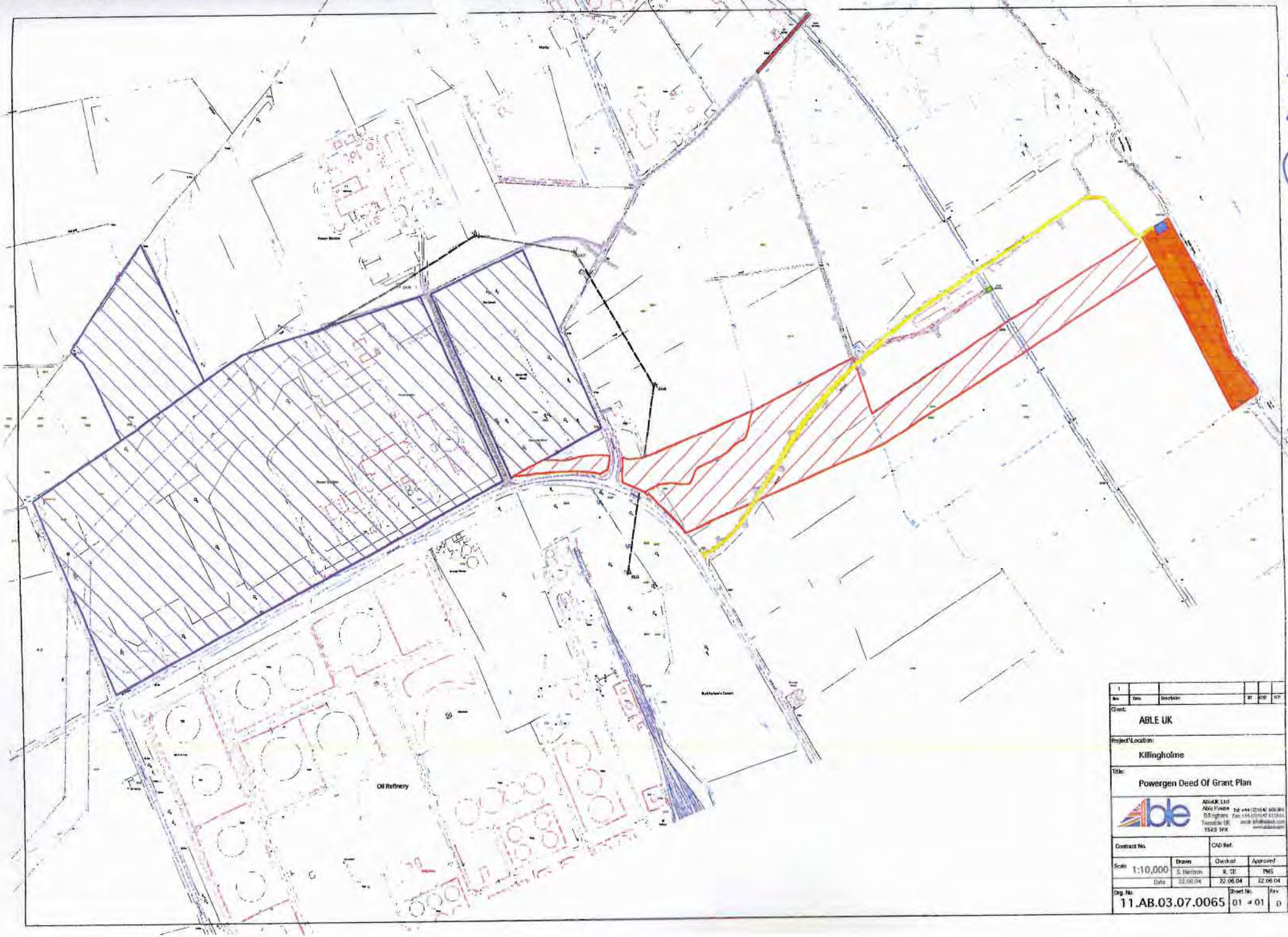
In consideration of the sum of one pound (£1), receipt of which the Grantor acknowledges, the Grantor grants the Rights to the Grantee for the benefit of the Dominant Land and each and every part thereof, with full title guarantee to hold unto the Grantee for the benefit of the Dominant Land and each and every part thereof in fee simple.

3. THE GRANTOR'S OBLIGATIONS

3.1 The Grantor covenants with the Grantee, so as to bind the Servient Land and each and every part thereof whoever may own it in the future, and for the benefit and protection of the Dominant Land and each and every part thereof, that the Grantor and his successors in title shall at all times after the date of this deed observe and perform the following stipulations and restrictions in relation to the Servient Land and the Rights:

3.1.1 the Grantor must ensure that the Rights granted by this deed are not impeded

3.1.2 the Grantor must maintain and keep in good repair and condition and keep clean and clear and unobstructed at all times subject to the Grantee's obligation to pay a fair and reasonable proportion of the costs of maintenance and upkeep the



Rev	Date	Description	BY	CHD	APP
1					

Client:
ABLE UK

Project\Location:
Killingholme

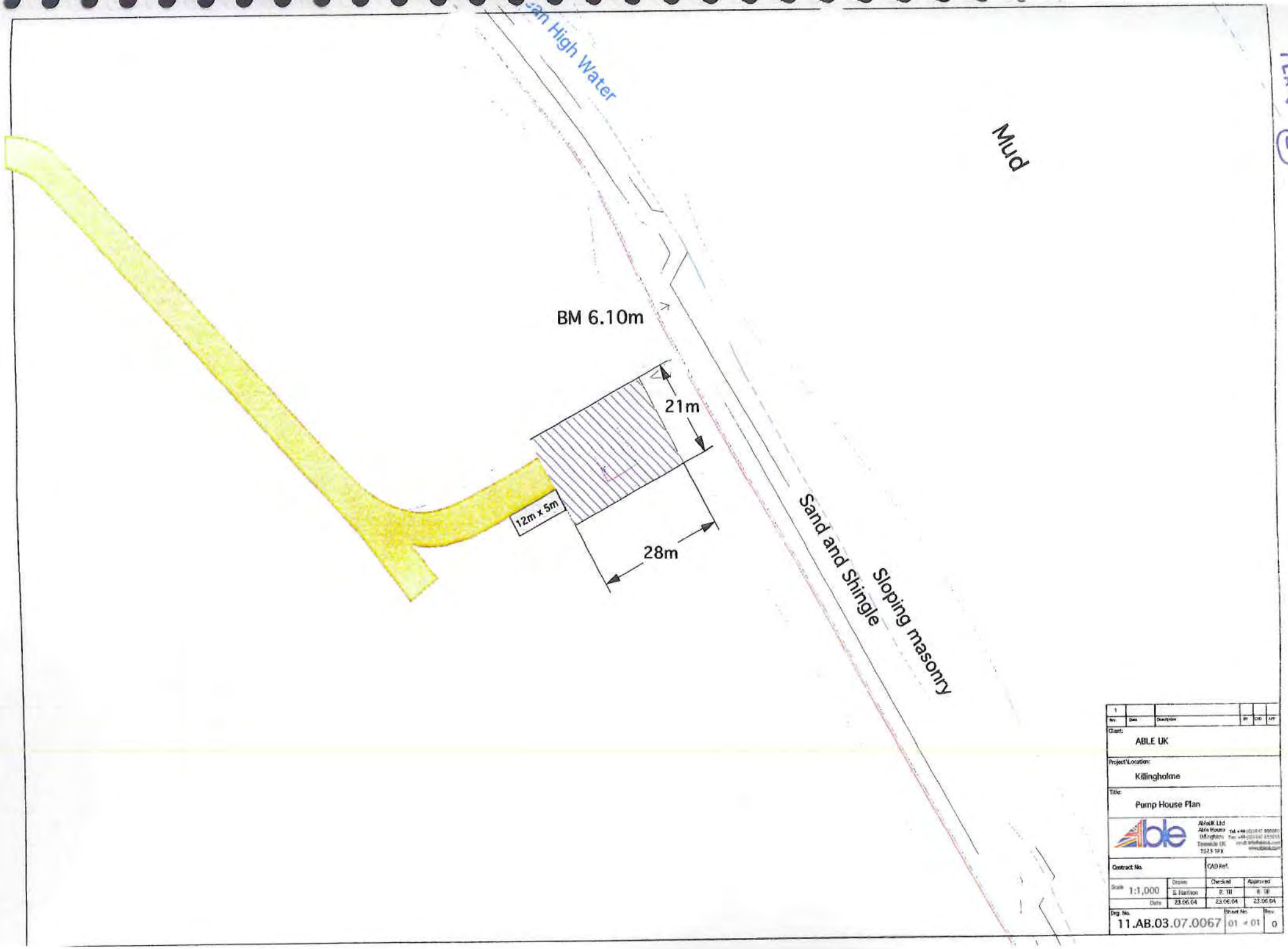
Title:
Powergen Deed Of Grant Plan

ABLE UK Ltd
Able House
Billingham
Teesside UK
TS23 1PX
Tel: +44 (0)1642 806806
Fax: +44 (0)1642 815814
email: info@ableuk.com
www.ableuk.com

Contract No.		CAD Ref.	
Scale 1:10,000	Drawn	Checked	Approved
	S. Harrison	R. Till	TMS
Date	22.06.04	22.06.04	22.06.04

Drg. No.	Sheet No.	Rev
11.AB.03.07.0065	01 of 01	0

PFA (1)



PLAN (2)

Rev.	Date	Description	BY	CHD	APP
1					

Client: ABLE UK

Project/Location: Killingholme

Title: Pump House Plan

Able UK Ltd
Able House
Billingham
Teesside UK
TS23 1PX

Contract No.

CAD Ref.

Scale	Drawn	Checked	Approved
1:1,000	S. Harrison	P. Till	P. Till
Date	23.06.04	23.06.04	23.06.04

Drg. No. 11.AB.03.07.0067

Sheet No. 01 of 01

Rev. 0

3.1.2.1 the Pumping Station Roadway

3.1.2.3 the Level Crossing Roadway

3.1.3 Not to do or omit or permit or suffer to be done upon the Easement Strip or interfere with or obstruct the Grantee's access thereto and without prejudice to the generality of the foregoing not to place or permit to be placed any item or permit any building or other erection to be constructed on the Easement Strip and that no trees shall be planted over the Easement Strip **Provided Always** that the Grantor may subject to obtaining the prior written consent of the Grantee (such consent not to be unreasonably withheld or delayed) carry out the following works to the Easement Strip:-

3.1.3.1 surfacing or ground works to allow it to be used for external storage;

3.1.3.2 the laying and construction of access and other roads;

3.1.3.3 the laying of conducting and service media;

3.1.3.4 provision of lighting and CCTV towers;

3.1.3.5 the erection of fencing;

3.1.3.6 drainage works;

3.1.3.7 the construction of temporary buildings (without foundations).

Provided Always that :-

(a) any application by the Grantor for consent shall be accompanied by full proposals (including detailed specification and programme) for such works and for the protection of any existing service media (and access thereto).

(b) that the Grantor shall at its own cost and expense incorporate into the proposed works any additional works that the Grantee shall require for the protection of any existing service media (and access thereto)

(c) that the Grantor shall not commence the works (after the consent of the Grantee has been obtained) without giving to the Grantee fifteen (15) Working days notice of the Grantor's proposals to commence such works

(d) that if required by the Grantee the Grantor shall not carry out any such works without a representative of the Grantee being afforded the opportunity to be in attendance

AND PROVIDED FURTHER that notwithstanding the provisions above the Grantor shall at its own cost and expense on six (6) months notice from the Grantee to the Grantor (if reasonably required so to do by the Grantee) remove from in on or over the Easement Strip or move to another part of the Easement Strip (such position to be agreed with the Grantee) any of the works referred to above and in the event that the Grantor fails to do so within the said six (6) month period the Grantee shall be entitled to enter upon the Easement Strip with or without workmen plant and machinery and remain thereon for the purpose of removing any such items and the Grantor shall indemnify and keep indemnified the Grantee from and against all costs claims expenses damages and liabilities relating to the same.

3.1.4 not to alter the ground cover or depth of soil over the Easement Strip other than as permitted under clause 3.1.3 hereof

3.1.5 not to carry out a disposal of any part of the Servient Land (other than the granting of a legal charge or the grant of a rack rent lease provided that such charge or lease are completed subject to the provisions of this Deed) without procuring that the "disponee" enter into a Deed of Covenant with the Grantee to perform the obligations set out in this Clause 3

4. THE GRANTEE'S OBLIGATIONS

4.1 The Grantee covenants with the Grantor, so as to bind the Dominant Land whoever may own it in the future, and for the benefit of the Servient Land, that the Grantee and his successors in title shall at all times after the date of this deed observe and perform the following stipulations and restrictions in relation to the Dominant Land:

4.1.1 the Grantee will make a proper and reasonable contribution towards the costs of maintaining

4.1.1.1 the Pumping Station Roadway

4.1.1.2 the Level Crossing Roadway

according to user

4.1.2 that the person or persons exercising the Rights will act carefully and reasonably and cause as little damage and inconvenience as reasonably practicable and in doing so will make good at their own cost immediately any damage caused to the Servient Land

5. INDEMNITY

The Grantee covenants with the Grantor to keep the Grantor indemnified from and against any act, loss, damage or liability directly arising from the exercise of the Rights by the Grantee

6. EXTENT OF RIGHTS GRANTED

6.1 All rights not specifically and expressly included in the Rights are reserved to the Grantor.

6.2 Unless otherwise stated, the Rights are not exclusive and are granted in common with corresponding rights of the Grantor and other persons lawfully entitled to exercise such rights.

7. PERPETUITY PERIOD

The Rights shall be exercisable only if they or their subject matter shall come into existence within a period of 80 years from the date of this deed, which shall be the perpetuity period applicable to this deed.

8. RIGHTS OF THIRD PARTIES

A person who is not a party to this deed has no right under the Contracts (Rights of Third Parties) Act 1999 to enforce any term of this deed but this does not affect any right or remedy of a third party which exists or is available apart from that Act

9. APPLICATION TO CHIEF LAND REGISTRAR

9.1. The Grantor will apply to the Chief Land Registrar to enter notice of the Rights granted by this deed in the registers of title to the Servient Land

9.2 The parties hereby apply to the Chief Land Registrar for the following restriction to be registered against the Proprietorship Register of the Servient Land:-

"no disposition of the registered estate by the proprietor of the registered estate or by the proprietor of any registered charge is to be registered without a written consent signed by E.ON UK Plc (or its Solicitors) confirming that the provisions of Clause 3.1.5 of the Deed of Grant of Easement dated [ ] 2004 made between Able UK Limited (1) and E.ON UK Plc (2) have been complied with"

SCHEDULE 1

Part I

The Dominant Land

All those freehold and leasehold land and buildings known as land at Killingholme being:-

1. the areas shown for the purposes of identification only edged blue and hatched blue, coloured blue and coloured orange on the Plan, and
2. the leasehold land registered under title number HS273152

Part II

The Servient Land

All those freehold land and buildings known as land at Killingholme, Lincolnshire belonging to the Grantor being:-

1. the land registered under Title Number HS287158; and
2. the freehold property transferred to the Grantor by way of the transfer of even date made between the Grantee (1) and the Grantor (2)

SCHEDULE 2

The Rights

1. Pumping Station Roadway

Subject as to the conditions mentioned in paragraph 3 below and (if applicable) to the terms of the Deed dated 24 March 1976 made between (1) British Railways Board and (2) the Central Electricity Generating Board right of way at all times and for all purposes associated with the use of the Dominant Land over the Pumping Station Roadway for the Grantee its successors in title and all others

authorised by them or without vehicles for the purposes of gaining access to and egress from the Dominant Land

2. Level Crossing Roadway

The right (subject to the following conditions) of way at all times and for all purposes associated with the use of the Dominant Land with or without vehicles for the purposes of gaining access to and egress from the Dominant Land over the Level Crossing Roadway and thereafter so much of the Servient Land as is required to give access to and egress from the Dominant Land. The conditions are as follows:

2.1 the exercise of the right shall be subject to the Grantor's consent (such consent not to be unreasonably withheld or delayed)

2.2 the Grantee shall give to the Grantor not less than 28 days prior written notice of its desire to exercise the right

2.3 the Grantor acting reasonably at all times shall have the right to specify the route over which the right shall be exercised over that part of the Servient Land between the eastern side of the level crossing shown coloured green on the Plan and the Dominant Land

2.4 the Grantee shall pay all of the Grantor's proper and reasonable costs and expenses in connection with the exercise of the Rights

3. Conditions

3.1 The Pumping Station Roadway and bridge shall not be used by vehicles which exceed the permissible maximum weight limit of 40 tonnes and in case such weight limits are exceeded by the Grantee or other persons authorised by the Grantee shall at its own expense forthwith remedy or cause to be remedied any damage caused to the said roadway and/or bridge as a result of the transportation over the said roadway and/or bridge or any load in excess of such weight limits

3.2 The Grantor shall have the right at any time within the Perpetuity Period with the prior consent of the Grantee to substitute for the said roadway(s) other suitable alternative roadways which shall be constructed at the cost

of the Grantor to a load bearing capacity not less than that or those which is or are being replaced; and

3.3 In the event that the roadway and/or bridge over which rights of way are from time to time granted to the Grantee hereunder shall at any time within the Perpetuity Period be of a specification or condition which is inadequate having regard to the loads which the Grantee wishes to transport across such roadway and/or bridge then the Grantee may with the Grantor's prior consent (such consent not to be unreasonably withheld or delayed) enter the Servient Land with or without vehicles, workmen, plant and machinery and remain thereon and at the Grantee's expense (save that if the works hereinafter in this paragraph mentioned are carried out as a result of a breach by the Grantee of its obligations within clause 3 to this Deed then at the Grantor's expense) carry out such works to the roadway/bridge as are necessary to enable the roadway and/or bridge to withstand such loads as aforesaid PROVIDED THAT in carrying out such works the Grantee shall cause as little interference as possible to the Grantor and shall reinstate any damage caused to the Servient Land as a result thereof PROVIDED THAT the Grantee shall give the Grantor seven working days previous notice in writing of its intention to exercise its rights over the bridge

4. Easement Strip

4.1 The right to the free and uninterrupted passage and running to and from the Dominant Land of gas, water, electricity, steam, soil, telecommunications and all other services in on over through and along the Conducting Media from time to time in on over or under the Easement Strip for the use and enjoyment of the Dominant Land

4.2 The right to enter onto the Easement Strip at reasonable times and upon reasonable notice to the Grantor (save in the case of emergency) and those parts of the Servient Land adjoining the same with or without workmen

plant and machinery and to remain thereon in order to retain, lay, construct, erect, clean, inspect, maintain, replace, renew or upgrade any Conducting Media provided always that the person or persons exercising such rights will act carefully and reasonably and to cause as little damage and inconvenience as reasonably practicable and in doing will make good at their own costs immediately any damage caused to the Servient Land in exercising those rights

4.3 The right to enter upon the Servient Land at all times with or without vehicles plant and machinery and to remain thereon so as to rectify any default of the Grantor of its obligations contained in Clause 3 of the this Deed

Executed as a Deed by
ABLE UK LIMITED
acting by:-

Director [redacted]

Director/Secretary [redacted]

Executed as a Deed by
E.ON UK PLC
acting by:-

Director

Director/Secretary

PLANNING ACT 2008

AND

THE INFRASTRUCTURE PLANNING (EXAMINATION PROCEDURE) RULES 2010

THE ABLE MARINE ENERGY PARK DEVELOPMENT CONSENT ORDER 2012

(PINS REFERENCE NUMBER: TR030001)

WRITTEN REPRESENTATIONS OF E.ON UK PLC

(UNIQUE REFERENCE NUMBER: 10015527)

APPENDIX 3.3

Table of land interests from the Book of Reference

Plot Number	***Status of Land***	***Comments***
04017	Non-Operational	Freehold vested in E.ON UK plc leased to Able UK Limited Not objecting to Compulsory Acquisition
04018	Non- Operational	Freehold vested in E.ON leased to Able, easement for Anglian Water effluent discharge. Concerns about re-routing of pipeline and impact on E.ON assets. Not objecting to Compulsory Acquisition.
04021	Non -Operational	Freehold vested in E.ON leased to Able. Not objecting to Compulsory Acquisition.
04023	Operational	Easement for protection of Existing Cooling Water Intake and Outfall Pipes. Required for protection, maintenance, repair, replacement and renewal. Object to Compulsory Acquisition.
04024	Operational	As 04023 above, identifies where rail track crosses site. Object to Compulsory Acquisition
04027	Operational	As 04023 above. Object to compulsory Acquisition
04028	Operational	As 04023 above, identifies where access road crosses easement. Object to Compulsory Acquisition.
04029	Operational	As 04023 above Object to Compulsory Acquisition.

04030	Non-Operational	Identifies private access road over which E.ON in common with others enjoys a right of way. Not objecting to compulsory acquisition.
Plot Number	***Status***	***Comment***
05003	Operational	As 04023 above appears also to identify a drainage ditch. Object to Compulsory Acquisition
05004	Operational	As 04023 above, appears also to identify drainage channel. Object to Compulsory Purchase
05005	Operational	As 04023 above, Object to Compulsory Acquisition.
05007	Operational	As 04023 above, appears also to identify drainage channel. Object to Compulsory Acquisition
05008	Operational	As 04023 above, also identifies private access road over which E.ON has a right of way. Object to Compulsory Acquisition.
05009	Operational	As 04023 above, Object to Compulsory Acquisition
05010	Operational	Shows Proposal by Able for a reduced easement corridor which is insufficient for E.ONs operational purposes Object to Compulsory Acquisition.
05011	Operational	As 04023 above. Object to Compulsory Acquisition

05012	Operational	Identifies Ables proposal for a reduced easement corridor where it is crossed by the private access road. Object to Compulsory Acquisition
Plot Number	***Status***	***Comments***
05013	Operational	As 04023 above, also identifies private access road over which E.ON has a right of way. Object to Compulsory Acquisition
05014	Operational	As 04023 above. Object to Compulsory Acquisition.
05015	Operational	Area identified as being between the existing easement and the easement proposed by Able. Object to Compulsory Acquisition
05016	Operational	Shows narrow easement corridor proposed by Able which is outside existing easement corridor. Object to Compulsory Acquisition.
05019	Operational	Shows Proposal by Able for a reduced easement corridor which is insufficient for E.ONs Operational Purposes. Object to Compulsory Acquisition.
05020	Non- Operational	Access rights for the benefit of E.ON are not identified. Not objecting to compulsory acquisition.
05021	Non- Operational	Identifies private access road over which E.ON has a right of way. Not objecting to compulsory acquisition.

05024	Non-Operational	As 05021 above, but identifies where rail track is bridged by road. Not objecting to compulsory acquisition.
05025	Non- Operational	Shows rail track but doesn't identify level crossing over which E.ON has a right of way. Not objecting to compulsory acquisition.
Plot Number	***Status***	***Comments***
05026	Operational	As 4023 above. Identifies easement where it crosses rail track. Object to Compulsory Acquisition.
05027	Operational	Shows proposal by Able for a reduced easement width where it crosses the rail track. Object to Compulsory Acquisition.
05028	Operational	As 4023 above, identifies easement where it crosses rail track. Object to Compulsory Acquisition.
05031	Non Operational	Identifies access road to Centrica Pump House. Not objecting to compulsory acquisition.
05032	Non Operational	Identifies private access road over which E.ON has a right of way giving access to EONs Pump House which is essential to the Operational Integrity of the Killingholme Power Station. (04030, 04028, 05008, 05013, 05021, 05024, 05032 also refer). Not objecting to compulsory acquisition.
05036	Operational	As 04023 above. Object to Compulsory Acquisition.

05037	Operational	Shows reduced easement proposed by Able which is insufficient for operational purposes. Object to Compulsory Purchase.
05038	Operational	As 04023 above Object to Compulsory Acquisition.
Plot Number	***Status***	***Comments***
05039	Operational	Freehold vested in E.ON Lease to Able required for access to the Pump House as stated above the Pump House is essential to the operational integrity of the cooling water system and power station. Object to Compulsory Acquisition.
05040	Operational	Freehold vested in E.ON Lease to Able. Identifies proposed cooling water easement proposed by Able. Note that easement is not shown on other side of pump house nor is any facility shown for the parking of vehicles. Object to Compulsory Purchase.
05041	Operational	E.ON Freehold subject to Able Lease see comment 05039 and 05040 above. Object to Compulsory Purchase.
05044 and 6006	Operational	Land adjacent to Chase Hill Wood no provision shown for Cooling water easement. Object to Compulsory Acquisition.

06004	Non Operational	Land reserved for road improvements no objection provided access is maintained.

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THE ABLE MARINE ENERGY PARK DEVELOPMENT CONSENT ORDER 2012

(PINS REFERENCE NUMBER: TR030001)

WRITTEN REPRESENTATIONS OF E.ON UK PLC

(UNIQUE REFERENCE NUMBER: 10015527)

APPENDIX 4

Note of meeting with undertaker held 23 April 2012

(Prepared by E.ON and submitted to Able on 1 May 2012)

Able Marine Energy Park Proposal Review Meeting

23rd April, 2012
E.ON UK, Westwood House

E.ON UK

Rob Griffin	Generation Operations Environment Manager
Eleanore Merrills	Trainee solicitor
Steve Pace	Killingholme Plant Manager
Jennifer Parsons	Environmental Advisor
Richard Rodgers	Property Management Senior Surveyor
Tom Staff	Killingholme Environment and Chemistry Team Leader
Steven Wilson	Technical Project Development

Able UK

Richard Cram	Able UK Ltd design director
Peter Stephenson	Able UK Ltd Executive Chairman

- Introduction from RG – Covering our IPC objection; simply put in to ensure that E.ON are able to remain in the consulting process and not stopping our wish to continue to work with Able.
- Introduction from PS – Objective is to accommodate questions already raised and provide more information. As well as discussing position during the presentation, Able will complete a formal document covering discussion topics and questions for E.ON.
- PS set out that Able's target within the IPC Process is to have statements of common ground prepared by 15th June 2012.
- PS informed the meeting that Able UK is owned by Elba (Jersey established in 2004) and Able Humber Ports Ltd now own Killingholme land (previously purchased by Able UK Ltd in 2004). Able are agents for Elba and Able Humber Ports Ltd. Legal agreements are therefore required to be with Able Humber Ports Ltd.

Areas of discussion

1. The land acquisition and the proposed revised Easement Corridor
2. The potential impact of construction activities on both the power station pipes and the intake and outfall points
3. The effect on E.ON intake and outfall points of sedimentation during construction and operation of the AMEP and the dredging strategy proposed
4. Any other business

1. Land Acquisition

E.ON set out their position with regards to the width of easement required to remain in order to maintain, repair or replace pipework. Able commented that the widest corridor required in any of their previous projects has been 20 metres wide, and the proposed 6 metres was as an Industry standard, with a 7m corridor being representative of what was used on their own pipelines.

In response E.ON stated that, regarding the asset in the ground for current usage and repair or replacement (with consideration to soil storage, pipe lay-out, vehicle and plant access, pipe trench, safe distance and CDM requirements) with the two pipes being side by side, various utilities and a 6.6Kv Cable, it was considered that a minimum corridor width of 23 metres was required along the entire length of the pipe. The width proposed by E.ON also takes the depth of the pipe into consideration.
It was agreed that Able would provide details to explain the rationale behind their proposed 6m corridor. E.ON would then review this against the information prepared for the 23m requirement and would

respond to Able with their position. Able stated that a corridor of this width would have a significant impact on their development.

E.ON set out that both during construction and operation of the Able Marine Energy Park (AMEP), the ability to access the pipes inspection hatches would need to be maintained. To date, there have been no problems experienced gaining access; it was agreed by Able that there is no reason for this to change and they will work with E.ON to ensure access continues as previously.

Proposal for purchase

At this point, it was agreed by both parties that the financial aspect of the sale (including the negotiations for the freehold area at the front of the quay) would be discussed after agreements had been reached on the proposals for the easement corridor.

2. Impact of construction activities

Able highlighted that the plans for construction of the AMEP would not require ground levels to be raised, and that the current (and forward) agreement between E.ON and Able requires a written application from Able when a crossing or ground raising is required, with E.ON agreeing this prior to construction or use.

Able detailed that the main equipment being used for transport on the road that will cross over the pipes will be a self propelled mobile trailer, which puts down a weight of 10 tonnes per m^3. A crawler crane may also be used which would be heavier. If pipelines are to be crossed, written proposals would be submitted to E.ON by Able detailing the type and method of construction and of reinforcement measures that would be put in to protect from any loading weight. In addition, Able agreed to submit detailed plans and associated method statements for agreement of any piling activity that was to take place in proximity to the pipelines, which Able confirmed would be required, noting this would be carried out using low vibration methods.

E.ON have requested specific plans around crossings, depths and proximity of buildings close to the sensitive pipelines, which Able have agreed to forward once they have fixed plans. Able also confirmed that within the current proposal, any changes within the current easement range would have to be approved in advance by E.ON.

Able agreed to provide an outline of proposed wording between Able and E.ON to detail the requirement to give information and receive approval from E.ON prior to carrying out any of the above work.

E.ON stated that they wished to ensure that there is no risk of damage to the intake and outfall pipes during construction and operation of the AMEC. Able confirmed that the closest to the pipes that they would be operating would be 76 metres, with 100 metres to the nearest piling. They also confirmed that there will be rock armouring around the land based plant. E.ON requested more information about the construction around the intake / outfall pipes, and vessel movement in the area. In addition E.ON asked that a system put in place to allow for construction monitoring and the agreement of trigger points for communication between Able and E.ON relating to any aspects that could cause problems, in a similar way to monitoring contractors who may be working near overhead cable.

Able commented that they do not believe that monitoring is required, and explained that although the IPC was a high level overview which did not include thorough information around this construction and dredging, it has been captured further in their detailed plans.

E.ON has therefore requested a review of these plans, as well as detailed method statements of the work proposed and how different aspects of the construction will be controlled as they become available.

With regards to vessel management, Able assured E.ON that the tracking accuracy of vessels in the region will be within 10/20cm of where their plough / dredging equipment would be, and that extra room will be allowed when working near any pipe. Able confirmed that the method statement discussed

will be put together and sent through to E.ON for agreement prior to action, with plenty of notice made to resolve any potential areas of concern.

3. Sedimentation during construction and operation.

E.ON raised the concern that sedimentation during construction and operation has the most potential to be a difficult and long running issue, for which there is no detail covered in the IPC documentation on how this will be managed. To date, there have been no sedimentation issues that have reduced or impacted upon operation or plant. E.ON would like assurance that this well established good flow operation will continue.

Able commented that they considered there to be no problem based on previous experience in dredging / monitoring and screening experience with another power station in a similar coastal position, albeit one with much lower turbity. Able commented that it was their belief that sedimentation was far more impacted by storm conditions than could be caused by the construction and operation of the AMEP. E.ON responded that there was no data within the modelling studies to support this.

Able also stated that the hopper concerns should not be an issue; the hopper can only operate on overflow when dredging sand, whereas the dredging that will happen in proximity of the intake and outfall points at Killingholme will be silt.

Whilst it was accepted that sedimentation modelling is not as accurate as, for instance air emission plume modelling because of the unknown factors such as the speed of the estuarine flow, the subsequent long term modelling information provided to E.ON shows a much lower confidence in the bed erosion and siltation build up around the outfall than had previously been reported. Indeed, with regards to the siltation, Able commented there was likely to be an issue surrounding the outfall. E.ON indicated to Able their intention to begin baseline monitoring of Suspended Sedimentation Concentration prior to commencement of any construction activity. It was noted that any support that Able can provide with information towards monitoring requirements (such as weather monitoring) would be gratefully received.

E.ON set out their expectation that if there is a problem with sedimentation going forward, that this would be reviewed and corrected as soon as possible and that the timescales and process for achieving this would be documented and agreed with E.ON prior to any commencement of construction activities. Able suggested an overview of their learning from previous development at Hartlepool would be good to pass on from an operational point rather than a sedimentation view (as there is no comparison in water flow).

Able confirmed that the Quay has already been moved back to reduce the eroding impact, along with the inclusion of protection of the bed with unerodable material around the outfall. As a fall back, the proposal shows a diversion of the outfall pipe. Any alternatives to the current placement and operation of the pipe require would require a full review by E.ON to consider issues such as regulatory requirements, as impacts in this area are uncertain. Able have agreed to give E.ON an overview of the various options that have been suggested, and also propose a meeting with the EA to discuss barriers. E.ON would be grateful to receive a copy of the various alternatives, but will continue to review in house before independently discussing with the competent authority.

E.ON raised the issue of the lack of detailed information available to date regarding a proposed dredging strategy to maintain acceptable sedimentation levels around the intake and outfall. Able expressed a preference to examine alternative options to achieve this aim initially, but would provide an initial draft Dredging Strategy to E.ON in the mean time. Able also commented that a requirement for very regular dredging (the example given being every 5 months) wouldn't be acceptable to them.

It was agreed by both parties that a workshop to go through possible sedimentation issues and solutions should be arranged. The detailed quay design is still being finalised by Able and is likely to be completed by October 2012, with construction proposed to begin Summer 2013.

Able advised that they had a timeframe of 15 June 2012 for IPC statements of common ground on unresolved issues.

4. Other business

Able also discussed the requirement for diversion of an Anglian water pipe, which is currently placed in the middle of the quay and may need to cross Killingholme pipe work. It was agreed that information relating to this (and any other works that may go through the E.ON easement or across the pipework), including modelling and water sampling, would need to be reviewed and agreed by E.ON prior to work. When questioned, Able commented that they did not know what was being discharged from the pipe currently.

E.ON agreed to forward future outage plans that may support construction work for Able; however it was noted that these dates are subject to change at short notice.

Able agreed to provide available dates for workshop to Rob Griffin as soon as possible.

For future liaison, it was agreed that contact should be made through Rob Griffin (E.ON UK Generation Operations Environment Manager). For any Legal matters, contact should be addressed to Eleanore Merrills (E.ON UK Trainee Solicitor).

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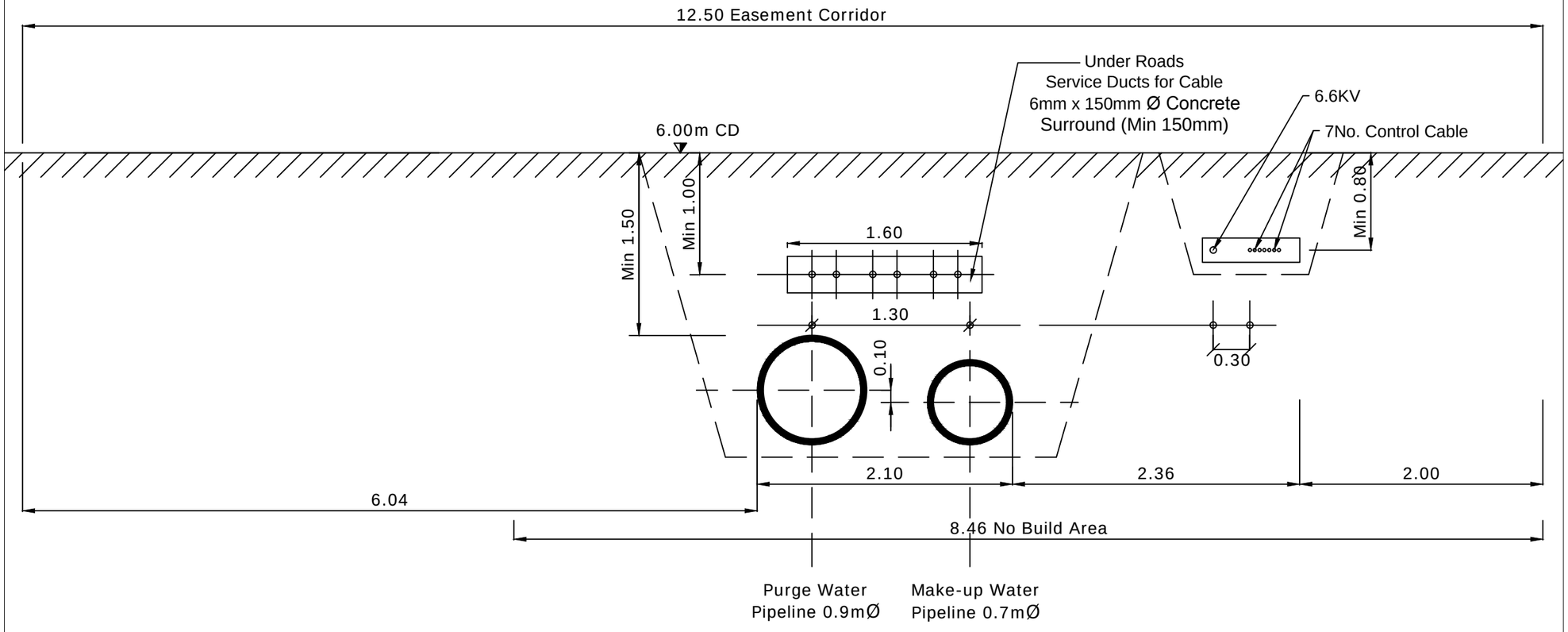
(PINS REFERENCE NUMBER: TR030001)

WRITTEN REPRESENTATIONS OF E.ON UK PLC

(UNIQUE REFERENCE NUMBER: 10015527)

APPENDIX 5

Drawings provided by the undertaker on 17 May 2012



e.On Pipeline - Typical Section

KEY

Notes:

1. All dimensions in metres (m) unless stated otherwise

Rev	Date	Comments	Drw	Chk	App
B	01/05/12	No Build Area Added	JH	PMS	PMS
A	26/04/12	Preliminary Issue	JH	PMS	PMS

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www ableuk.com

Project: ABLE Marine Energy Park

Client: Able UK Ltd

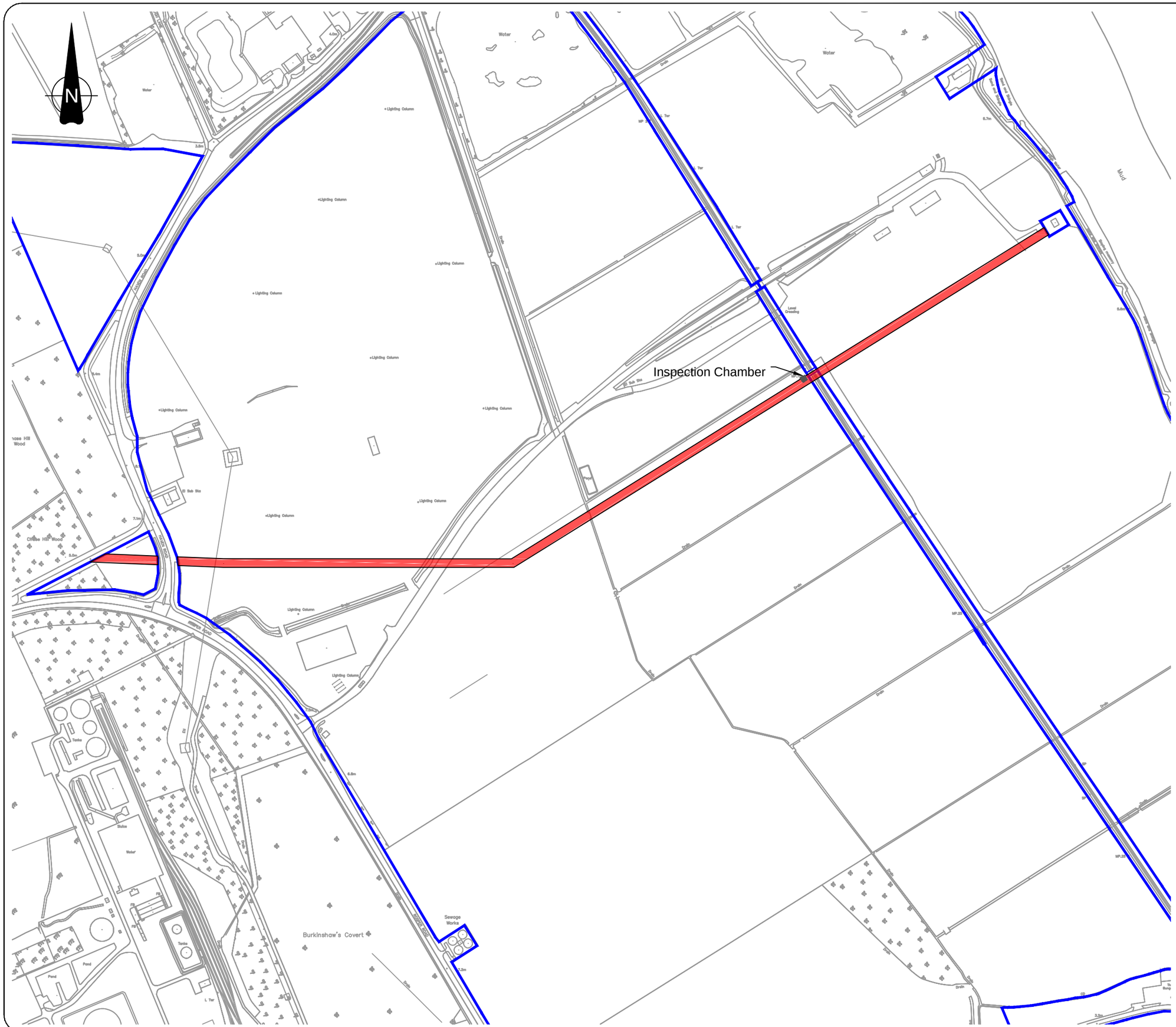
Title: e.On Pipeline - Typical Section

PRELIMINARY

Scale:	Drawn	Checked	Approved
1:40@A3	J Harris	PMS	PMS
Date	26/04/2012	26/04/2012	26/04/2012

Drawing No. AME - 03033

Revision: B



KEY

- Estates Boundary
- Proposed 12.5m Wide Corridor
- Inspection Chamber

	Area(m²)	Length(m)
Triangle Area	988	83
AMEP Main	15,987	1,332
Total	16,975	1,415

Rev	Date	Comments	Drw	Chk	App
C	01/05/12	Rights Land Removed	FM	PMS	PMS
B	25/04/12	Corridor Amended	JH	PMS	PMS
A	23/04/12	Preliminary Issue	RK	PMS	PMS

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www ableuk.com

Project: Able Marine Energy Park

Client: Able Humber Ports Ltd

Title: EON AMEP Easement Corridor

PRELIMINARY

Scale:	Drawn	Checked	Approved
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Date	23/04/2012	23/04/2012	23/04/2012

Drawing No. AME - 08093

Revision: C

PLANNING ACT 2008

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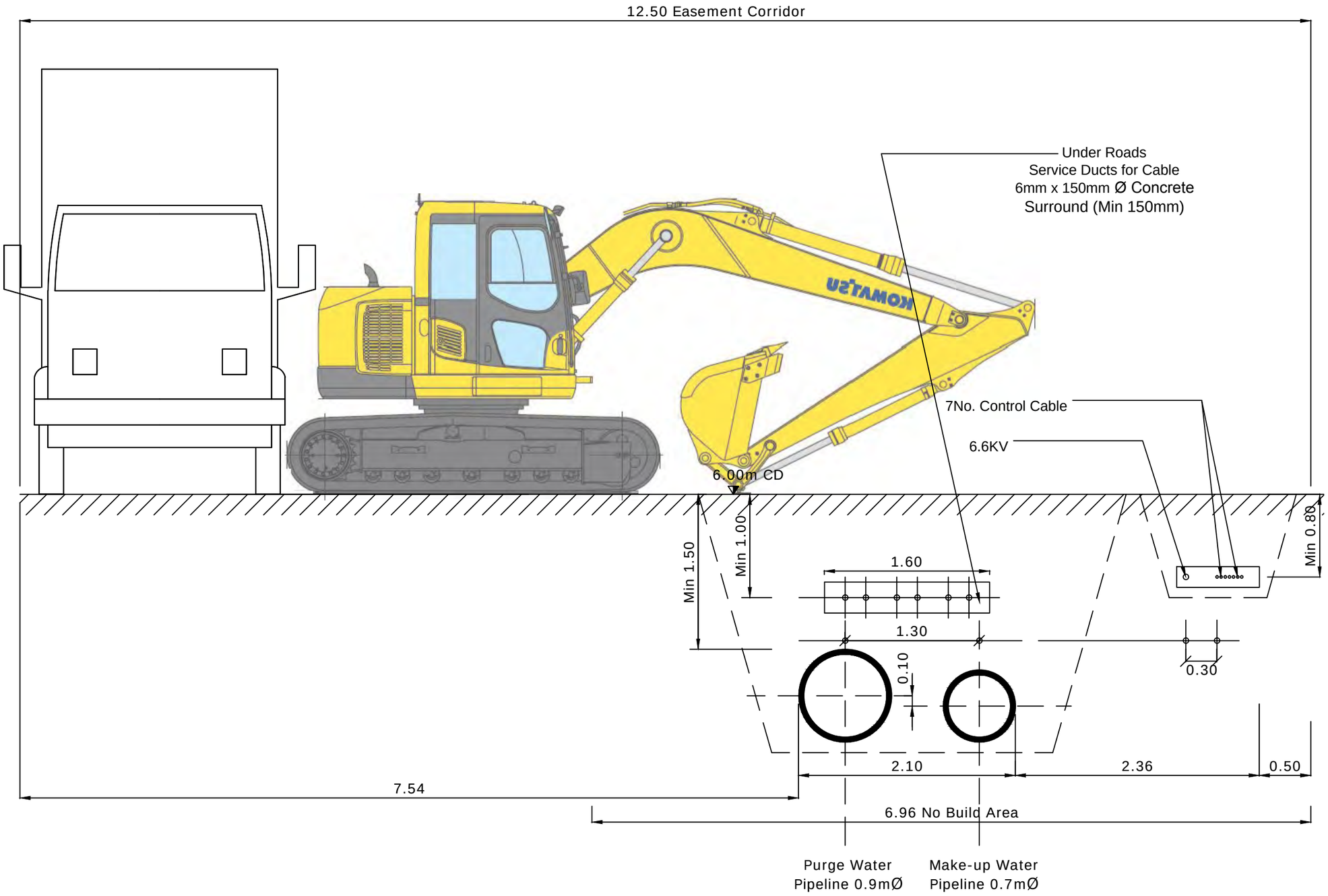
(PINS REFERENCE NUMBER: TR030001)

WRITTEN REPRESENTATIONS OF E.ON UK PLC

(UNIQUE REFERENCE NUMBER: 10015527)

APPENDIX 6

Drawings provided by the undertaker on 22 June 2012



e.On Pipeline - Typical Section

KEY

Notes:

1. All dimensions in metres (m) unless stated otherwise

Rev	Date	Comments	Drw	Chk	App
C	30/05/12	Dimensions Ammended	FM		
B	01/05/12	No Build Area Added	JH	PMS	PMS
A	26/04/12	Preliminary Issue	JH	PMS	PMS

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Project: ABLE Marine Energy Park

Client: Able UK Ltd

Title: e.On Pipeline - Typical Section

PRELIMINARY

Scale:	Drawn	Checked	Approved
1:40@A3	J Harris	PMS	PMS
Date	26/04/2012	26/04/2012	26/04/2012

Drawing No. AME - 03033

Revision: C

PLANNING ACT 2008

AND

THE INFRASTRUCTURE PLANNING (EXAMINATION PROCEDURE) RULES 2010

THE ABLE MARINE ENERGY PARK DEVELOPMENT CONSENT ORDER 2012

(PINS REFERENCE NUMBER: TR030001)

WRITTEN REPRESENTATIONS OF E.ON UK PLC

(UNIQUE REFERENCE NUMBER: 10015527)

APPENDIX 7

Report by Capita Symonds : CW Pipelines, Permanent Easement Report for Killingholme Power Station, June 2012

CW PIPELINES - PERMANENT EASEMENT REPORT

FOR

KILLINGHOLME POWER STATION

JUNE 2012

Capita Symonds
6,Bowood Court
Calver Road
Warrington
WA2 8QZ
Tel: 01925 418333

CAPITA SYMONDS

successful people, projects and performance

Contents

APPENDICES

Date:	Prepared by:	Checked by:	Approved by:
June 2012	Dave Morgan	Karl Johnson	Karl Johnson

1. Introduction

E.ON UK have a 'permanent easement' agreement over the CW pipelines and associated HV cables / potable water supply that are routed to the east of Killingholme Power Station to the River Humber.

A Developer wishes to build on the land to the east of the Power Station and in doing so requests the 'permanent easement' to be reduced to 12.5m. (see Appendix 1 for proposed 12.5m Corridor – Drawing No.AME-08093 and Drawing No. AME-02006 for proposed development Masterplan)

Capita Symonds is a leading consultancy in managing pipeline construction projects on behalf of utility based clients. E.ON UK has therefore requested that Capita Symonds compile a report to determine the minimum width of Permanent Easement required and if the proposed reduction of Permanent Easement to 12.5m is acceptable and on the grounds of safety and practibility.

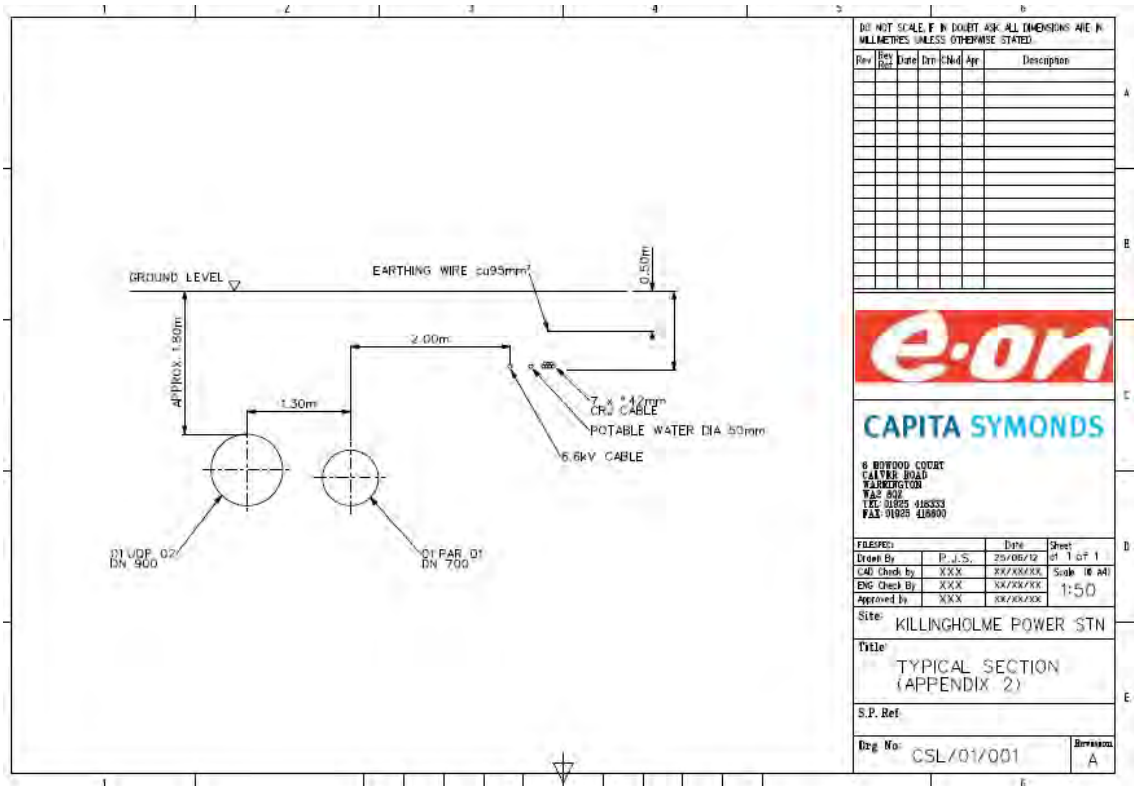
2 Scope of Works

Capita Symonds have been instructed to review the request by the Developer to reduce the permanent easement' to 12.5m and advise if this is acceptable. In doing so Capita Symonds will assess the proposal based on current and recent knowledge and experience of pipeline construction projects and the princples of Working at Heights Regulations 2005.

Capita Symonds will make recommendations to E.ON UK within this report if the 12.5m proposed corridor is deemed to be insufficient. These recommendations will be based on any future access requirements E.ON UK will need to safely maintain the existing plant and equipment.

3 Existing Pipeline Corridor

The corridor contains two large bore pipes (Nb 900mm and 700mm) offset by approximately 500mm. These pipes are laid with an original cover of approximately 1.8m to 2.0m. However E.ON UK are aware that the original ground level has been raised by up to a further 2m along large sections of the route. To the northern side of the pipelines there is also a 6.6kV cable, a 50mm potable water main and a cluster of earthing / CRJ cables laid alongside the large diameter pipes at a depth of approximately 1m (invert of original trench) and offset by approximately 1.65m from the 700mm n.b pipe. (See below – Drg No: CSL/01/001 – Typical Section)



The existing pipelines run in an easterly direction from the Power Station towards the River Humber crossing a disused road and Haven Road. After crossing an existing minor road the route heads in a north easterly direction. The route traverses a ditch and a railway before entering the Make-Up Water Pumphouse / Transfer Structure immediatelty before the River Humber.

4 Future access requirements

E.ON UK will need to ensure that adequate space is available for any future event that will require access over or down to the buried services. The space requirement will differ depending on the circumstance.

a) **Visual Inspection** / **Non-intrusive Surveys** – There are a number of manholes along the route which E.ON UK will need to regularly inspect. These inspections may require vehicular access to be available. E.ON UK may also need to undertake non-intrusive surveys which generally involve "walkover" surveys along the route.

b) **Localised repairs** - E.ON UK may be required to under take localised repairs to the buried services. In this instance suitable and adequate space will be required for both labour and equipment to facilitate excavation works including equipment storage, excavated material storage, safe access and egress to and from the excavations as well as suitable and adequate working areas both in and around the excavations.

c) **Full length replacement of part or all of the existing buried services** – E.ON UK may need to replace completely one or all of the buried services in the future. In this case an adequate working area will be required along the full length of the corridor in order for the existing plant to be exposed and removed, for the new pipe / cables to be made above ground and placed within the excavation. Again safe access and egress to and from the excavations, equipment and excavated material storage areas as well as adequate working areas in and around the excavations must be available.

When assessing the space requirements for the above, the need to be able to establish safe systems of work must be considered at all times.

5 Proposed Easement Assessment

In order to determine if the proposed 12.5m corridor is adequate it is necessary to establish the potential future work scope. Section 4 above outlines the different scenarios that may arise. The sections below aim to assess the minimum requirements for each of the scenarios.

Option a) above – **Visual Inspection** / **Non-intrusive surveys** – would require minimal space as this operation is generally limited to above ground activities (with the exception for gaining access in to the manholes). Therefore 12.5m would be sufficient.

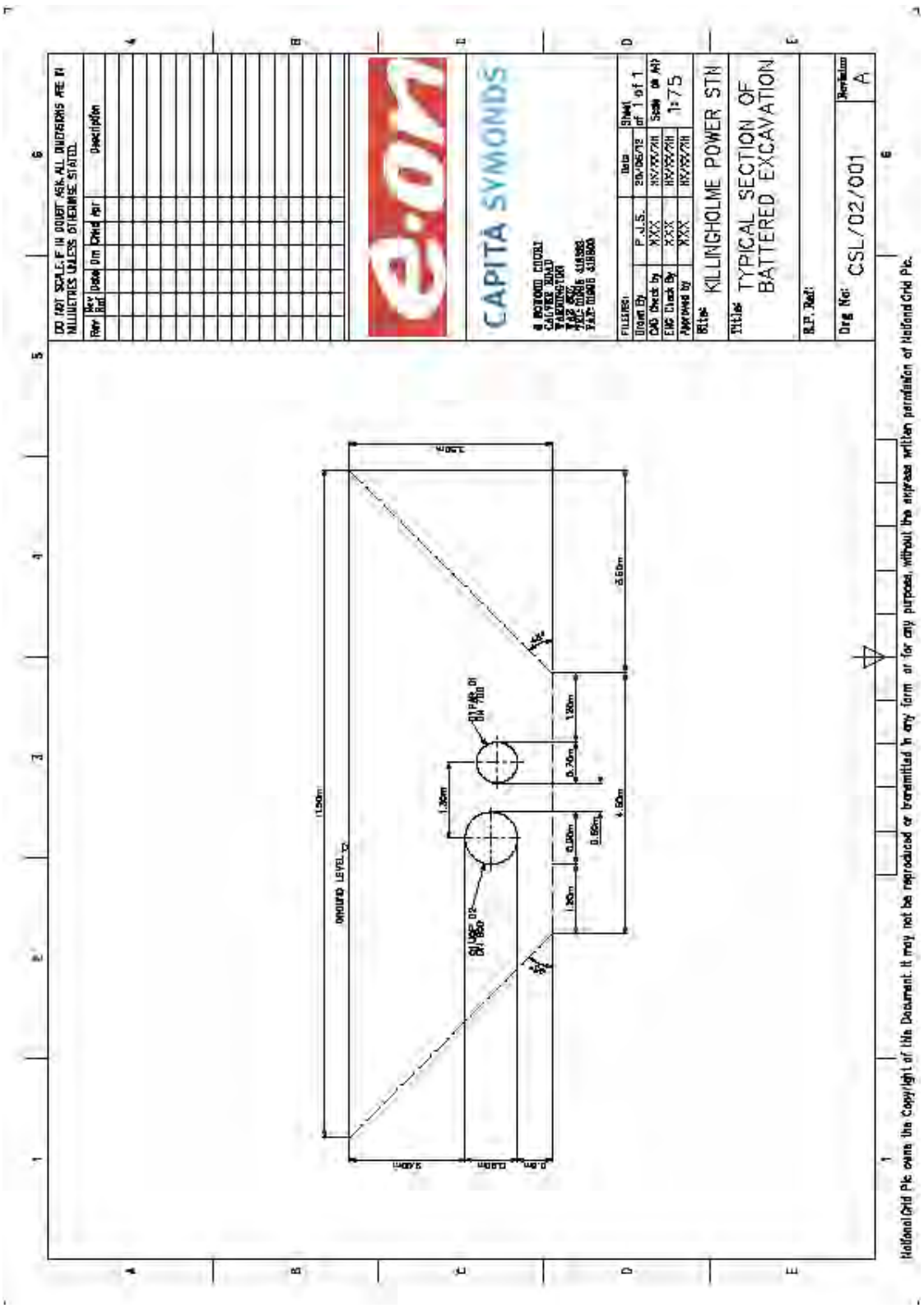
Option b) above – **Localised repairs** – would require excavation works to be undertaken over a relatively short linear length of the buried plant. Drawings CSL/002/001 & CSL/002/002 below show the required area to allow all safety factors (access/egress, storage, working area in and around the excavation) to be addressed.
Note: The cables and small bore pipe have been removed for clarity. The worst case scenario would involve the deeper large bore pipes and therefore these have been assessed.

Due to the close proximity of the two pipes – 500mm face to face and the depth of excavation – approximately 3.5m it will be necessary to expose both pipes. In order to allow for safe working within the excavation an allowance of 1.2m has been made to the outside of both pipes. This is necessary given the minimal distance between the two pipes (500mm).

Drawing No. CSL/002/001 shows a depth to the invert from ground level of 3.5m. This is based on an original cover to crown (900mm pipe) of 2m plus pipe of 900mm plus clearance below pipe for working of 600mm. Using a safe angle of repose of 45 degrees the plan size at ground level of the battered excavation would be - width at bottom of excavation (4.5m) plus 2 x depth (2 x 3.5m) – **11.5m**.

In order to comply with the Working at Heights Regulations 2005 as amended by the Work at Height (Amendment) Regulations 2007 and to prevent overloading of the excavation a "safety zone" of 1m around the excavation should be included. A working area of 4m either side of the excavation would be required to allow for movement of plant, storage of equipment (including pumps) and maximising works above ground rather than in the excavation (this should be undertaken where ever possible to avoid the risks associated with working in an excavation – Working at Height Regs Section 6 (2)). Excavated material storage would need to be considered. The drawing below – CSL/02/002 shows the plan view of the required easement. As can be seen the preferred plan dimension for the easement would be **25.5m**.

It may be possible to work from 3 sides only. This could be achieved by removing the working area / running track of 4m from one side but still retain the 1m "safety zone" . However it would be necessary to increase the working area / running track on the other side to a minimum of 7m to allow plant and vehicles to pass. This would result in reducing the plan size to **24.5m**.


DO NOT SCALE IF IN DOUBT ASK. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.
Rev Mod Date Drn Chkd Appr Description
CAPITA SYMONDS
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CAD Check by XXX XX/XX/XX Scale as A4
EMS Check By XXX XX/XX/XX 1:75
Approved by XXX XX/XX/XX
Site KILLINGHOLME POWER STN
Title TYPICAL SECTION OF BATTERED EXCAVATION
R.F. Ref:
Drg No: CSL/02/001 Revision A
GROUND LEVEL
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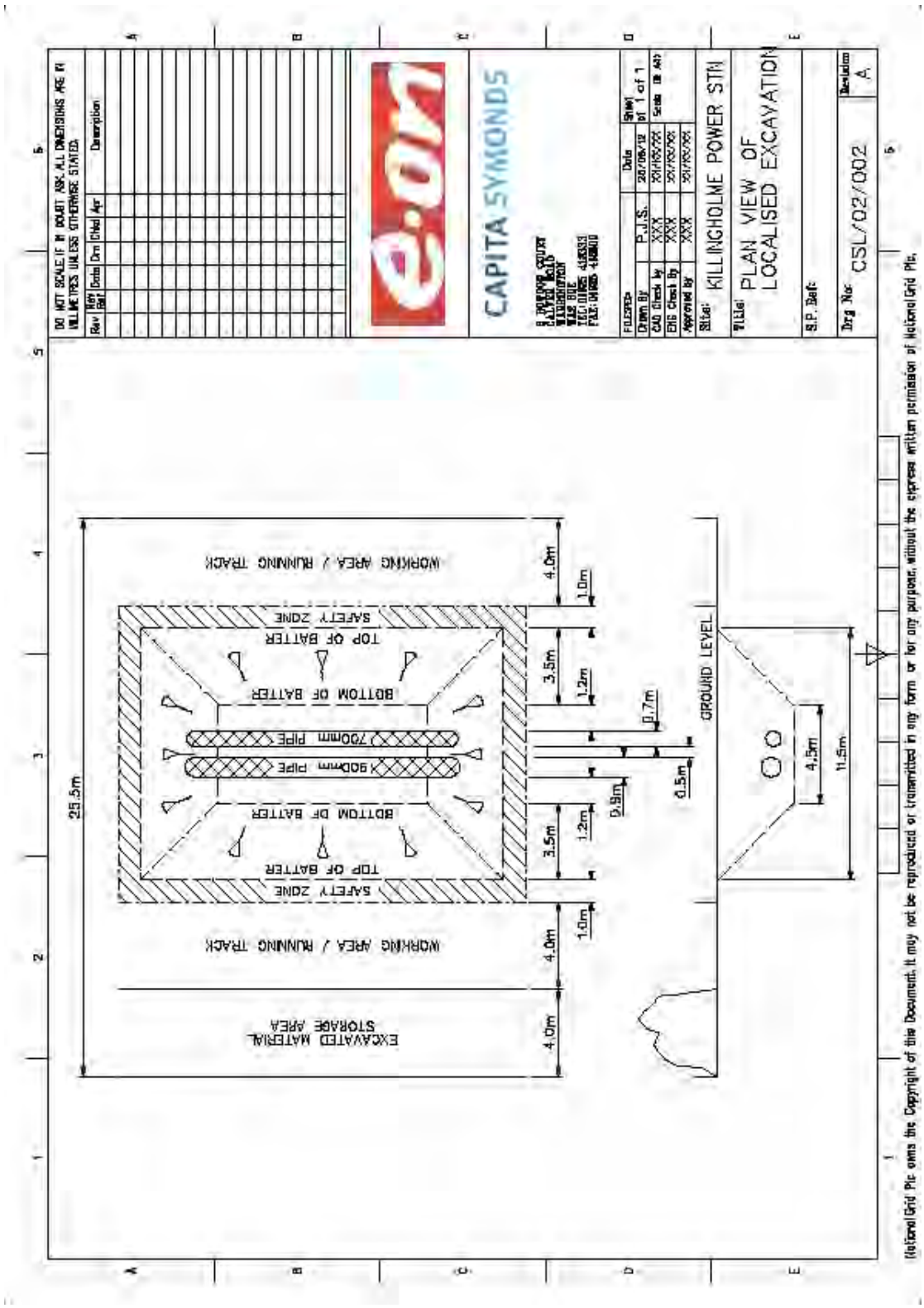
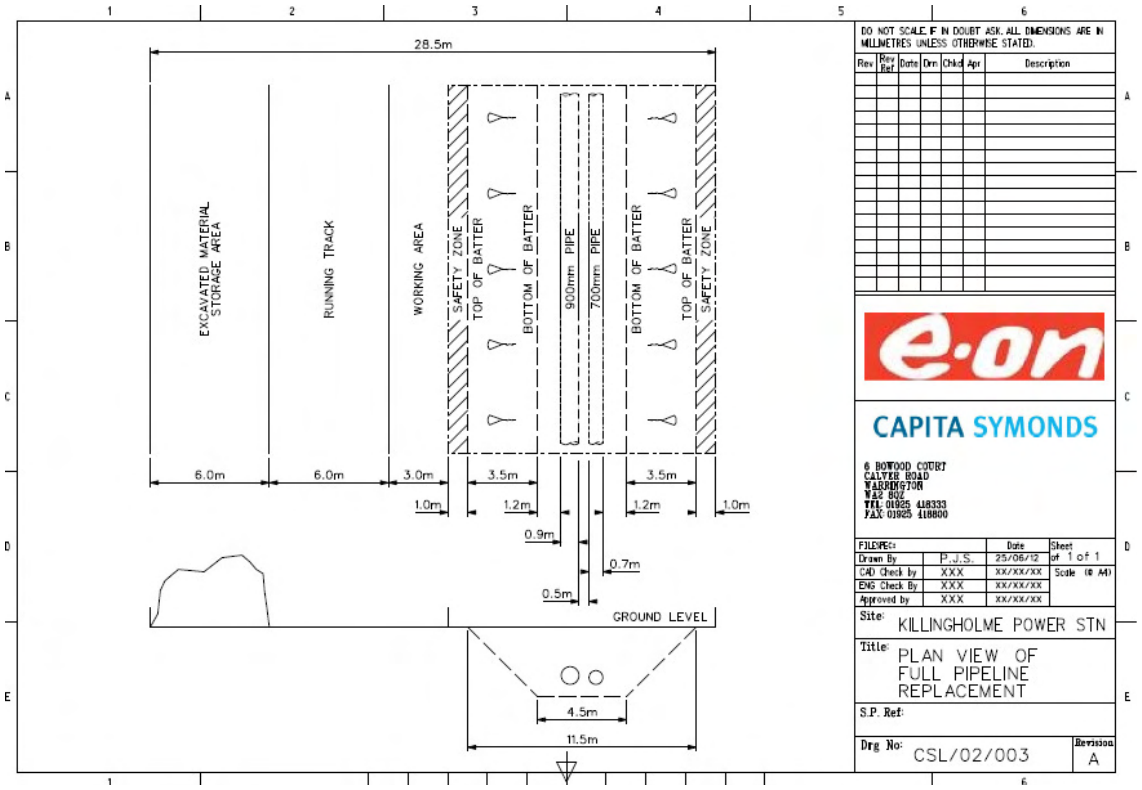


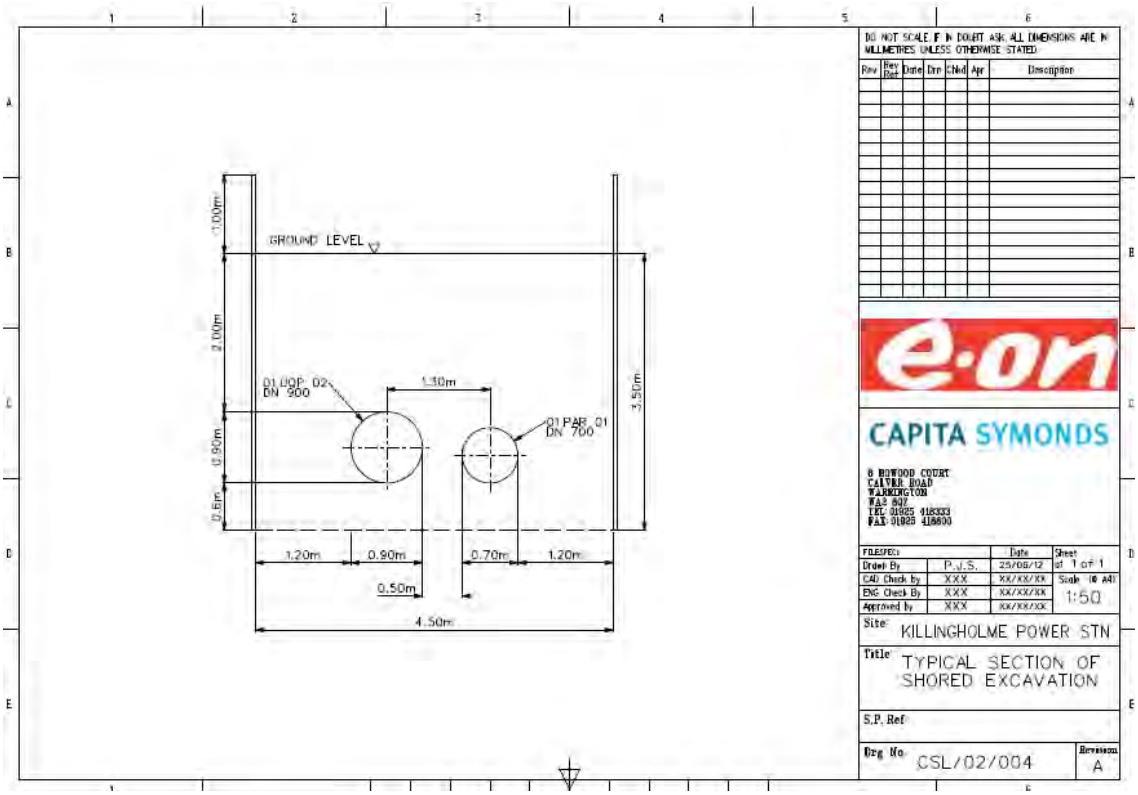
Option c) above – **Full length replacement of part or all of the existing buried services** - would require excavation works to be undertaken over the full length of the buried services. The preferred option would be a full working area as per Drawing No. CSL/002/003 below. This would take in to account the requirement for storage of excavated material along the full length of the corridor as well as having a safe working area for jointing of the new pipes above ground. This would result in an easement of **28.5m.**



Ground support / Shoring Option

The use of shoring could be considered to reduce the plan size of the excavation. This would be a more expensive option (upwards of 40 – 50% increase in excavation costs) and would require a greater temporary works design but one that would lend itself to "localised" excavations. The "safety zone" and storage areas would still need to be considered. The use of shoring would result in reducing the easement area by the width of the batters (2 x 3.5m) however the prescence of the 6.6kV cable, 50mm potable water and other cables should be considered. The foregoing calculations have assumed a 1.2m working area from the face of the 700mm diameter pipe to the edge of the bottom of the excavation. The cables etc are a further 450mm away from the excavation and are spread across a 750mm trench. Allowing for protection zone of 2m the resultant widths would be either **21.7m** (full access around the excavation) or **20.7m** (access to 3 sides only). Drawing CSL/02/004 below shows the typical section using trench shoring.

If this option is considered for the full replacement scenario it should be noted that the works would be considerably more expensive as well being a slower operation with a greater temporary works design input. Again, as above, consideration of the cables etc would need to be made. This would require a **23.7m** easement.



The shored trench solution would require horizontal beams/struts across the excavation to support the shoring. This creates an obstruction when considering the movement of labour, plant,equipment and materials within the excavation.For localised repairs it may be possible to design / plan for the positioning of these cross excavation supports such that they do not present an hazard or hinder the works. However with the full length replacement scenario these supports will present a problem to the workforce that will need careful consideration. Factors such as movement of workforce along the excavation, the lifting of plant and equipment in / out of the excavation and the lifting in / out of materials such as new sections of pipe will need to factored. The risk of striking the cross excavation supports and therefore affecting the stability of the shoring system will need to be carefully managed.

Section 111 of the ACOP for the CDM Regulations 2007 requires that *" Designers' responsibilities extend beyond the construction phase of a project. They also need to consider the health and safety of those who will maintain, repair, clean, refurbish and eventually remove or demolish all or part of a structure…."*

6 Conclusions

The above assessments are based on the practical working areas to access the pipes having a cover to ground level of 2m (to top of the 900mm pipe from the as-built information provided to CSL.

However, E.ON UK have noted that sections of ground have been built up since the installation of the pipelines by up to 2m along large sections. Where this is the case it would be reasonable to extend the easement by a further 4m on each of the battered excavation options above.

This would result in

- the localised repair option increasing from 25.5m to **29.5m**
- the localised repair option with access to 3 sides only increasing from 24.5m to **28.5m**
- the full replacement option increasing from 28.5m to **32.5m**

CSL would confirm that the proposed 12.5m easement corridor is insufficient for any future intrusive works on the deeper large bore pipelines.

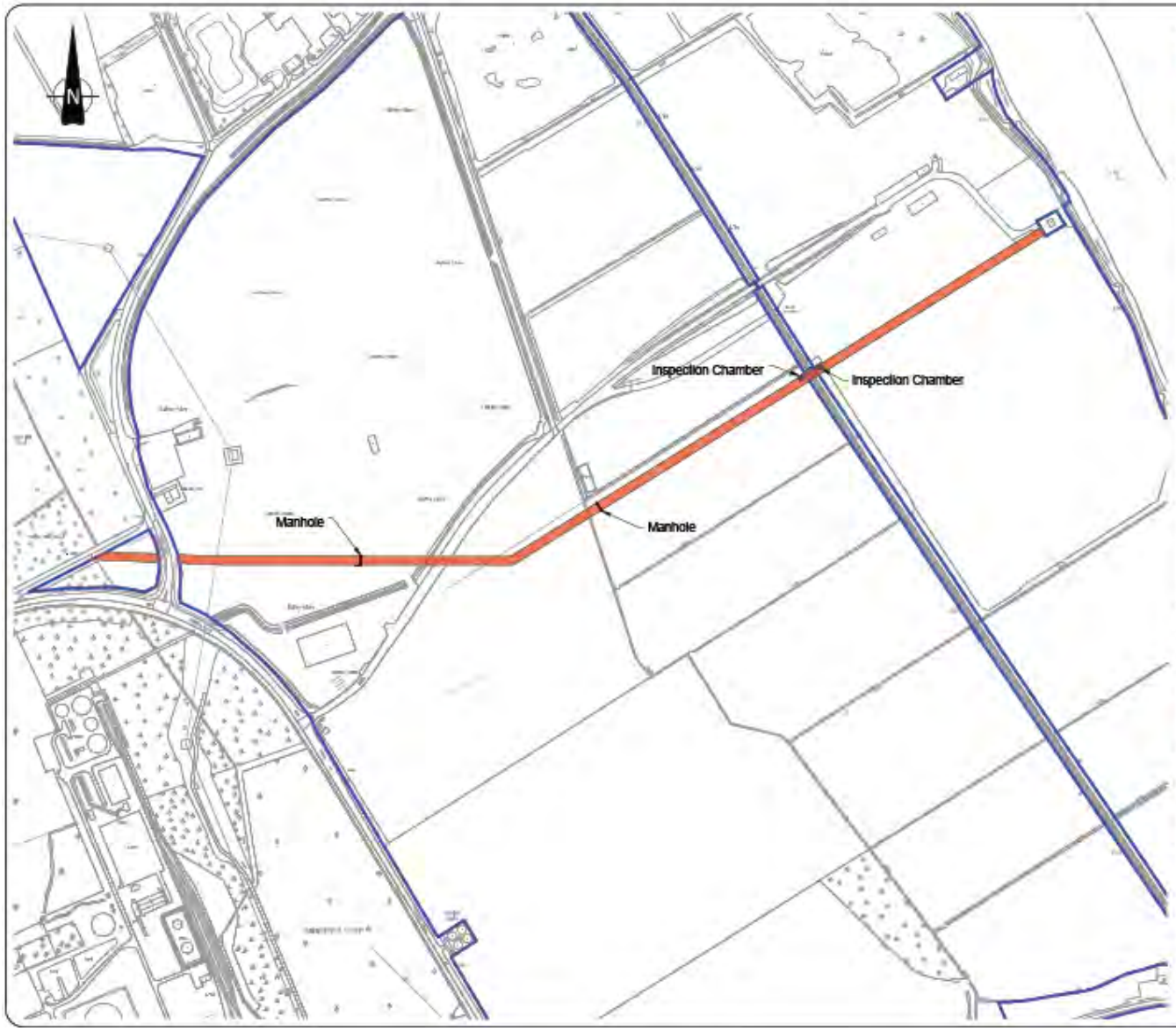
Based on the above and considering the Health and Safety requirements for any future works, CSL would recommend a minimum easement of **32.5m.** This is above normal easement agreements for most pipelines, however the prescence of two pipelines in close proximity as well the 6.6kV cable, a 50mm potable water main and a cluster of earthing / CRJ cables results in a larger easement being required.

Due to the potential for introducing hazards (cross excavation supports) and the increased time for undertaking the works within a shored trench (therefore increasing the exposure to hazards for the workforce), the shoring option should be considered only if the conditions for a battered excavation are not deemed to be suitable.

APPENDIX 1

Eon AMEP Easement Corridor – AME-08093

Indicative Masterplan – AME-02006



KEY

Estates Boundary

Proposed 12.5m Wide Corridor

Inspection Chamber

	Area(m²)	Length(m)
Triangle Area	988	83
AMEP Main	15,987	1,332
Total	16,975	1,415

Rev	Date	Comments	Drw	Chk	App
D	07/06/12	Manholes Added	PM		
C	01/05/12	Rights Land Removed	PM	PMS	PMS
B	25/04/12	Corridor Amended	JH	PMS	PMS
A	23/04/12	Preliminary Issue	RK	PMS	PMS

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Project: Able Marine Energy Park

Client: Able Humber Ports Ltd

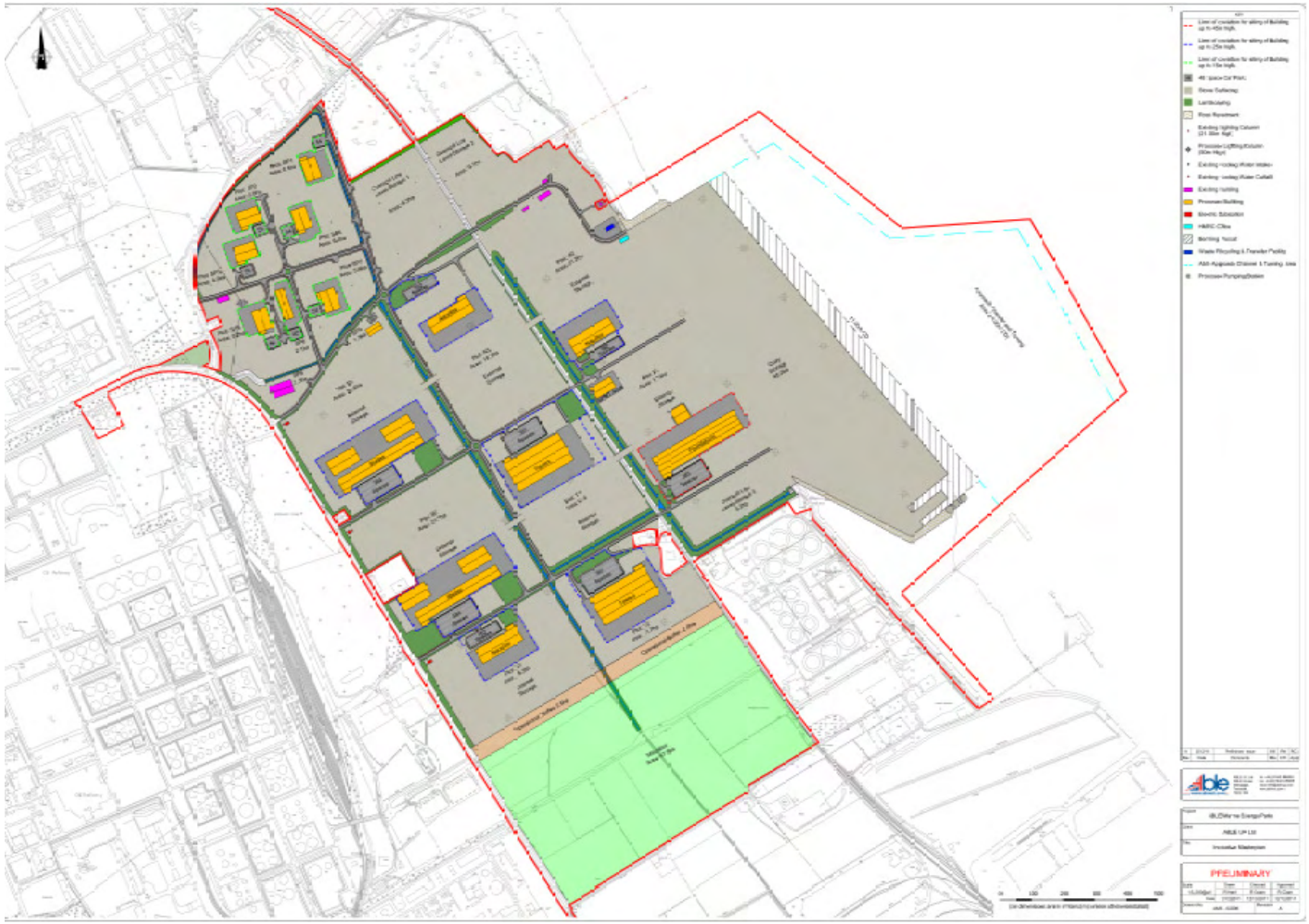
Title: EON AMEP Easement Corridor

PRELIMINARY

Scale:	Drawn	Checked	Approved
1:5,000@A3	R Kerr	PMS	PMS
Date	25/04/2012	25/04/2012	25/04/2012

Drawing No. AME - 08093

Revision: D


PRELIMINARY

PLANNING ACT 2008

AND

THE INFRASTRUCTURE PLANNING (EXAMINATION PROCEDURE) RULES 2010

THE ABLE MARINE ENERGY PARK DEVELOPMENT CONSENT ORDER 2012

(PINS REFERENCE NUMBER: TR030001)

WRITTEN REPRESENTATIONS OF E.ON UK PLC

(UNIQUE REFERENCE NUMBER: 10015527)

APPENDIX 8

Masterplan drawing AME-02006 hand marked with approximate route of CW pipelines

KEY

- Limit of deviation for siting of building up to 45m high.
- Limit of deviation for siting of building up to 25m high.
- Limit of deviation for siting of building up to 15m high.
- 46 Space Car Park
- Stone Surfacing
- Landscaping
- Rock Revetment
- Existing Lighting Column (21-30m High)
- Proposed Lighting Column (50m High)
- Existing Cooling Water Intake
- Existing Cooling Water Outfall
- Existing Building
- Proposed Building
- Electric Substation
- HMRC Office
- Berthing Pocket
- Waste Recycling & Transfer Facility
- Able Approach Channel & Turning Area
- Proposed Pumping Station

0 100 200 300 400 500

(all dimensions are in meters (m) unless otherwise stated)

Rev	Date	Comments	Drw	Chk	App
A	12/12/11	Preliminary Issue	RK	RC	RC

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Project: ABLE Marine Energy Park

Client: ABLE UK Ltd

Title: Indicative Masterplan

PRELIMINARY

Scale	Drawn	Checked	Approved
1:5,000@A1	R Kolr	R Cram	R Cram
Date	12/12/2011	12/12/2011	12/12/2011

Drawing No: AME - 02006

Revision: A

PLANNING ACT 2008

AND

THE INFRASTRUCTURE PLANNING (EXAMINATION PROCEDURE) RULES 2010

THE ABLE MARINE ENERGY PARK DEVELOPMENT CONSENT ORDER 2012

(PINS REFERENCE NUMBER: TR030001)

WRITTEN REPRESENTATIONS OF E.ON UK PLC

(UNIQUE REFERENCE NUMBER: 10015527)

APPENDIX 9

'Further issues related to modelling the impact of the Able Marine Energy Park on the Killingholme CW intake and Outfall – E.ON New Build & Technology Limited, 20 June 2012' ("Further Issues Report")

NEW TECHNOLOGIES
ENVIRONMENTAL MODELLING

TECHNICAL INFORMATION PUBLICATION

E.ON NEW BUILD & TECHNOLOGY LIMITED

Technology Centre
Ratcliffe-on-Soar
Nottingham, NG11 0EE
Tel: 02476 192900

Classification: **E.ON IN CONFIDENCE**

Number : ENT/12/CNS/EM/743/TIP

Date : 20 June 2012

To: Mr M Brown, Development Manager, E.ON UK

Job No : INT.K886
Our Ref :
Software: : None
Access : UKEM

Author : J M Lines

Authorised :

TITLE

FURTHER ISSUES RELATED TO MODELLING THE IMPACT OF THE ABLE MARINE ENERGY PARK ON THE KILLINGHOLME CW INTAKE AND OUTFALL

Master report signed by J M Lines & S J Griffiths (pp), 20 June 2012

T A Hill
Technical Head
Environmental Sciences & Climate Change

SUMMARY

A number of external documents have been reviewed by ENT in connection with modelling the potential impact of the proposed Able Marine Energy Park on the Killingholme CW Intake and Outfall.

Of most concern is the 2012 report on an Update to longer term morphological predictions in the region of the Centrica and E.ON intakes and outfalls (Technical Note DHR4808-01). The modelling results appear to predict that the E.ON outfall structure will become covered by deposition of sediment and possibly become blocked during periods of CW system inactivity.

Whilst the other work undertaken in 2011 by third parties on behalf on Able Marine Energy Park does not conclude that there definitely will be a negative impact on the Killingholme CW system resulting from sediment changes, the other reports do not clearly state that no significant impact on the Killingholme CW system is expected. This implies there is a possibility that the development may have a detrimental impact on the operation of the CW system and therefore a detrimental impact on station operation. Further modelling is unlikely to clarify the situation.

There have been no previous problems with sedimentation, erosion, suspended solids or siltation at the CW intake or outfall at Killingholme. Therefore it would be reasonable to assume that any problems that are encountered after the Able Marine works commence are a result of the development.

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CLIENT DISTRIBUTION LIST

EF	Mr M Brown	Development Manager, E.ON UK
EF	Dr R G Busby	Upstream Environment Manager, E.ON UK

1 CURRENT AND PREVIOUS EXPERIENCE WITH SEDIMENT AT KILLINGHOLME

There have been no previous problems with suspended solids or siltation at the CW intake or outfall at Killingholme. Therefore it would be reasonable to assume that any problems that are encountered after the Able Marine works commence are a result of the development.

2 FUTURE POTENTIAL CONCERNS RELATED TO ABLE MARINE ENERGY PARK DEVELOPMENT

It has been concluded previously that the development is unlikely to have a significant effect on the thermal impact on the CW system (see Appendix on Impact of Temperatures). The issue of current concern is the possible impact of suspended sediment, sediment transport and changes in bed morphology on the CW system.

There are two possible scenarios of concern:

- the impact of suspended sediment and bed level changes on the CW system when the power station is operating continuously (e.g. does too much sediment get drawn into the CW system causing a blockage and/or reduce efficiency?)

- the impact of sediment building up in the intake or outfall while the power station is not operational, causing a failure of the CW system when it is next run.

There are different mechanisms of concern, e.g:

- The impact of long term increases in suspended sediment concentration (SSC) and/or bed level morphology that may not have an immediate impact on the CW system, but may eventually have an impact over a longer period of time.

- The impact of a relatively large and sudden temporary increase in SSC (e.g. due to dredging or construction work).

The intake is designed to abstract water from well above the sea bed to minimise entrainment of bottom dwelling fish and other organisms. Any change in bed topography could have an effect on organisms that the intake was originally designed to minimise.

A further issue is that as there have been no previous problems with suspended sediment or siltation at Killingholme, the threshold SSC at which problems will be introduced is not known. This makes modelling results more difficult to interpret, as model results cannot be compared with a threshold SSC or bed level change that is known to cause a problem.

3 UNCERTAINTIES IN SEDIMENT MODELLING

Sediment modelling is more complex than thermal plume modelling. However good the software and however experienced the modeller, there will almost always be more uncertainty in sediment modelling results than thermal plume modelling. This is because there are more unknown parameters in sediment modelling. Modelling with a different software package and/or different modeller is unlikely to increase confidence in predictions as experience suggests the results will be different (although they may be similar) and discussions tend to focus on the

differences in results and which model is best – neither of which are especially helpful in providing confidence in what the actual impact will be.

4 DOCUMENTS REVIEWED

The following five reports have been reviewed:

- Able Marine Energy Park 3D Mud Modelling: Assessment of the Effects of a Proposed development on the South Bank of the Humber Estuary on Fine Sediments by HR Wallingford. Report EX6603, Release 7.0, November 2011

- Able Marine Energy Park: Dredging Plume Dispersion Arising from Capital Works by HR Wallingford. Report EX6627, Release 4.0, November 2011

- Able Marine Energy Park: Estuary Modelling Studies Report by JBA Consulting, November 2011

- Review of the Geomorphological Dynamics of the Humber by JBA Consulting, November 2011

- Able Marine Energy Park Update to longer term morphological predictions in the region of the Centrica and E.ON intakes and outfalls. Technical Note DHR4808-01, March 2012.

The JBA consulting report on Estuary Modelling Studies presents an assessment of the likely impacts on the hydrodynamic and short-term sedimentary regimes owing to the construction of a quay on the south bank of the Humber Estuary. The report states:

The increased accumulation is predicted in the areas of the Conoco and E.ON intakes/outfalls. Mitigation appears to be necessary to minimise the potential for increased sedimentation in the sub-tidal area to the north of the quay which may impact on these intakes/outfalls. The report recommends that discussions are held with the operators of these intakes to confirm that potential minor increases in suspended sediment concentrations due to dredging losses are within tolerance levels for the intakes, considering the large natural background suspended sediment concentrations variability.

There have been no suspended sediment measurements in the vicinity of the intake/outfall. The existing variability in the estuary may or may not be similar to the existing SSC variability near the intake/outfall.

The HR Wallingford dredging report predicts there will be temporary, but significant rises in background concentrations during the dredging of sand/gravel during the construction period over the course of a week or less. ENT suspects that the estimate of a week or less in the HR Wallingford report is too short since the Dredging Methodology produced by Royal Boskalis Westminster (Appendix 2 of Annex 7.6 to the Environmental Statement “Dredging Strategy”) states a nine day period and an eight day period. It is worth noting that the modelled position of the quay was set 50m further into the estuary than the final layout. The report does not suggest this is a problem, but the results look fairly sensitive to location in the general area of the intake/outfall and a different quay location could change the results. The report predicts peak increases of up to 400mg/l at the E.ON (south) intake and up to 200mg/l at the Centrica (north) intake on spring tides and up to 50mg/l and 100mg/l respectively on neap tides resulting from sand/gravel dredging.

The longer term (months) fine sediment modelling discussed in the HR Wallingford report also uses the older quay layout. The modelling includes some bathymetry updating, but the report acknowledges that morphological updating introduces uncertainties. The report infers that 3.5m of mud infill may occur at the E.ON outfall, but there is little risk of sedimentation at the intake (which is further offshore).

Using expert geomorphological techniques (this possibly means a desk assessment involving historical precedent, rather than a modelling assessment), long term morphological change was estimated. Accumulation of about 1.5m in the vertical is predicted. This could perhaps affect entrainment of benthic fauna in the vicinity of the intake.

The model predicts little change in fine SSC at the intakes, however the accumulation of sediment that is predicted upriver of the proposed development presents the risk of increased suspended sediment concentrations at the intakes via resuspension of newly deposited sediment.

An overall concern of ENT is that none of November 2011 reports make a clear statement that the authors believe there will be no significant SSC impact on the intakes/outfalls. Whilst this does not mean that the authors believe that there definitely will be a significant impact, it probably does mean that they believe there is a possibility of a significant impact. ENT does not believe further sediment modelling at this stage will help to determine whether or not suspended sediment related to the development will have a significant impact on the operation of the Killingholme CW system (partly because there are inherent uncertainties in sediment modelling and partly because the SSC impact threshold is unknown).

A further report was produced in March 2012 on an Update to the longer term morphology predictions in the region of the Centrica and E.ON intakes and outfalls. The report concludes that direct deposition of sediments to the bed is predicted at the E.ON outfall. ENT's interpretation of the report is that:

- After 30 weeks of simulation, approximately 0.9m of bed erosion in the vicinity of the E.ON intake and continuing (Figure 11 of Technical Note DHR4808-01, March 2012)

- After 30 weeks of simulation, approximately a 2.3m rise in bed level at the E.ON outfall and continuing (Figure 11 of Technical Note DHR4808-01, March 2012)

- Inshore of the E.ON outfall up to 3.8m of deposition is predicted (Figure 10b of Technical Note DHR4808-01, March 2012).

It is possible, but not certain, that the erosion in the vicinity of the intake could have an impact on the structural integrity of the intake.

Of more concern is that there is a real possibility the outfall structure will become covered in sediment and possibly become blocked during periods of CW system inactivity. From Drawing GBR 522-T217-00-1001, the bed level at the outfall is -5.0 mODN. Mean Low Water Spring is -3.1 mODN, which covers the top of the outfall structure. The difference between -5.0 and -3.1 is 2.1 m. Therefore accretion of 2.3 m would more than cover the top of the outfall structure.

Furthermore, the change in bed level will result in potentially more suspended sediment on occasions e.g. the accreted material at the outfall and inshore of the outfall could become resuspended via wave action and the material eroded from the intake could be drawn into the CW system.

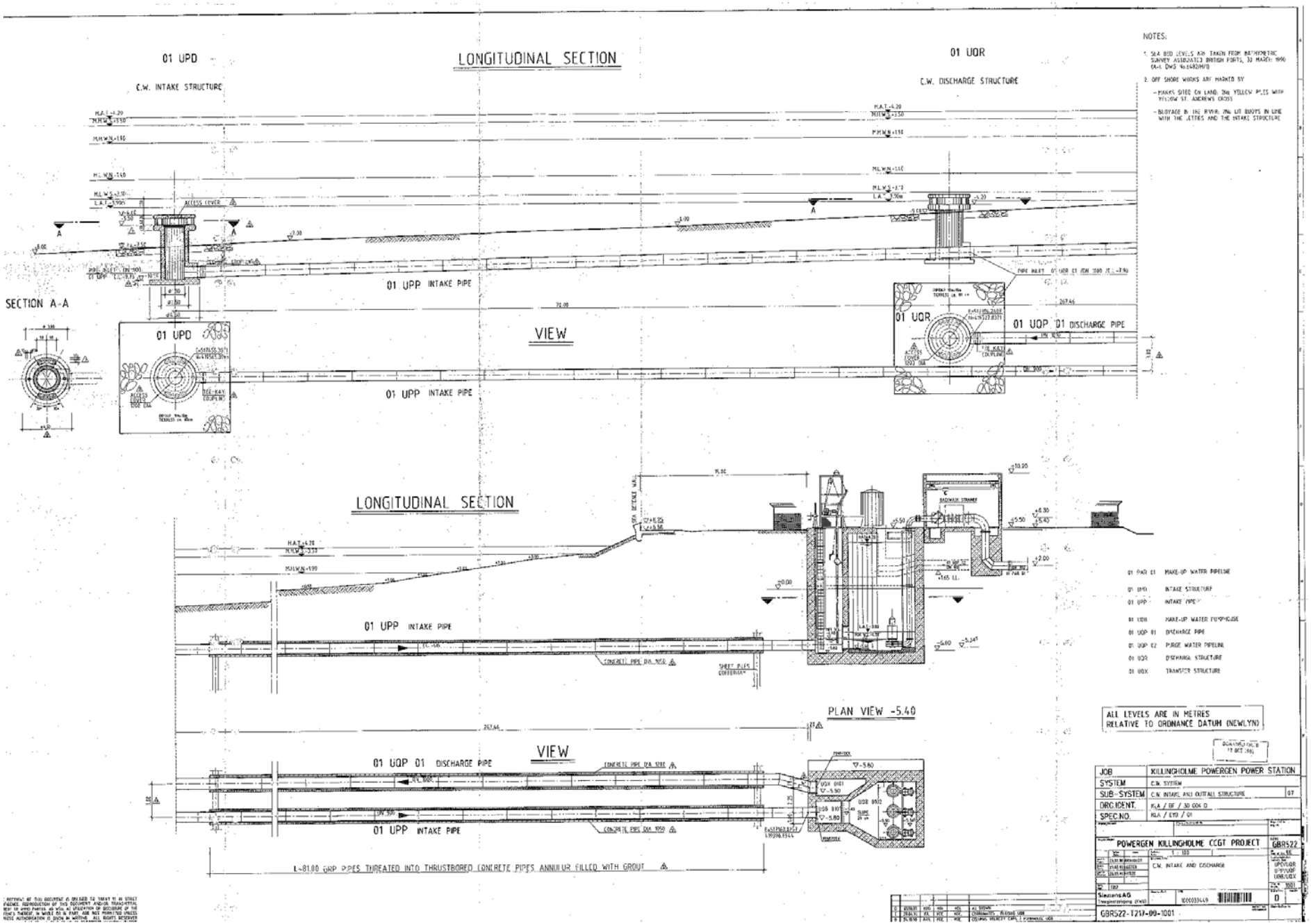
5 CONCLUSION

A number of external documents have been reviewed by ENT in connection with modelling the potential impact of the proposed Able Marine Energy Park on the Killingholme CW Intake and Outfall.

Of most concern is the report on an Update to longer term morphological predictions in the region of the Centrica and E.ON intakes and outfalls (Technical Note DHR4808-01). The modelling results appear to predict that the E.ON outfall structure will become covered by deposition of sediment and possibly become blocked during periods of CW system inactivity.

The impact threshold, the suspended sediment concentration at which a significant negative impact will occur, is not known as there have been no previous suspended sediment related problems at E.ON's Killingholme CCGT.

The other work undertaken in 2011 by third parties on behalf on Able Marine Energy Park does not conclude that there will be no impact on the Killingholme CW system resulting from sediment changes. Therefore it is a possible that the development may have a detrimental impact on the operation of the CW system and therefore a detrimental impact on station operation. Further modelling is unlikely to clarify the situation, partly because of the inherent uncertainties in sediment modelling and partly because the impact threshold suspended sediment concentration is unknown.


01 UPD
C.W. INTAKE STRUCTURE
LONGITUDINAL SECTION
01 UQR
C.W. DISCHARGE STRUCTURE
NOTES:
1. SEA BED LEVELS ARE TAKEN FROM BATHYMETRIC SURVEY ASSOCIATED BRITISH PORTS, 30 MARCH 1990 (A-L DWG No.6682/M/1)
2. OFF SHORE WORKS ARE MARKED BY
- MARKS SITED ON LAND: 2No YELLOW PILES WITH YELLOW ST. ANDREWS CROSS
- BUOYAGE IN THE RIVER: 2No LIT BUOYS IN LINE WITH THE JETTIES AND THE INTAKE STRUCTURE
SECTION A-A
01 UPD
01 UPP INTAKE PIPE
VIEW
01 UQR
01 UQP 01 DISCHARGE PIPE
01 UPP INTAKE PIPE
LONGITUDINAL SECTION
01 UPP INTAKE PIPE
01 PAR 01 MAKE-UP WATER PIPELINE
01 UPD INTAKE STRUCTURE
01 UPP INTAKE PIPE
01 UQM MAKE-UP WATER PUMPHOUSE
01 UQP 01 DISCHARGE PIPE
01 UQP 02 PURGE WATER PIPELINE
01 UQR DISCHARGE STRUCTURE
01 UQX TRANSFER STRUCTURE
PLAN VIEW -5.40
VIEW
01 UQP 01 DISCHARGE PIPE
01 UPP INTAKE PIPE
L=81.00 GRP PIPES THREATED INTO THRUSTBORED CONCRETE PIPES ANNULUR FILLED WITH GROUT
ALL LEVELS ARE IN METRES
RELATIVE TO ORDNANCE DATUM (NEWLYN)
JOB KILLINGHOLME POWERGEN POWER STATION
SYSTEM C.W. SYSTEM
SUB-SYSTEM C.W. INTAKE AND OUTFALL STRUCTURE 07
DRG.IDENT. KLA / DF / 30 004 D
SPEC.NO. KLA / EYJ / 01
POWERGEN KILLINGHOLME CCGT PROJECT
C.W. INTAKE AND DISCHARGE
Siemens AG
GBR522-1217-09-1001
D

APPENDIX

Impact on Temperatures

HR Wallingford has produced two reports:

- Able Marine Energy Park near Immingham: Initial Assessment of Impact of Proposed Reclamation on Existing Cooling Water Discharges. Report EX6440, Release 1.0 December 2010.

- Able Marine Energy Park near Immingham: Assessment of Proposed Reclamation Impact on Recirculation at E.ON Intake/Outfall Report EX 6503, release 3.0, August 2011.

i) We can be fairly confident that the software used and the model user are up to the task of modelling temperatures. The Telemac model used is well known, although not used by ENT. HR Wallingford are a well know consultancy with many years experience of aqueous discharge modelling

ii) The model predictions of temperature are likely to be of acceptable accuracy

iii) The predicted increases in temperature at the intake are likely to be acceptable to E.ON, as Killingholme is tower cooled, and therefore the intake temperature does not have a significant impact on station efficiency.

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THE ABLE MARINE ENERGY PARK DEVELOPMENT CONSENT ORDER 2012

(PINS REFERENCE NUMBER: TR030001)

WRITTEN REPRESENTATIONS OF E.ON UK PLC

(UNIQUE REFERENCE NUMBER: 10015527)

APPENDIX 10

'AMEP Review of Risks to the E.ON Inlet and Outfall During Construction & Maintenance of the AMEP Quay', June 2012 ("Review of Risks Report")

ABLE MARINE ENERGY PARK

REVIEW OF RISKS TO THE E.ON INLET AND OUTFALL DURING CONSTRUCTION & MAINTENANCE OF THE AMEP QUAY

JUNE 2012

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Approved by:			

REVISION	COMMENTS	DATE
A	**1ST DRAFT**	1/6/2012

CONTENTS

APPENDICES

1 INTRODUCTION

1.1 GENERAL

1.1.1 Able Humber Ports Ltd (Able) proposes to develop a marine energy park on the south bank of the Humber Estuary; if consented, the development will be known as Able Marine Energy Park (AMEP). AMEP will incorporate a new quay together with facilities for the manufacture of marine energy components including offshore wind turbines.

1.1.2 This report details the construction and installation of the quay and associated works at the north western end of the site in the vicinity of an existing cooling water inlet and outfall for a gas powered electricity generating station operated by E.ON.

1.1.3 The report identifies the risks considered relating to the construction and maintenance of the AMEP works in the vicinity of the cooling water inlet and outfall and establishes a number of mitigation measures to reduce or eliminate the risk from the associated activity.

1.1.4 The report includes data sheets for plant that is equivalent to those required for the reviewed operations for the site.

1.2 BACKGROUND

1.2.1 Able is proposing to develop AMEP for the manufacture and transportation of offshore energy infrastructure and provide a significant base for its associated supply chain. The development will also provide quay facilities that are necessary to load offshore energy components such as wind turbines onto new generation installation vessels and to receive and export raw materials and products. Once construction of the offshore marine energy facilities is complete, the quay will provide a facility from which to operate, monitor and maintain them.

1.2.2 The location for the proposed project is on the south bank of the River Humber, north of Immingham. The centre of the development is at grid reference TA170190. The size of the development is 469.3 ha in total – 45.0 ha for the quay, 222.7 ha for the onshore facilities, 48.5 ha for on-site ecological mitigation and 153.1ha for a compensatory habitat on the north bank of the Humber.

2 EXISTING STRUCTURE

2.1 EXISTING PIPEWORK TO POWER STATION

2.1.1 E.ON operate a gas fired power station approximately 1800m from the bank of the River Humber. The power station is located off Chase Hill Road with main site coordinates at 515400E, 418925N.

2.1.2 The plant has a cooling water system which is served by a 700mm diameter intake pipe and a 900mm discharge pipe running parallel to one another. The pipes pass under New Haven Road and through the AMEP site linking the power station to a pumping station and transfer structure set back 15m from the sea defence wall on the River Humber.

2.1.3 The pumping station is located at coordinates 517145E, 419383N

2.2 INTAKE PIPE

2.2.1 Design drawings of the outfall, included within Appendix 2, indicate that the pumphouse and transfer station receives water through a 1200mm diameter intake within the river, 337.46m from the pumphouse structure.

2.2.2 The intake pipe is vertical at the point of discharge and connected to the pumphouse via a 900mm diameter GRP pipe under the river bed, of which 81m is encased within a 1200mm diameter concrete pipe under the sea defences.

2.2.3 The GRP pipe is connected to the intake structure with a Tee-Kay pipe coupling. The intake structure is likely to be either GRP or ductile iron, with details that would indicate that the intake pipe structure is encased in 500mm of concrete.

2.2.4 The upper level of the intake pipe is shown at -4.6m OD, -0.7m Chart Datum, i.e. 700mm below Lowest Astronomical Tide. The coordinates of the intake point are understood to be 517455E, 419565N.

2.3 DISCHARGE PIPE

2.3.1 Drawings included within Appendix 2 indicate that the cooling water from the gas fired power station is discharged via the pumphouse and transfer station through a 1200mm diameter discharge structure, 267.45m from the pumphouse.

2.3.2 A 1000mm GRP pipe runs parallel to the intake pipe and is located 3 metres, centre to centre, downstream of the intake pipe, connecting the pumphouse with the discharge structure.

2.3.3 The dimensions and construction of the discharge structure appear to be the same as the intake structure and also has 81m of pipework encased within a 1200mm diameter concrete pipe under the sea defences. The GRP pipe is connected to the intake structure with a Tee-Kay pipe coupling. The intake structure is likely to be either GRP or ductile iron, with details that would indicate that the intake pipe structure is encased in 500mm of concrete.

2.3.4 The upper level of the discharge pipe is understood to be at -3.3m OD, +0.6m Chart Datum, i.e. 600mm above Lowest Astronomical Tide. The coordinates of the outlet point are understood to be 517396E, 419528N.

3 PROPOSED WORKS

3.1 QUAY FACILITY

3.1.1 In order to receive and load both materials and completed components of wind turbines produced on the AMEP site, a new quay facility is required to enable berthing of ships immediately adjacent to the manufacturing and process part of the site.

3.1.2 The quay will involve the reclamation of tidal land within the Humber Estuary. This will require the installation of a new quay wall along the main berthing section approximately 290m from the existing flood defences into the estuary. The front quay will be linked to the land via a short section of piling and a rock revetment. The area encompassed by the piling and revetments will be in-filled by a mixture of dredged materials and imported fills.

3.1.3 Dredging will be required in the estuary in front of the quay to form a berthing pocket and an approach channel to it.

3.2 QUAY WALL

3.2.1 The quay is proposed to be a combi-pile wall for 1,200 m of its length along the front wall which consists of a combination of large diameter tubular steel piles alternating with steel sheet piles. The upper finished level of the quay shall be +10.0m Chart Datum. The tubular piles will be tied back with anchors that are fixed near to the upper surface of the pile and angled down to an anchorage trench behind the quay.

3.2.2 At the southern end of the quay a specialist berth for emerging offshore wind turbine installation vessels will be formed, which will consist of a combi-pile and steel sheet piled wall.

3.2.3 At the northern end, the quay returns at an angle that is square to the existing flood defence. The initial 160m of the return shall consist of a mixture of steel sheet piles and a small section of combi-pile wall. The sheet piling northern return wall is intended to be positioned 105m downstream of the centre of the E.ON Discharge Pipeline.

3.2.4 A concrete relieving slab will be constructed behind the front wall which will sit on additional piles driven behind the quay.

3.3 REVETMENT

3.3.1 At both the southern and northern ends of the quay, the sheet piles will be linked to the flood defences via stone revetments. The revetment will be designed to retain the infill behind and shall have a gradient of 1 in 4 falling from an upper finished level of +10.0m Chart Datum to the existing estuary bed level.

3.3.2 At its closest point the toe of the revetment along the northern return wall will be approximately 77m from the centreline of the E.ON Discharge Pipeline. Where the existing sea defences are improved, the revetment will be approximately 47m from the E.ON Discharge Pipeline.

3.3.3 The existing intertidal area between the existing flood defence, new quay and revetment will be filled with dredged and imported materials.

3.4 BERTHING POCKET & APPROACH CHANNEL

3.4.1 To enable vessel access to the operational quay and allow berthing alongside its length over a commercially viable tidal range, capital dredging will be required.

3.4.2 The proposed berthing to the quay will have an operational draught of 10 m therefore the quay will have a dredged berthing pocket that will be maintained at -11m Chart Datum. The berthing pocket will be 60 m wide. In the area of the berthing pocket, bed levels currently range from around -2m Chart Datum at the northern end to -4 m Chart Datum. A maximum capital dredge of approximately 9 m is therefore required to create the berthing pocket.

3.4.3 The side slopes of the berth will have a gradient appropriate to the in-situ properties of the bed material, which consists of cohesive materials. The ground investigation results have demonstrated that the clay underlying the river bed varies in places ranging from firm to sandy clay.

3.4.4 BS 6349 part 5 1991 Code of Practice for Dredging and Land Reclamation provides typical values of side slopes for ranges of bed materials. For firm clay in moving water the typical slope gradient can be 1(V) in 1.4(H), reducing in gradient to 1 in 3.7 for sandy clay. The proposed slope gradient to the interface between the berthing pocket and existing bed level is 1 in 4, which is a flatter gradient than the typical value for sandy clays in moving water.

3.4.5 The base of the berthing pocket will be situated 107m from the E.ON Intake Pipeline. The top of the 1 in 4 cut slope within the river bed for the berthing pocket will be approximately 71m from the pipe.

3.4.6 The approach channel is proposed to have a maintained depth of -9m Chart Datum. Capital dredging within the approach channel will be around 4m at the northern end of the quay but will reduce to about 2.5 m at the southern end. Part of the approach is currently dredged to allow access to Killingholme Oil Terminal and HST. An initial over-dredge of 0.3m will be undertaken.

3.5 MAINTENANCE

3.5.1 Modelling studies carried out by HR Wallingford, Technical Note DDR4808-04, on the proposed scheme has identified that the predicted annual maintenance requirement arising from operations will be in the range 49,000 – 429,000 dry tonnes from the dredged area for AMEP.

3.5.2 The model results have also shown the potential for accumulations of sediment inshore of the E.ON intake/discharge point. This will need to be monitored and if necessary, managed through dredging.

4 WORKS METHODOLOGY

4.1 SURVEYING AND SETTING OUT

4.1.1 For offshore marine works, surveys will be carried out using a DGPS-System (Differential Global Positioning System). A basic station with known coordinates will be installed on a high point on site. This station will be used to correct the received signal given by the satellites.

4.1.2 On the vessel for the marine works, mobile GPS-Receivers will be present.

4.1.3 The DGPS – System will also be used for the dredging and concrete works

4.2 DELIVERY OF CONSTRUCTION MATERIALS

4.2.1 Materials for the combi wall will generally be delivered direct to the piling platform via barge.

4.2.2 Concrete and rock/sand for the revetments and landward infill will be delivered by road.

4.2.3 Materials delivered by road will be unloaded and placed at the works or within stockpile areas.

4.3 PILING OPERATIONS

4.3.1 Piles shall be installed from a jack-up barge working within the estuary.

4.3.2 The initial positioning of the jack up barge should be conducted during low current periods with tug boats. The barge is then temporarily anchored to the bed by jacking up on legs. The jack up barge contains a guiding bar which is finely adjusted using receivers located on the vessel to position the first tubular pile.

4.3.3 The tubular pile is lifted from the delivery barge via crane to its driving position. The tubular pile will initially be driven into the river bed using a vibrating hammer. In total seven tubular piles will be installed before they are then driven to the correct position using an impact hammer. Following driving to the correct depth, the jack-up barge is re-floated and moved to the location for the next set of piles.

4.3.4 A second piling barge will install the intermediate sheet piles between the installed tubular piles. The sheet piles will be lifted via the crane directly from a delivery vessel moored alongside the piling barge. The piles will be driven using vibrating and impact hammers.

4.3.5 The anchor piles behind the main quay wall will be lifted into place from the jack-up barge using the on board crane.

4.3.6 The piles underneath the suspended slab will be installed from behind the quay using land based piling equipment.

4.4 REVETMENT WORKS AND RECLAMATION INFILL

4.4.1 The revetment will be commenced from the sea defences, working outwards towards the main quay. Stone and rock armour will be delivered over land and deposited via dumper truck. Final positioning of the rock armour will be carried out by a long reach excavator or crane working from the top of the revetment.

4.4.2 Infilling of the tidal area enclosed by the quay wall and revetments will be carried out both from the land and from the front quay wall.

4.5 CAPITAL DREDGING

4.5.1 Site investigations have been carried out to determine the material within the berthing pocket and approach channel and an anticipated dredging strategy identified, which is summarised as follows.

4.5.2 It is anticipated that the surface alluvium, silts and the sand & gravel within the river bed can all be dredged using a trailing suction hopper dredger (TSHD). The glacial till (clay) underlying the silts cannot be removed by a trailing suction hopper dredger and will need to be removed using a backhoe dredger.

4.5.3 The dredged materials will be classified for suitability for beneficial re-use within the AMEP quay or the AMEP site behind the flood defences. Suitable material shall either be over-pumped from the dredger behind the quay or loaded into a split hopper barge and transferred from the quay area by suitable land based grab crane or excavator.

4.5.4 Unsuitable materials will be either be dredged and disposed of directly from the dredger or loaded onto barges and disposed at the licensed sites

4.6 MAINTENANCE DREDGING

4.6.1 Maintenance dredging if required in the vicinity of the E.ON pipelines will be carried out by a self propelled vessel operating a plough on the river bed.

4.6.2 The plough is effectively a large steel shovel, which depending upon the vessel is approximately 9m in width. The plough is connected to the rear of the vessel both vertically and horizontally. The vessel moves forwards pulling the plough behind removing layers of material 100 to 200mm deep.

4.6.3 The depth and rate of pull is controlled onboard the vessel by using a series of calibrated marks on the vessel in conjunction with tidal information taken from a tide board. On board electronic apparatus is used to visually represent the riverbed and identify high spots or ridges. A track sailing plan is utilised which provides an actual position and real time update of the dredging, which enables the works to be carried out in the relevant area.

4.6.4 The ploughed material is pulled into deeper water where it can be removed by a trailing suction hopper dredger.

5 RISK ASSESSMENT

5.1 INTRODUCTION

5.1.1 An assessment has been carried out on the potential for causing major disruption to the power station cooling water system caused by the construction and maintenance of the AMEP works.

5.1.2 The principal risks are

- impact and vibration damage to the discharge and intake points
- elevated suspended sediment concentration in the vicinity of the intake point

5.1.3 A number of hazards/ risks during installation of the piles, dredging and maintenance have been identified and minimum mitigation measures have been ascertained, which would reduce the likelihood of the risk/ hazard.

5.1.4 Due to the major impact that the risks/ hazards identified can have on the operation of the power station, the minimum mitigation measures may not be deemed sufficiently proportionate given the impact therefore where possible a number of principle measures for the elimination of the hazard or further reduction of the risk have been identified, which should be carried out or given further consideration.

5.1.5 The assessments for the risks and mitigation measures for each main activity are included within Appendix 1, and are summarised in this section.

5.2 SUMMARY OF IMPACT RISKS AND GENERAL MITIGATION MEASURES

5.2.1 Damage to the discharge and intake points may be caused by a number of reasons no matter what the activity. These predominantly involve impact due to the following:-

- Adverse weather
- Communication failure
- Equipment failure - loss of power
- Equipment failure - mooring lines
- Failure of navigation aid
- Failure to observe Byelaws/ Regulations
- Human error
- Restricted visibility

5.2.2 The likelihood of these occurring whilst not being high can be reduced or managed through standard procedures, which include:-

- Ensuring all ships personnel are suitably qualified
- Navigation aids and communication equipment are in working order and utilised
- All plant and equipment has regular inspections and maintenance
- All vessels within the Humber VTS area shall employ Vessel Traffic Services (VTS) Humber
- Restricted working in adverse weather

5.3 SPECIFIC MITIGATION MEASURES FOR IMPACT

5.3.1 There are several specific procedures which can be adopted to significantly reduce the potential for impact by plant or vessels. The procedures which have also been shown on drawing AME 03036 revA, within Appendix 2, include the following:-

- Vessels approach the northern quay on an ebb tide
- Install the piles with the piling barge and delivery craft behind the pile line, away from the outlet and intakes
- A temporary dolphin could be placed upstream of the quay when installing the piles on the main quay front
- Capital dredging plant faces downstream if possible and does not pass beyond the northern dredging limit
- A minimum distance of separation of 10m between the pipeline and any maintenance dredging
- Provision of marker buoys to be considered along pipeline

5.4 RISK OF DAMAGE DUE TO VIBRATION

5.4.1 The most significant source of vibration during the construction works will be from installation of the tubular steel piling and sheet piling for the quay. The level of vibration has been assessed and included within Chapter 16 of the Environmental Statement for the AMEP Site.

5.4.2 BS5228 Part 2 – Code of Practice for Noise and Vibration Control on Construction and Open Sites provides guidance for the prediction of an upper estimate of vibration from piling operations which is based on the energy per blow or cycle (determined by the type of piler and ram weight), the distance of the receptor from piling and generalised soil conditions.

5.4.3 BS5228 also identifies a maximum PPV for intermittent and continuous vibrations. PPV (Peak Particle Velocity) is the instantaneous maximum velocity reached by a vibrating element as it oscillates about its rest position.

5.4.4 For underground services the maximum PPV for intermittent vibration is 30mm/s

5.4.5 For underground services the maximum PPV for continuous vibration is 15mm/s

5.4.6 During impact driving of the steel sheet tubes, the likely hammer required given the pile size and ground conditions will deliver a maximum energy per blow of 300KJ. Using BS5228 to assess the transmitted vibration levels, the PPV at the pipeline location, 105metres from the piling, will be 1mm/s. The operation of a continuous vibrating hammer during installation of the steel sheet piles will result in a PPV of less than 0.3mm/s at the pipeline.

5.4.7 The level of vibration is significantly lower than the maximum threshold stated in the British Standard for the services, which are located 105m from the line of piling. The risk of damage is therefore low.

5.5 SUSPENSION OF SEDIMENT

5.5.1 Suspension of sediment in the water column is likely to occur during most activities but is likely to be low and localised for piling activities. Activities which may cause significant volumes of sediment suspension which could affect the intake structure are:-

- Infilling behind the main quay
- Capital dredging
- Maintenance dredging

5.5.2 Infilling behind the main quay should only be carried out when there is sufficient external protection from revetments and piles to prevent sediments entering the main river.

5.5.3 Bathymetry and hydrography studies have been carried out which have been included within Annex 9.1 of the AMEP Environmental Statement. During the studies the level of suspended solid concentrations were measured over a single tidal cycle during a neap and a spring tide to determine the volume and range of suspended solids. The results showed that the level of sediment fluctuates depending upon the tide, ranging from 97mg/l to 1534mg/l.

5.5.4 Computer modelling by HR Wallingford of the dredging plume dispersion during capital dredging has been carried out and included within Annex 8.4 of the AMEP Environmental Statement. The use of a trailing suction hopper dredger to remove alluvium will increase levels of suspended sediment concentrations at the intake point by up to 180mg/l. The modelling report concludes that given the large range of background natural suspended sediment concentrations, the impact of the dredging operation is not considered unduly onerous on the operation of the intakes.

5.5.5 Levels of suspended solids can however be monitored over a longer period to determine with greater confidence the range and maximum amount of suspended solids within the water column. Intervention levels can be agreed following the monitoring period whereby automated recording devices are affixed to a buoy near to the intake structure. During dredging operations the monitor can warn the dredging contractor when suspended levels are approaching the maximum agreed range and the dredging position or speed of dredge can be altered whilst levels stabilise. This can apply to both capital and maintenance dredging.

5.5.6 Depending upon the practicality and operational limitations of the capital dredging plant and equipment, dredging during an ebb tide at the northern end of the capital dredge area may assist in reducing the potential for large concentrations of suspended solids at the intake structure.

APPENDIX 1

RISK ASSESSMENTS

Information Enclosed in Appendix	
Table A	Risk Reduction for Impact to Intake/ Outlet During Piling Works
Table B	Risk Reduction for Impact to Intake/ Outlet During Capital Dredging Works
Table C	Risk Reduction for Impact to Intake/ Outlet During Maintenance Dredging Works
Table D	Risk Reduction for Concentrated Levels of Suspended Sediments at Intake Pipe

Table A - Risk Reduction for Impact to InTake/ Outlet During Piling Works

No	Element	Identified Operational Risk.	Minimum Measures/ Procedures for Hazard Elimination or Risk Reduction	Principle Measures/ Procedures for Hazard Elimination or Risk Reduction (or alternatives for consideration)
1	Impact by Construction Vessel	Adverse weather Communication failure Equipment failure - loss of power Equipment failure - mooring lines Failure of navigation aid Failure to observe Byelaws/ Regulations Human error Restricted visibility	a) Pilots trained and authorised b) Pilot Exemption Certificates authorised c) Vessel Traffic Services (VTS) Humber compulsory for all craft entering Humber VTS area d) All ships personnel to be suitable qualified e) Navigation aids and communication equipment to be utilised f) All plant and equipment to undergo necessary inspections and maintenance	Vessels approach piling site during outgoing tide Northern pile return wall constructed with plant and delivery barge positioned downstream of the piles Only pontoons with at least 2 stilts eg “Kiel” shall be used to mitigate movement of pontoon Movement and mooring of pontoon only during low current flow (turning tide) Temporary dolphin installation to be considered between E.ON pipelines and quay wall
2	Fire/ Explosion on Vessel	Defective, or failure, of equipment Human error Inadequate procedures on board vessel	a) All ships personnel to be suitable qualified b) All plant and equipment to undergo necessary inspections and maintenance c) Fire tug to be available d) Emergency procedure plan to be produced by main Contractor	Northern pile return wall constructed with plant and delivery barge positioned downstream of the piles
3	Construction Vessel Capsizes	Loss of stability Watertight integrity Vessel ramps/ hatches secure	a) All ships personnel to be suitable qualified b) All plant and equipment to undergo necessary inspections and maintenance	Northern pile return wall constructed with plant and delivery barge positioned downstream of the piles
4	Materials fall of vessel/ crane	Defective or failure of equipment Human error	a) All ships personnel to be suitable qualified b) All plant and equipment to undergo necessary inspections and maintenance	Northern pile return wall constructed with plant and delivery barge positioned downstream of the piles

Table B - Risk Reduction for Impact to InTake/ Outlet During Capital Dredging

No	Element	Identified Operational Risk.	Minimum Measures/ Procedures for Hazard Elimination or Risk Reduction	Principle Measures/ Procedures for Hazard Elimination or Risk Reduction (or alternatives for consideration)
1	Impact by Dredging Vessel	Adverse weather Communication failure Equipment failure - loss of power Equipment failure - mooring lines Failure of navigation aid Failure to observe Byelaws/ Regulations Human error Restricted visibility	a) Pilots trained and authorised b) Pilot Exemption Certificates authorised c) Vessel Traffic Services (VTS) Humber compulsory for all craft entering Humber VTS area d) All ships personnel to be suitable qualified e) Navigation aids and communication equipment to be utilised f) All plant and equipment to undergo necessary inspections and maintenance	Vessels approach dredging site during outgoing tide Temporary dolphin installation to be considered between E.ON pipelines and quay wall
2	Fire/ Explosion on Vessel	Defective, or failure, of equipment Human error Inadequate procedures on board vessel	a) All ships personnel to be suitable qualified b) All plant and equipment to undergo necessary inspections and maintenance c) Fire tug to be available d) Emergency procedure plan to be produced by main Contractor	
3	Dredging Vessel Capsizes	Loss of stability Watertight integrity Vessel ramps/ hatches secure	a) All ships personnel to be suitable qualified b) All plant and equipment to undergo necessary inspections and maintenance	Dredging vessel does not pass beyond northern limit of dredging to form berthing pocket.
4	Impact by Backhoe on Dredging Vessel	Human Error Incorrect Setting Out	a) All ships personnel to be suitable qualified b) All surveying equipment to be checked and operated by suitable personnel	Dredging to be carried out after pile installation – providing visual line of berthing pocket for dredging Slope cut from top down with dredging vessel located over berthing pocket Temporary dolphin installation to be considered between E.ON pipelines and quay wall

Table C - Risk Reduction for Impact to InTake/ Outlet During Maintenance Dredging

No	Element	Identified Operational Risk.	Minimum Measures/ Procedures for Hazard Elimination or Risk Reduction	Principle Measures/ Procedures for Hazard Elimination or Risk Reduction (or alternatives for consideration)
1	Impact by Dredging Vessel	Adverse weather Communication failure Equipment failure - loss of power Equipment failure - mooring lines Failure of navigation aid Failure to observe Byelaws/ Regulations Human error Restricted visibility	a) Pilots trained and authorised b) Pilot Exemption Certificates authorised c) Vessel Traffic Services (VTS) Humber compulsory for all craft entering Humber VTS area d) All ships personnel to be suitable qualified e) Navigation aids and communication equipment to be utilised f) All plant and equipment to undergo necessary inspections and maintenance	Vessels approach dredging site with opposing tide flow Dredging downstream of Intake and Outlet carried out during outgoing tide Dredging upstream of Intake and Outlet carried out during incoming tide
2	Fire/ Explosion on Vessel	Defective, or failure, of equipment Human error Inadequate procedures on board vessel	a) All ships personnel to be suitable qualified b) All plant and equipment to undergo necessary inspections and maintenance c) Emergency procedure plan to be produced by dredging Contractor	
3	Dredging Vessel Capsizes	Loss of stability Watertight integrity Vessel ramps/ hatches secure	a) All ships personnel to be suitable qualified b) All plant and equipment to undergo necessary inspections and maintenance	Dredging vessel does not cross over pipeline. Minimum offset distance between dredged area and intake/ outlet points to be considered
4	Impact by Plough on Dredging Vessel	Human Error Incorrect Setting Out	a) All ships personnel to be suitable qualified b) All surveying equipment to be checked and operated by suitable personnel	Dredging vessel does not cross over pipeline. Minimum 10m offset distance between dredged area and intake/ outlet points Dredging to be carried out in parallel direction to pipeline and northern quay Consider installing marker buoys along pipeline

Table D - Risk Reduction for Concentrated Level of Suspended Silts at InTake Pipe

No	Element	Identified Operational Risk.	Likely hood of significant volume of silts being disturbed and fouling intake	Principle Measures/ Procedures for Hazard Elimination or Risk Reduction (or alternatives for consideration)
1	Significant volume of suspended silts	Piling Works	During piling operations, silt generally is only disturbed locally to the pile. Piles are held from a crane within a piling gate on the barge and placed vertically to ensure correct positioning but has the benefit of prevent dragging and silt disturbance. It is anticipated that on the main quay, no more than three piles will be driven at any one time; therefore it is likely that the amount of suspended sediments at the intake will be low.	Monitoring Buoy may be considered to assess the amount of silt disturbance
		Installation of Revetment	The placement of stone will be carried out from the shore line, however end tipping of materials from dumper trucks may cause the silt to heave forward and cause some localised disturbance of silts, suspending them within the water column. The intake point is over 180m from the cooling water intake therefore it is likely that the amount of suspended sediments at the intake will be low	Monitoring Buoy may be considered to assess the amount of silt disturbance
		Infilling of Quay Area	Infill of the reclaimed quay area with dredged and imported materials will cause significant amount of suspension of silts and particles within the water column	The reclaimed quay area will be infilled in three stages. Two bunds will be constructed in a similar method to the revetment, at equidistant positions from the northern and southern revetments. The infilling with each “cell” will only commence once the piles and bunding/ revetment fully enclose the area to be reclaimed

Table D - Continued

No	Element	Identified Operational Risk.	Likely hood of significant volume of silts being disturbed and fouling intake	Principle Measures/ Procedures for Hazard Elimination or Risk Reduction (or alternatives for consideration)
1 (cont)	Significant volume of suspended silts (continued)	Capital Dredging	Operations to dredge silt and gravels using a trailing suction hopper are likely to cause silt disturbance Dredging operations using a backhoe excavator are likely to cause localised disturbance of sediments. The risk of significant volumes of suspended sediments at the intake is low	Monitor the natural levels of suspended sediment using an alarmed water quality monitoring system (600OMS V2 Monitor attached to a buoy) which will regularly measure total suspended solid concentrations within the water column. Use results to identify levels of intervention. Apply monitoring during dredging operations. Consider carrying out dredging works at the northern end of the site on an outgoing tide.
		Maintenance Dredging	Dredging using a plough will cause sediments to become locally suspended in the water column. The plough is generally operated at a low speed and removes only thin layers of sediment, therefore the risk of significant volumes of suspension is low	Monitor the natural levels of suspended sediment using an alarmed water quality monitoring system (600OMS V2 Monitor attached to a buoy) which will regularly measure total suspended solid concentrations within the water column. Use results to identify levels of intervention. Apply monitoring during dredging operations. Dredging downstream of Intake and Outlet carried out during outgoing tide Dredging upstream of Intake and Outlet carried out during incoming tide Minimum 10m offset distance between dredged area and intake/ outlet points.

APPENDIX 2

DRAWINGS

Information Enclosed in Appendix	Reference	Date
EON Outfall - General Outfall Layout	GBR522-T217-00-1000	31.07.91
EON Outfall - General Layout C.W. Intake & Discharge	GBR 522-T217-00-1004 revD	11.06.90
EON Outfall - C.W. Intake & Discharge longitudinal section	GBR 522-T217-00-1001 revD	23.02.90
Proximity of AMEP Quay to E.ON Cooling Pipes	AME – 03030 revB	28/05/12
Construction and Maintenance near to E.ON Cooling Pipes	AME – 03036 revA	31/05/12

1039 /D | A0 (CAD)

LEGEND

ACA SWITCHYARD (4.16 kV)
GAD TOWNS WATER TANK
GHC RFW TANKS
GJA RAIN WATER PURGE
10 / 20 PAB COOLING WATER PIPES
PAR MAKE UP WATER SUPPLY PIPES
UAZ CABLE DUCTS (OPTION)
UBA CONTROL BUILDING
10 / 20 UBA POWER CONTROL CENTER FOR COOLING TOWER
10 / 20 UBA POWER CONTROL CENTER FOR STEAM TURBINE /
11-22 UBA POWER CONTROL CENTER FOR GAS TURBINE
11-22 UBE STRUCTURES FOR UNIT TRAFORMER GAS TURBINE
10 / 20 UBF STRUCTURES FOR GENERATOR TRANSFORMER STEAM TURBINE
11-22 UBF STRUCTURES FOR GENERATOR TRANSFORMER GAS TURBINE
01 / 02 UBH OIL COLLECTING PIT
UBN STRUCTURE FOR EMERGENCY DIESEL GENERATOR
UBZ CABLE DUCT
UEN GAS PRESSURE CONTROL STATION
UGD WATER TREATMENT PLANT
UGH RETENTION BASIN FOR RAIN WATER
UGW SEWAGE TREATMENT PLANT
UGX SETTLING BASIN
UGZ PIPING DUCT
UMA BOILER HOUSE
11-22 UMH BYPASS STACK
UMA STEAM TURBINE BUILDING
UMB GAS TURBINE BUILDING
10 / 20 UMH BRIDGE FOR STEAM / WATER PIPES
10 / 20 URA COOLING TOWER
URD C.W. PUMPHOUSE
10 / 20 URL COOLING TOWER DISCHARGE CULVERT
10 / 20 URQ COOLING TOWER BLOWDOWN PIPE
URZ CABLE DUCTS
UST WORKSHOP AND STORE
11-22 UTX STRUCTURES FOR LUBE OIL COOLER
UYE GATE HOUSE
UZD STATION CAR PARK

Chase Hill Farm
Fox Covert
Chase Hill Wood
Possible Route of Transmission Line.
Route of Transmission Line.
TEMPORARY TOP SOIL STORAGE 1.5 HA
Footpath
AREA TO BE PRESERVED 12.8 ha
Fairfields
GAS PIPELINE TO STATION (INDICATIVE ONLY)
Area reserved for GAS Receiving Station
GAS TERMINAL POINT (Gas supply provided by others)
POWER & TELECOM TERMINAL POINT
ROAD IMPROVEMENTS BY PRELIMINARY WORKS CONTRACTOR
SERVICE DUCTS FOR CABLE
PIPE JACKING 59.00 m SEE DRG GBR 522-T217-00-1013
PIPE JACKING - 01 UQP 02
POINT NO.4 LAYING PIPES TO RADIUS R=400 M
PIPE JACKING 59.00 m SEE DRG GBR 522-T217-00-1013
DITCH CROSSING SEE DRG GBR 522-T217-00-1013
ACCESS ROAD
PROPOSED ACCESS ROAD TO THE PUMPHOUSE WIDTH 4.00 m
REFERENCE POINT C.W. DISCHARGE TA 77145 19383
290 m
01 UPP
01 UQP 01
01 UQR
01 UQB/UQX
COORDINATES CONNECTION UQB/UQX SEE DRG GBR 522-T 217-11-1004
CHAMBER FOR PIPE DRAINAGE 01 UQZ 5
CHAMBER FOR FLOW METER 01 PAR 01 / 01 UQP 01 01 UQZ 4
PIPE JACKING
DRG GBR 522-T 217-11-1011
DRG GBR 522-T 217-11-1012
01 UQP 02
01 PAR 01
DITCH CROSSING SEE DRG GBR 522-T217-00-1012
01 UQZ 3
01 UQZ 2
Dyke
Dyke
Sewage Works
30 m WIDE RAISED & LANDSCAPED AREA USING EXCAVATED SUBSOIL COVERED WITH TOP SOIL TO BE PROVIDED BY OTHERS IN PRELIMINARY WORKS CONTRACT.

Coordinates for C. W. Discharge Pipe UQP 02

No.	National grid E	National grid N	Local grid X	Local grid Y
1	515614.993	418893.950	953.800	409.100
2.1	515625.227	418899.195	965.300	409.100
2.2	515638.444	418897.705	976.383	401.746
2.3	515682.963	418905.838	1019.711	388.678
2.4	515700.416	418914.107	1039.014	388.077
3	515781.208	418938.880	1117.651	364.373
4	515999.982	418920.015	1308.300	256.700
5	516400.035	418919.977	1664.300	74.200
6	517101.441	419355.926	2487.338	142.265

TYPICAL SECTION

G.L. (AREA POWER PLANT +800 A.O.D.)
76.00 / 72.69 A.O.D.
3 N° CONTROL CABLE
01 UQP 02 DN 900
01 PAR 01 DN 710
UNDER ROADS SERVICE DUCTS FOR CABLE 4 x 150 DIA CONCRETE SURROUND (MIN 150 MM)

01 PAR 01 MAKE-UP WATER PIPELINE
01 UGX SEDIMENT SETTLING BASIN
01 UPD INTAKE STRUCTURE
01 UPP 02 INTAKE PIPELINE
01 UQB MAKE-UP WATER PUMPHOUSE
01 UQM COLLECTING PIT
01 UQP 01 DISCHARGE PIPELINE
01 UQP 02 PURGE WATER PIPELINE
01 UQR DISCHARGE STRUCTURE
01 UQX TRANSFER STRUCTURE
01 UQZ 02 MANHOLE
01 UQZ 03 MANHOLE
01 UQZ 04 FLOWMETER
01 UQZ 05 MANHOLE

OFFICE 19 AUG 1991

F	31.07.91	KU	KU	HO	REVISED AS SHOWN
E	17.04.91	SIE.	HO.	KO	REVISED AS SHOWN
D	21.02.91	ANS.	HO./	KO	01 UQZ 2-5 POINT 3.6 / PIPE JACKING HAVEN ROAD
C	14.01.91	ANS.		HO	NO OF PIPE SLEEVES FOR CABLE BELOW ROADS
B	05.12.90	ANS.		HO	DIA PIPE PAR 01 / PIPE JACKING
A	24.09.90		196		COMPLETELY REVISED

JOB	KILLINGHOLME POWERGEN POWER STATION
SYSTEM	CW SYSTEM
SUB-SYSTEM	GENERAL - COMBINED LAYOUTS
DRG.IDENT.	KLA / BF / 30003 F
SPEC.NO.	KLA / EYB / 01

POWERGEN KILLINGHOLME CCGT PROJECT

DESIGN	90.02.07	MEEPER	
DRAWN	90.02.07	MEEPER	
CLIENT APPROVAL	90.03.21		

SCALE 1 : 2500

GENERAL LAYOUT MAKE UP AND PURGE WATER

Siemens AG
Unternehmensbereich KWU

GBR 522 - T 217 - 00 - 1000 F

2 019 765

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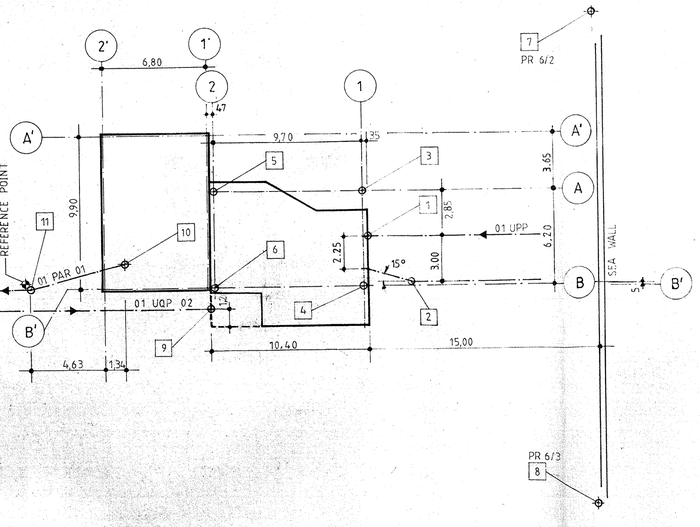
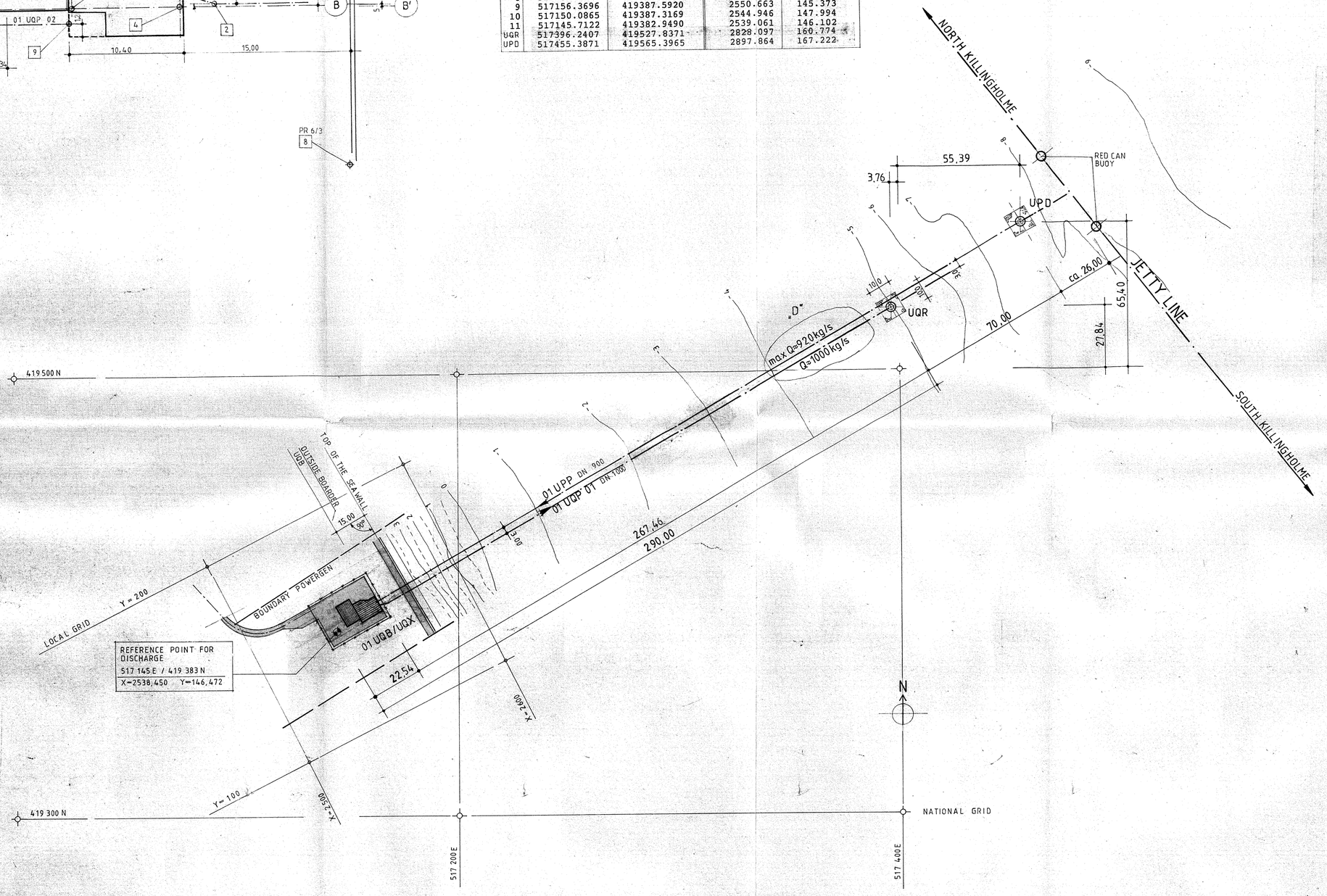
14y_9 JC-FEB-90 09:43.20

01 PAR 01	MAKE-UP WATER PIPELINE
01 UPD	INTAKE STRUCTURE
01 UPP	INTAKE PIPELINE
01 UQB	MAKE-UP WATER PUMPHOUSE
01 UQP 01	DISCHARGE PIPELINE
01 UQP 02	PURGE WATER PIPELINE
01 UQR	DISCHARGE STRUCTURE
01 UQX	TRANSFER STRUCTURE



No.	NATIONAL GRID E	NATIONAL GRID N	LOCAL GRID X	LOCAL GRID Y
1	517163.0257	419396.8544	2560.811	150.580
2	517166.7819	419395.5569	2563.562	147.717
3	517161.3055	419399.1517	2560.328	153.409
4	517164.4020	419393.7809	2560.634	147.217
5	517152.9010	419394.3071	2550.639	152.931
6	517155.9989	419388.9358	2550.946	146.738
7	517168.6630	419416.8090	2574.929	165.767
8	517184.7350	419388.9300	2576.516	133.626
9	517156.3696	419387.5920	2550.663	145.373
10	517150.0865	419387.3169	2544.946	147.994
11	517145.7122	419382.9490	2539.061	146.102
UQR	517396.2407	419527.8371	2828.097	160.774
UPD	517455.3871	419565.3965	2897.864	167.222



NOTES:

1. SEA BED LEVELS ARE TAKEN FROM BATHYMETRIC SURVEY ASSOCIATED BRITISH PORTS, 30 MARCH 1990 (A&L DWG NO. 6482/H/1)

2. OFF SHORE WORKS ARE MARKED BY
   - MARKS SITED ON LAND: 2 NO. YELLOW PILES WITH YELLOW ST. ANDREWS CROSS
   - BUOYAGE IN THE RIVER: 2 NO. LIT BUOYS IN LINE WITH THE JETTIES AND THE INTAKE STRUCTURE

△D UPSTREAM BUOY – FL R 4s
COORD. 517 465E – 419 595N

△D DOWNSTREAM BUOY FL R 2s
COORD. 517 490E – 419 563N

OFFICE
23 JAN 1992
COPY

ALL LEVELS ARE BASED ON A.O.D. (OD NEWLYN)

SCANNED DATE
19 OCT 1993

Index	Datum Date	gezeich. Drawn	bearb. Coord	geprüft Checked	Änderungshinweis/Details of revision
D	11.12.91	SIE.	KU.	HO.	COORD. BUOYS, QUANTITY OF WATER, ACCESS ROAD
C	31.07.91	KU.	KU.	HO	REVISED AS SHOWN
B	26.04.91	SIE.	HO.	KO.	JETTY LINE, NOTES, COORDINATES
A	20.02.91	ANS.	HO.	KO.	COMPLETE REVISED

JOB	KILLINGHOLME POWERGEN POWER STATION
SYSTEM	C.W. SYSTEM
SUB-SYSTEM	C.W. INTAKE AND OUTFALL STR./MAKE UP W.P.-HOUSE 07 08
DRG.IDENT.	KLA / BF / 30 104 D
SPEC.NO.	KLA / EYB / 01

Ursprung/Origin: | Ursprung-Zeichnungs-Nr./Original drawing No.: | Ursp.-KW-Nr./Orig. Plant code:

Projekt/Project: POWERGEN KILLINGHOLME CCGT PROJECT | KW-Nr./Plant code: GBR 522

	Datum Date	Name Name
gezeich. Drawn	11.06.90	HOFER
bearb. Coord	11.06.90	HOFER
geprüft Checked	12.06.90	KÖGLER
Abtlg. Dept.	T 217	

Maßstab/Scale: 1:1000/1:200 | UA: Doc key: UC

Benennung/Title: GENERAL LAYOUT C.W. INTAKE AND DISCHARGE

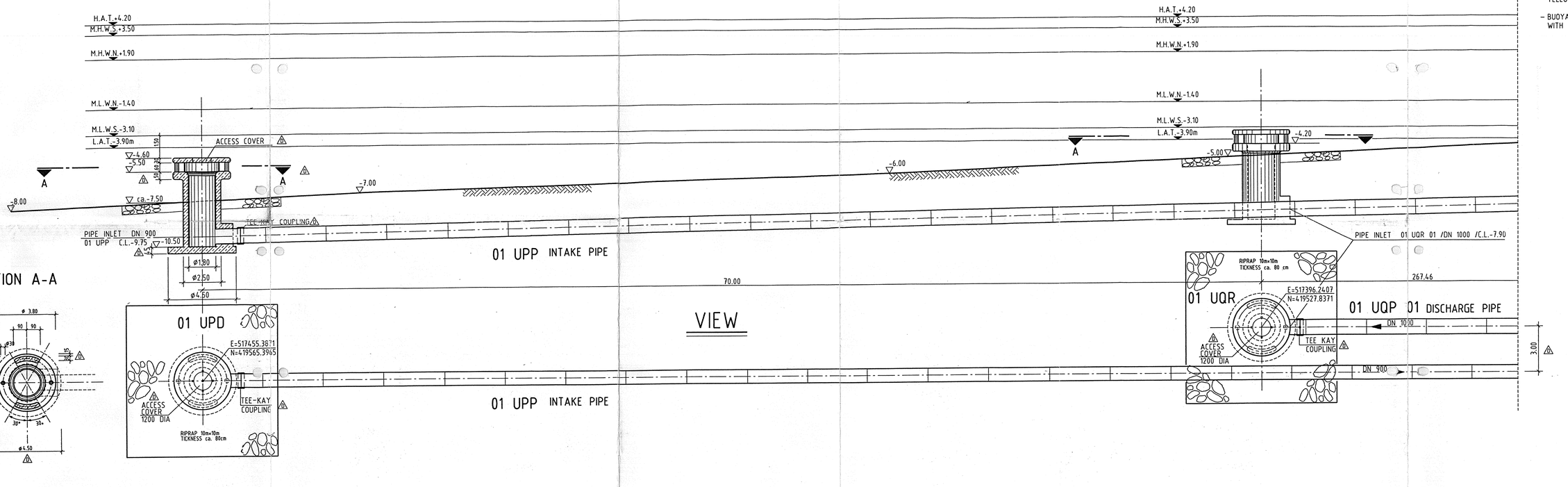
Inhaltskennzeichen/Code: UPD/UPP UQP/UQR UQB/UQX

Siemens AG
Unternehmensbereich KWU

Zeichnungs-Nummer/Drawing No.: GBR 522- T 217 -11- 1004 D

Ersetzt durch/Superseded by: 1095087 | Ersatz für/Supersedes: 2 019 673

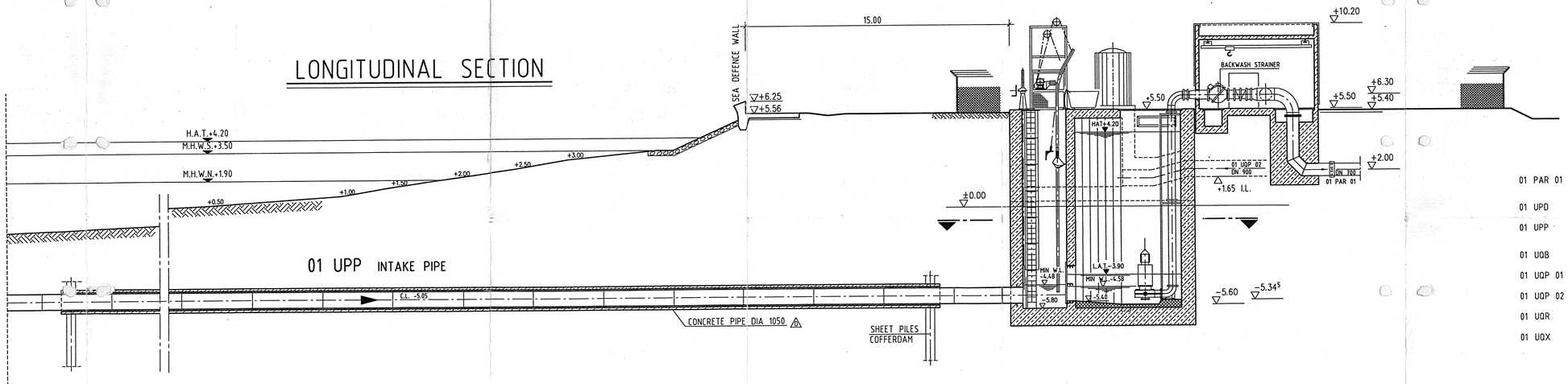
LONGITUDINAL SECTION



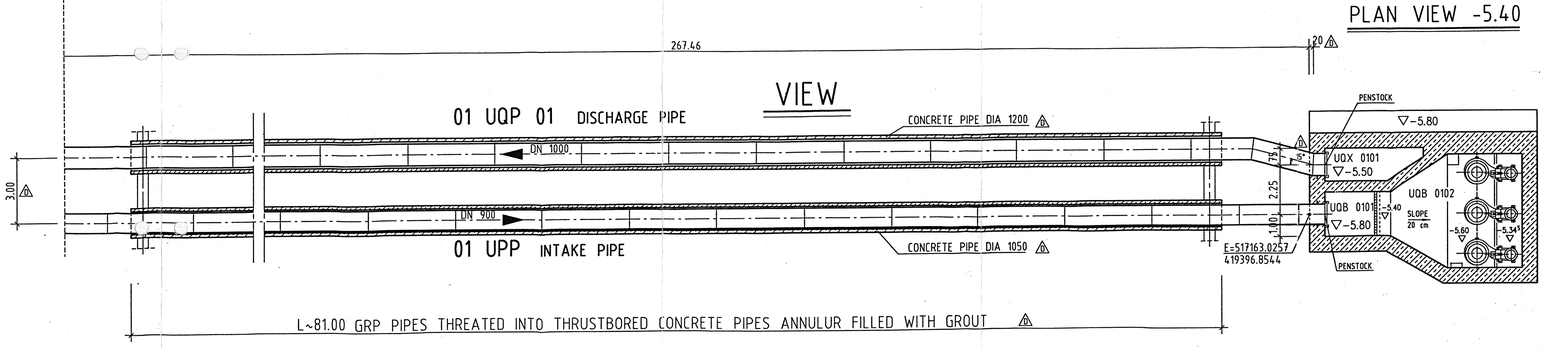
NOTES:

1. SEA BED LEVELS ARE TAKEN FROM BATHYMETRIC SURVEY ASSOCIATED BRITISH PORTS, 30 MARCH 1990 (A+L DWG No.6482/H/1)
2. OFF SHORE WORKS ARE MARKED BY
   - MARKS SITED ON LAND: 2No YELLOW PILES WITH YELLOW ST. ANDREWS CROSS
   - BUOYAGE IN THE RIVER: 2No LIT BUOYS IN LINE WITH THE JETTIES AND THE INTAKE STRUCTURE

LONGITUDINAL SECTION



PLAN VIEW -5.40



01 PAR 01	MAKE-UP WATER PIPELINE
01 UPD	INTAKE STRUCTURE
01 UPP	INTAKE PIPE
01 UQB	MAKE-UP WATER PUMPHOUSE
01 UQP 01	DISCHARGE PIPE
01 UQP 02	PURGE WATER PIPELINE
01 UQR	DISCHARGE STRUCTURE
01 UQX	TRANSFER STRUCTURE

ALL LEVELS ARE IN METRES
RELATIVE TO ORDNANCE DATUM (NEWLYN)

SCANNED DATE
12 OCT 1993

D	01.08.91	KRO	HOE	HOE	AS SHOWN
C	29.04.91	NA.	HOE.	KOE.	COORDINATES , BUILDING UQB
B	24.10.90	ARN.	HOE.	KOE.	COLUMNS VELOCITY CAPS / PUMPHOUSE UQB

JOB	KILLINGHOLME POWERGEN POWER STATION
SYSTEM	C.W. SYSTEM
SUB-SYSTEM	C.W. INTAKE AND OUTFALL STRUCTURE 07
DRG.IDENT.	KLA / BF / 30 004 D
SPEC.NO.	KLA / EYB / 01

Ursprung/Original | Ursprung-Nr./Original-No. | Urspr./PKZ-Nr. Orig./PC

Projekt/Project: POWERGEN KILLINGHOLME CCGT PROJECT | PKZ/PC: GBR522

	Datum Date	Name
Gezeich. Drawn	23.02.90	ARNHOLDT
Gepr. Chkd.	23.02.90	HOEFER
Freigabe Released	20.03.90	FRITZE
Abtlg. Dept.	T217	

Maßstab Scale: 1 : 100

Benennung/Title: C.W. INTAKE AND DISCHARGE

Art Type of Doc.: UE

Inhaltsklassifizierung Content Code: UPD/UQR UPP/UQP UQB/UQX

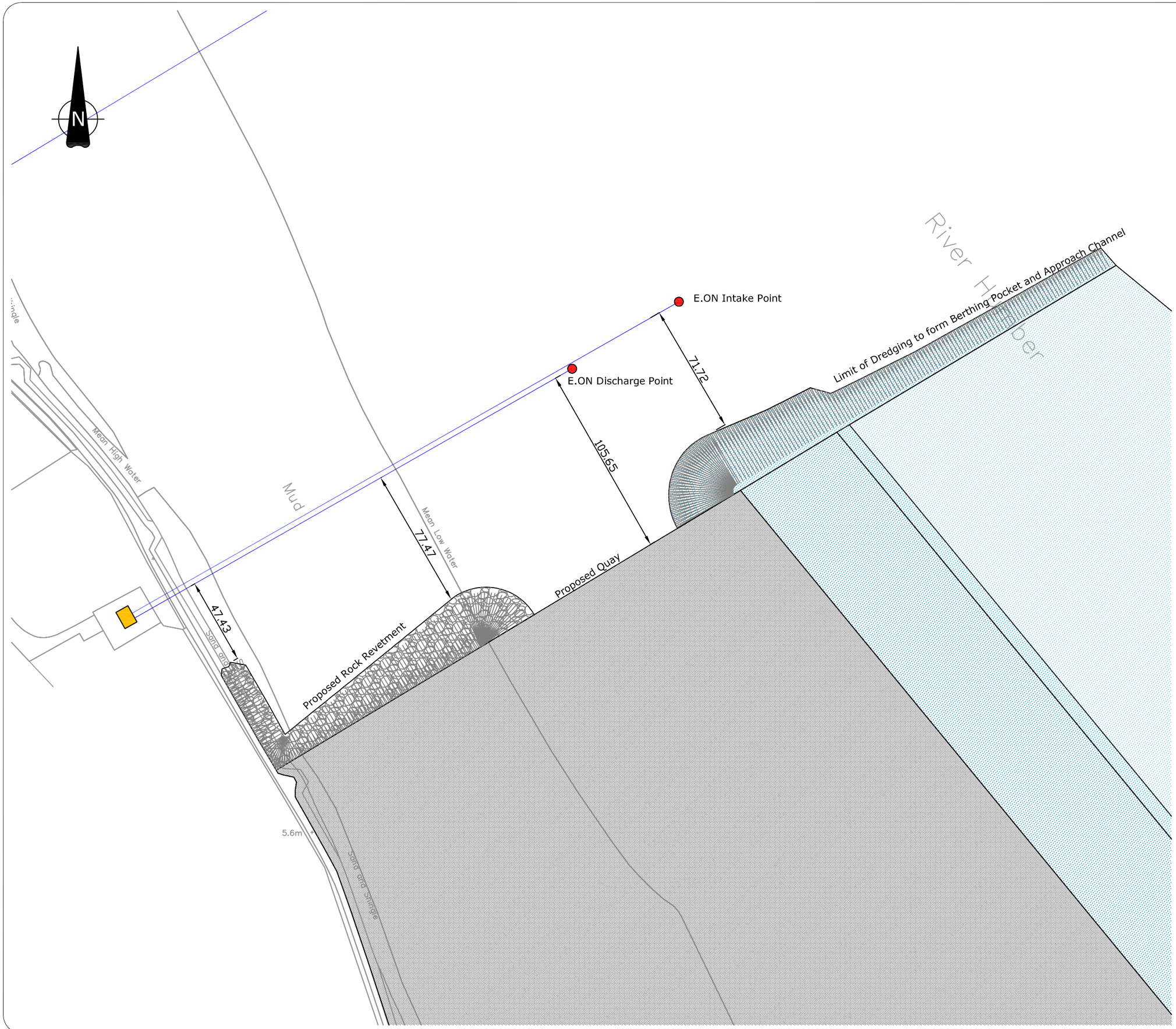
Zeichn.-Nr. Drg.-No.: 1001

Siemens AG
Energieerzeugung (KWU)

Übersetzt/Dept. | UMD: 1000033449 | Index/Rev.: D | Version:

GBR522-T217-00-1001

Erstellt mit: DOS/AutoCAD | Blatt-Nr./Page-No.



KEY

- Existing Pumphouse & Transfer Structure
- Existing Intake & Discharge Pipelines
- Proposed Quay
- Berthing Pocket and Approach Channel

Rev	Date	Comments	Drw	Chk	App
B	28/05/12	Details updated	IW	RC	PMS
A	23/04/12	Preliminary Issue	IW	PMS	PMS

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Teesside
TS23 1PX
United Kingdom

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Fax: +44(0)1642 655655
Info@ableuk.com
www.ableuk.com

Project: Able Marine Energy Park

Client: Able UK Ltd

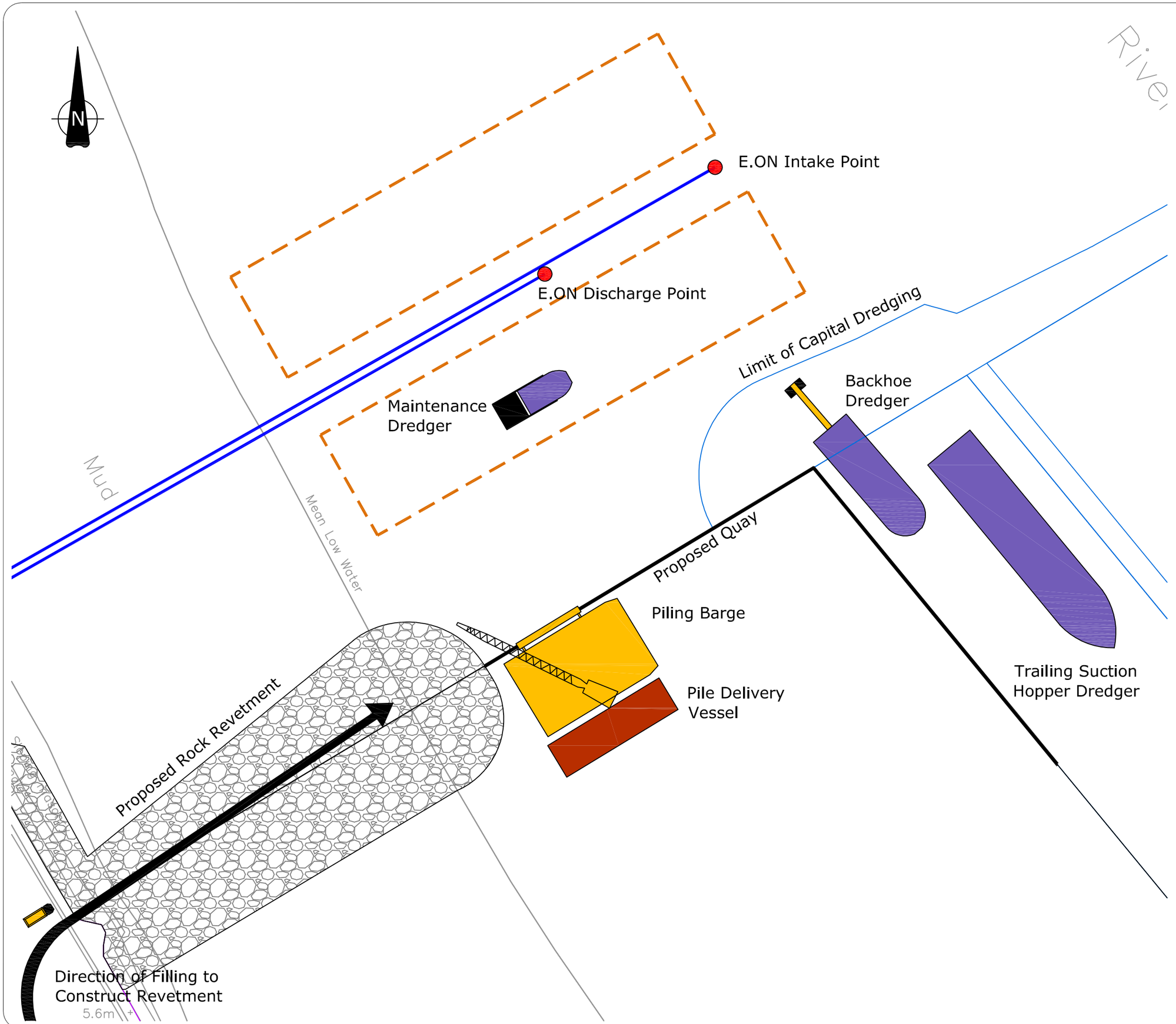
Title: Proximity of AMEP Quay to E.ON Cooling Pipes

PRELIMINARY

Scale:	Drawn	Checked	Approved
1:2,000@A3	IW	PMS	PMS
Date	23/04/2012	23/04/2012	23/04/2012

Drawing No. AME - 03030

Revision: B



KEY

Existing Intake & Discharge Pipelines

Area of Maintenance Dredging (set back 10m from pipeline)

NOTE
Operations/ plant shown will not all be carried out or present at the same time.

Plant sizes are representative of those likely to be used

Rev	Date	Comments	Drw	Chk	App
A	31/05/12	Preliminary Issue	IW	RC	PMS

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Project: Able Marine Energy Park

Client: Able UK Ltd

Title: Construction and Maintenance Near to E.ON Cooling Pipes

PRELIMINARY

Scale:	Drawn	Checked	Approved
1:1250@A3	IW	RC	PMS
Date	31/05/2012	31/05/2012	31/05/2012

Drawing No. AME - 03036

Revision: A

APPENDIX 3

PLANT DATA SHEETS

Plant Data Enclosed in Appendix	Likely Application
Jack up Platform Odin	Piling Barge
Working pontoon	Working pontoon
Vessel Oranje	Capital Dredging (Trailing Suction Hopper)
Vessel Barent Zanen	Capital Dredging (Trailing Suction Hopper)
Vessel Nordic Giant	Capital Dredging (Backhoe)
Vessel Norma	Maintenance Dredging
Monitoring Solutions	Sediment Monitoring
600OMS V2 Monitor	Sediment Monitoring

CIVIL ENGINEERING AND MARINE WORKS

Jack-up platform **Odin**

In the field of harbor construction, extension of existing waterways, pile foundations for large-size bridges and development of new offshore projects, it is a well-know fact that anyone working in water needs a safe platform. With its "Odin" jack-up platform, HOCHTIEF is bracing itself for major maritime projects world-wide. One such project is the container terminal in Bremerhaven. HOCHTIEF is currently expanding this international freight trade hub in Northern Germany. A big challenge in constructing the world's longest quay wall is the anchoring of the sheet-pile walls. The walls consist of panels which weigh up to 30 tons. For anchoring works of this order, a high-capacity jack-up platform is indispensable.

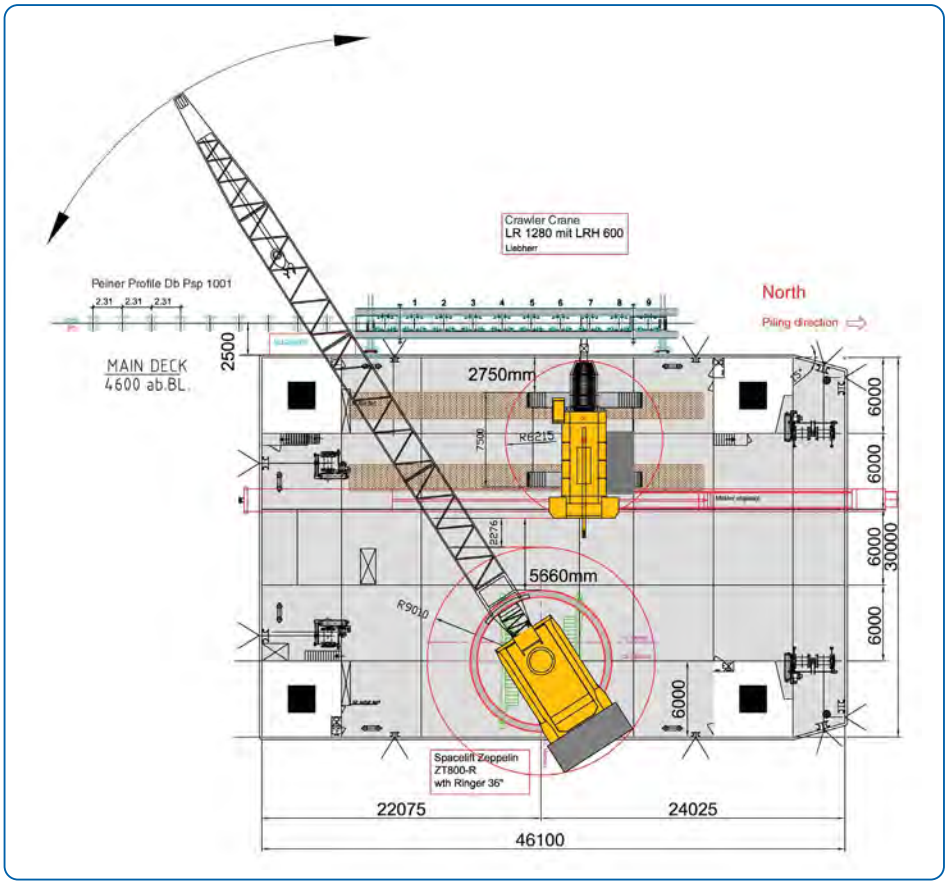
The technical capacity of HOCHTIEF's "Odin" jack-up platform, named after the Nordic Father God, is illustrated best during the tough offshore works: thanks to the jack-up platform's 60-meter long legs, works can even be performed in depths of up to 45 meters under water. HOCHTIEF thus lays the groundwork for the development of new technologies and markets in the field of marine works.

HOCHTIEF
CONSTRUCTION AG





Power for New Projects.



Technical Data

Name	ODIN
Classification	GL + 100 A5 K50
Dimensions	Length: 46.10 m Width: 30.00 m Height: 4.60 m
Leg dimensions	Length: 60.00 m □ 2.00 m
Draught	min.: 2.30 m max.: 3.25 m
Operating depth	45.00 m
Payload	1,200 t
Deck load	15.00 t/m^2 - 30.00 t/m^2
Hoisting capacity	900 t/each
Hoisting speed	up to 2.50 m/min
Cranage	Spacelift ZT - R 800 Ringer S3
Crane capacity	61.00 m / 32.20 t
Crawler crane	Liebherr LR 1280
equipped with	LRH 600

Mooring winches

2 double winches	pull 17.50 t/each
2 single winches	pull 17.50 t/each

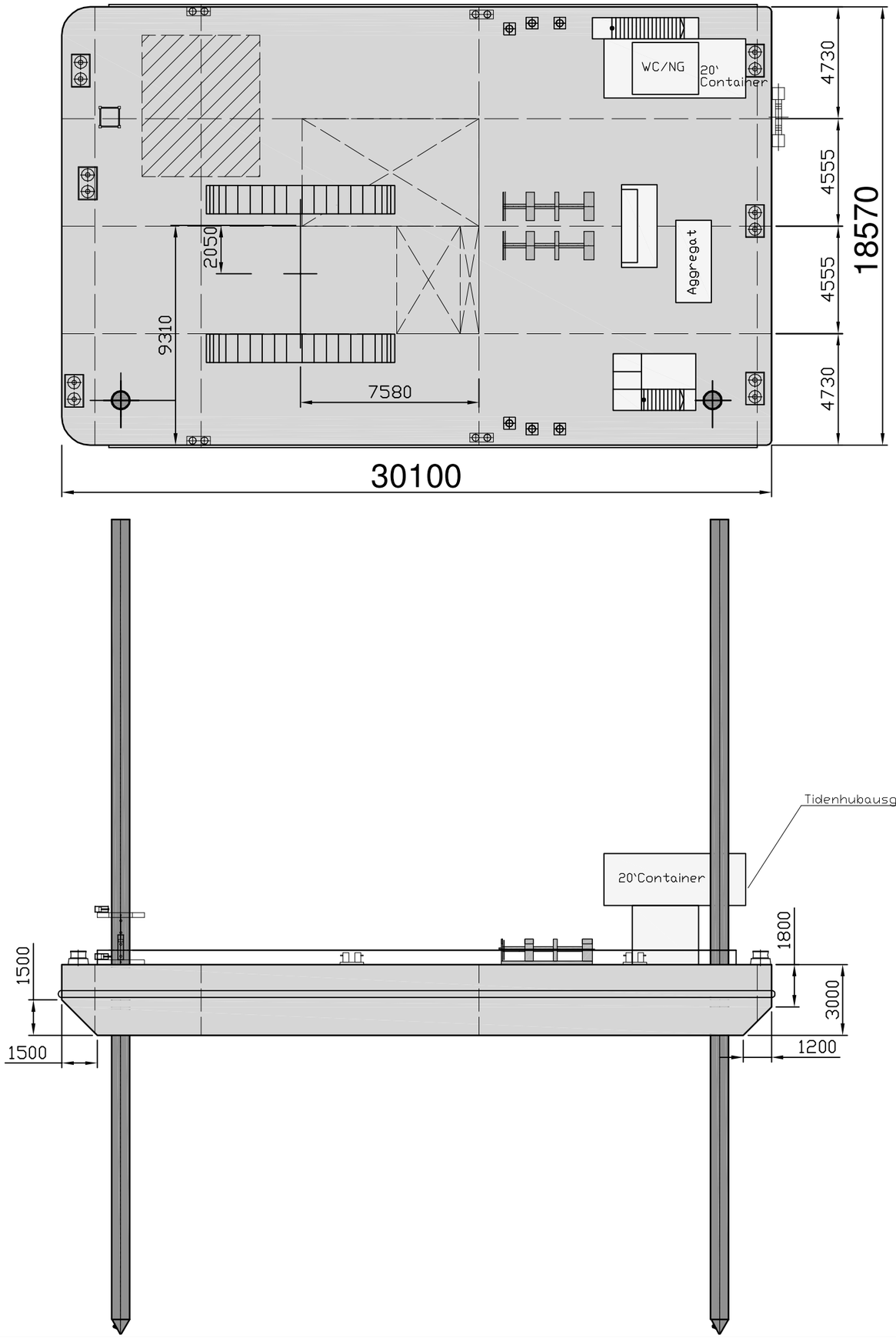
Power supply

Diesel / hydraulical:	4 x 355.00 KW
Diesel / electrical:	1 x 355.00 KW

HOCHTIEF Construction AG
Civil Engineering and Marine Works

Eiffestrasse 585
20537 Hamburg, Germany
Phone: +49 40 219 86-0
Fax: +49 40 219 86-200

www.hochtief-construction.com
E-mail: marine-works@hochtief.de



Ponton Kiel

M 1:200

Boskalis
Dredging & Marine Experts

EQUIPMENT SHEET

ORANJE
TRAILING SUCTION HOPPER DREDGER

CONSTRUCTION/CLASSIFICATION

Built by	Merwede Shipyard
Year of construction	2004
Classification	B.V. I ✠ HULL ✠ MACH ✠ AUT-UMS, hopper dredger, unrestricted navigation, dredging over 15 miles from shore, MON-SHAFT.

FEATURES

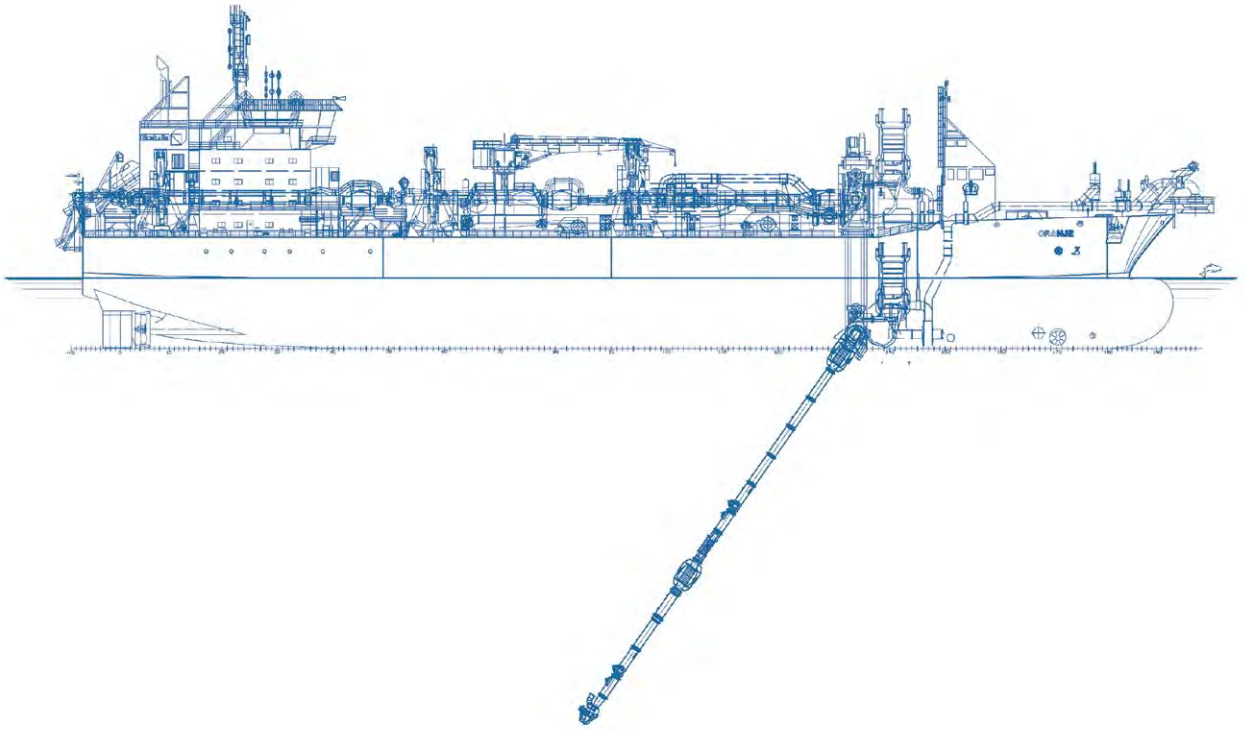
Long suction pipe with underwater pump.
5 gravity-gantries.

MAIN DATA

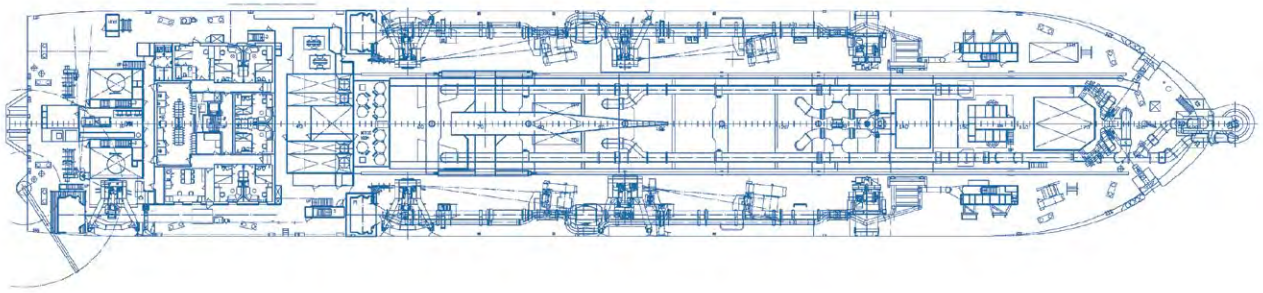
Gross tonnage	18,091
Length overall	156.00 m
Breadth	28.00 m
Moulded depth	15.00 m
Max. draught empty	4.63 m
Max. draught Int. load line	9.24 m
Max. draught dredging load line 1	12.02 m
Max. draught dredging load line 2	12.84 m
Carrying capacity (D.W.)	30,445 t
Hopper capacity	15,961 m^3
Suction pipe diameter	2 x 1.00 m
Max. dredging depth	90.0 m
Discharge systems	bottom doors/pump ashore/ rainbow installation
Sailing speed loaded	16.2 kn
Total installed power	19,500 kW
Sand pump output	5,000 kW
Jet pump output	3,000 kW
Pump ashore output	8,800 kW
Propulsion power sailing	14,000 kW
Bow thruster	1,400 kW

Boskalis
Dredging & Marine Experts

ORANJE
TRAILING SUCTION HOPPER DREDGER



SIDE VIEW



TOP VIEW DECK LEVEL

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The Netherlands

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royal@boskalis.com
www.boskalis.com

Boskalis
Dredging & Marine Experts

EQUIPMENT SHEET

BARENT ZANEN
TRAILING SUCTION HOPPER DREDGER

CONSTRUCTION/CLASSIFICATION

Built by	IHC Smit B.V.
Year of construction	1984
Classification	B.V. I ✠ HULL ✠ MACH ✠ AUT-UMS, Hopper dredger Dredging within 15 miles from shore or within 20 miles from port Dredging over 15 miles from shore with H.S. <= 3.0 m Unrestricted Navigation Ice class IA

FEATURES

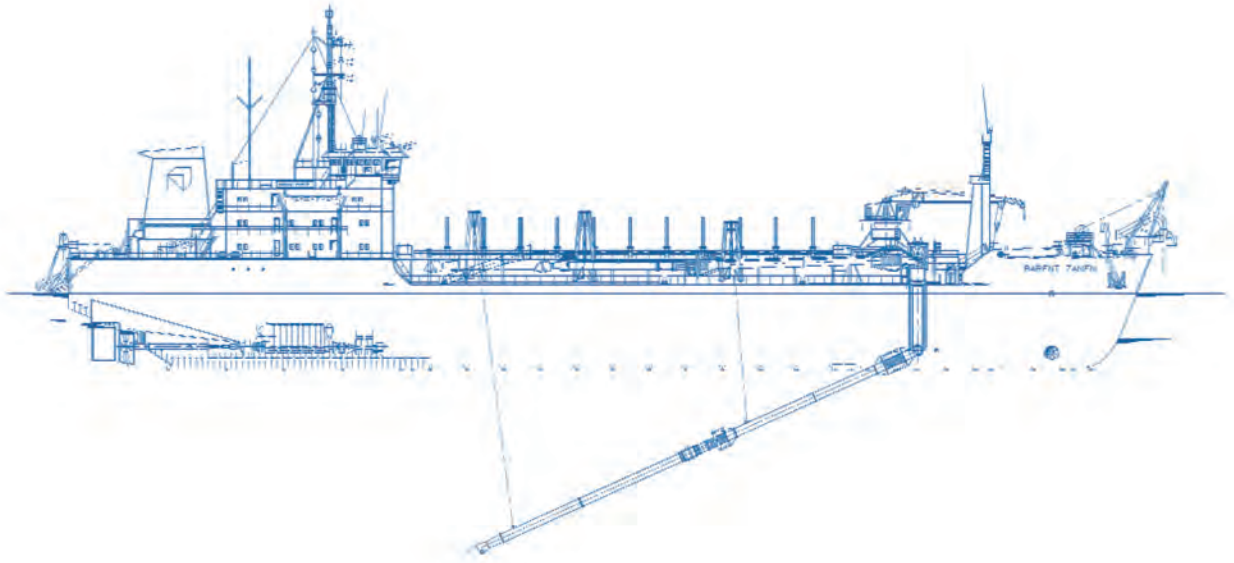
Dredging freeboard for trading area up to 15 miles offshore.
Dynamic positioning and tracking system.

MAIN DATA

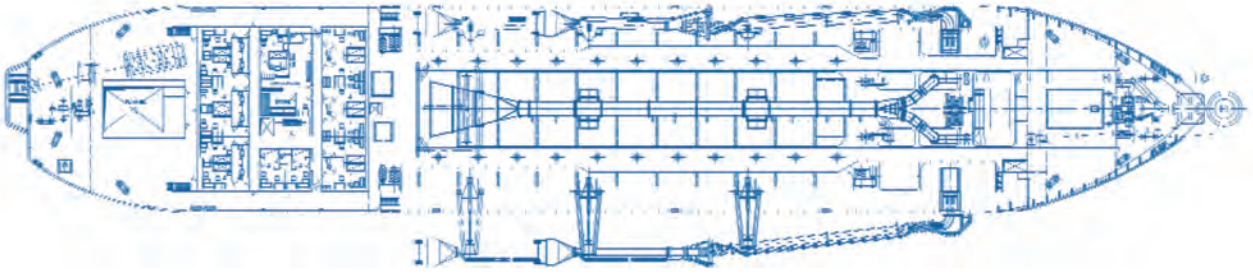
Gross tonnage	9,773
Length overall	133.58 m
Breadth	23.13 m
Moulded depth	10.00 m
Max. draught empty	5.66 m
Max. draught Int. load line	7.95 m
Max. draught dredging load line	8.81 m
Carrying capacity (D.W.)	14,335 t
Hopper capacity	8,116 m
Suction pipe diameter	2 x 1.00 m
Max. dredging depth	49.00 m
Discharge systems	44 bottom doors/pump ashore/ rainbow installation
Sailing speed loaded	13.5 kn
Total installed power	12,658 kW
Sand pump output	3,600 kW
Jet pump output	1,576 kW
Pump ashore output	5,902 kW
Propulsion power sailing	9,120 kW
Bow thruster	750 kW

Boskalis
Dredging & Marine Experts

BARENT ZANEN
TRAILING SUCTION HOPPER DREDGER



SIDE VIEW



TOP VIEW DECK LEVEL

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F +31 78 69 69 555

royal@boskalis.com
www.boskalis.com

Nordic Giant

Backhoe Dredger

Features:

High capacity, powerful backhoe dredger designed for dredging in all kind of materials under heavy working conditions

Several monoblock / stick / bucket combinations for optimising productions in different materials

Main data:

Built by	Port Said Shipyard / Turku Repair Yard
Year of construction	1999 / 2002
Classification	B.V.I. Hull Special service / Dipper dredger / NP
Working area	Dredging within 15 miles offshore or 20 miles from port
Tonnage	GRT 1090
Length overall	55,00 m
Breadth	17,00 m
Moulded depth	4,00 m
Draught	2,60 m
Hull	Welded steel
Crane	Liebherr 995 (1999)
Total installed power	1600 kW
Bucket sizes	6 ... 22 m^3, environmental buckets 16 m^3 and 25 m^3
Max dredging depth	27 m
Equipment	Computerised excavation monitoring control
	DGPS / RTK positioning
	Deck crane
Port of registry	Helsinki, Finland

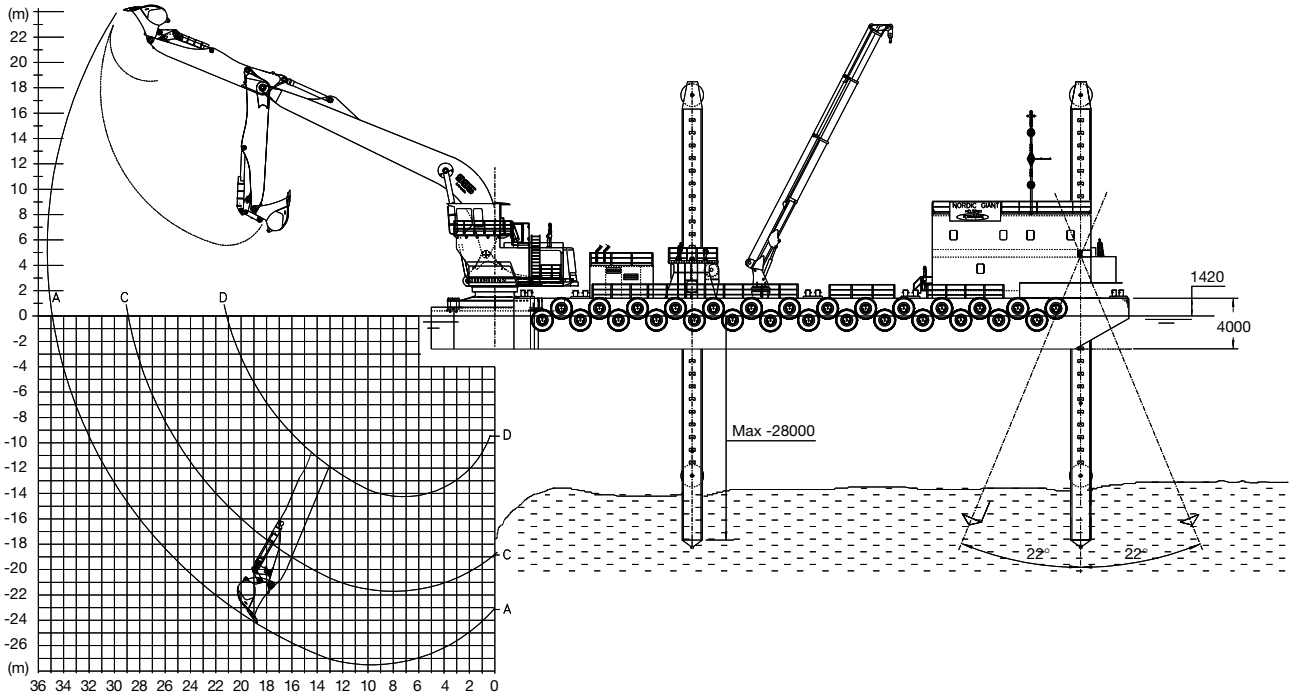
Royal Boskalis Westminster nv

P.O. Box 14, Laurinmäenkuja 3 A, 00441 Helsinki, Finland
Telephone +358 (0)9 613 621, **telefax** +358 (0)9 6136 2700
Internet www.terramare.fi **e-mail** terramare@terramare.fi

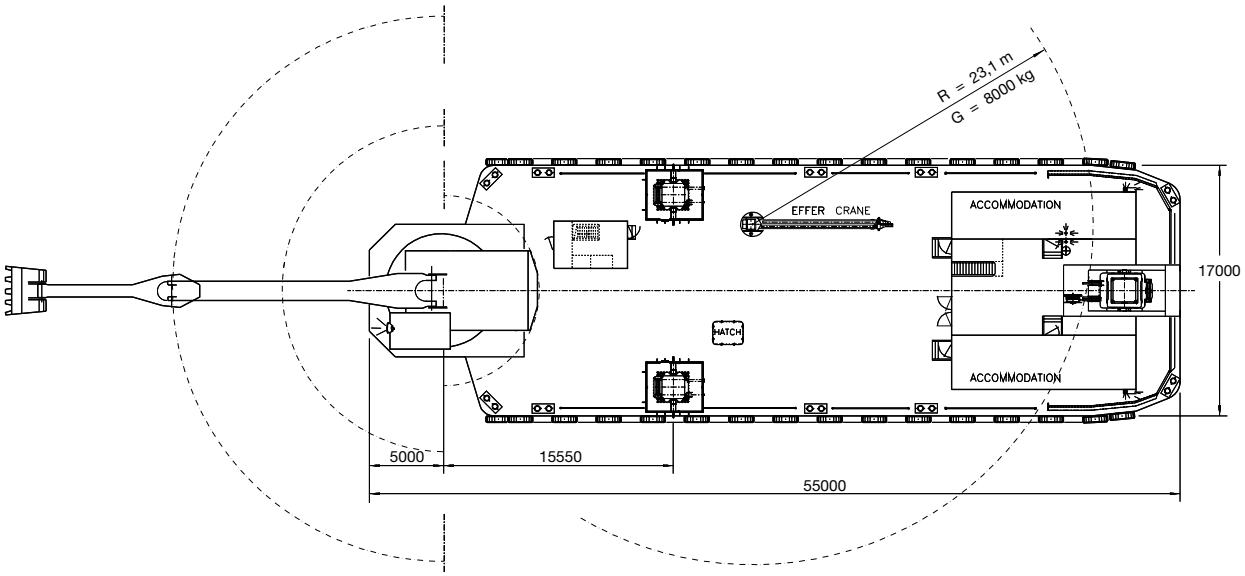
TERRAMARE

Nordic Giant

Backhoe Dredger



Side view



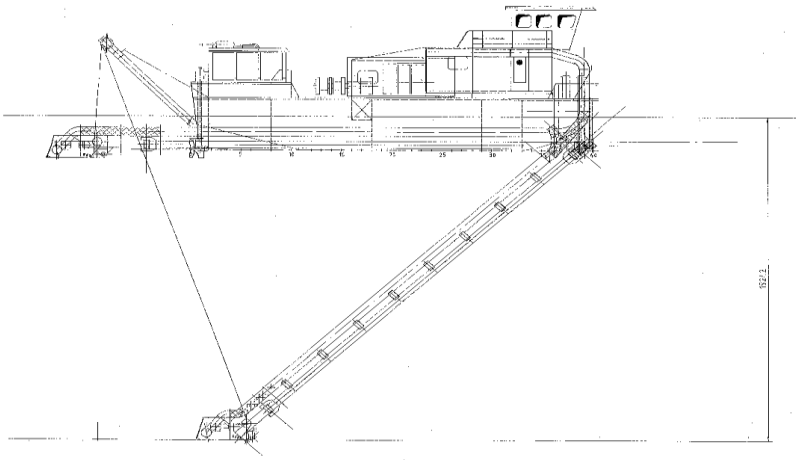
Top view

NORMA

Water injection vessel

FEATURES

- This versatile vessel can operate in either water injection mode or as a plough boat
- Water injection is achieved via two low pressure water pumps which circulate water to a specially designed injection head fitted with multiple water jets.
- The combined output of these pumps is up to 7400m3 per hour.
- The injection head is brought into contact with the seabed and a pre-determined thickness fluidised.
- Accurate horizontal positioning and track plotting is achieved using DGPS to enable targeted dredging.
- Vertical control is achieved using tidal data transmitted from shore together with digital ladder depth indication.
- Twin Scottel azimuth thrusters permit a high degree of manoeuvrability with the ability to dredge accurately and in confined areas.



Westminster Dredging Company Limited

Westminster House,
Crompton Way, Segensworth West,
Fareham, Hampshire, PO15 5SS, U.K.

Telephone: 01489 885933
Telefax: 01489 578588
Internet: www.westminsterdredging.co.uk
E-mail: wdco@boskalis.co.uk

MAIN DATA

Year of construction	1981 – major upgrade 2008
Working areas	Sheltered waters
Length overall	27.00m
Length BPP	18.80m
Width	9.50m
Depth moulded	3.00m
Draught	2.15m
Main propulsion	625 kW (850 h.p.)
Manoeuvring Propulsion	2 No. Schottels 2 x 220 kW (2x300 h.p.)
Bowthruster	120 kW (160 h.p.)
Jetting Head	
- maximum depth	19.00 m
- width	8.80 m

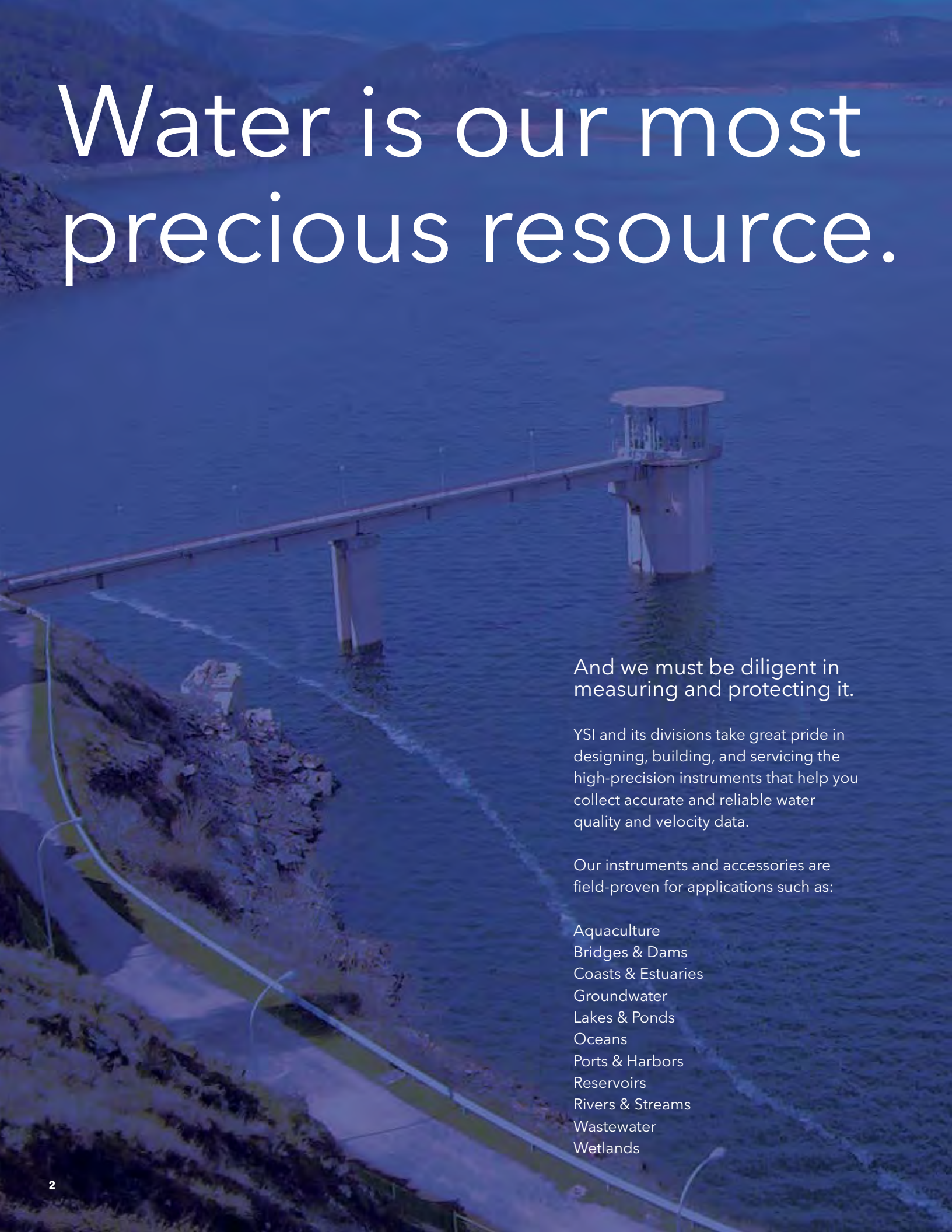
Water Monitoring Solutions

YSI®

a xylem brand

E58

Water is our most precious resource.



And we must be diligent in measuring and protecting it.

YSI and its divisions take great pride in designing, building, and servicing the high-precision instruments that help you collect accurate and reliable water quality and velocity data.

Our instruments and accessories are field-proven for applications such as:

Aquaculture
Bridges & Dams
Coasts & Estuaries
Groundwater
Lakes & Ponds
Oceans
Ports & Harbors
Reservoirs
Rivers & Streams
Wastewater
Wetlands

Why YSI?

For 60 years, YSI has pioneered the development of high-quality instrumentation for use in natural waters.

Our technology saves you time:

Meeting the global need for improved environmental monitoring requires fewer technical personnel and a lower cost of ownership. YSI provides accurate sampling and turn-key monitoring solutions, equipment that is easy to use and install, and intuitive interfaces.

Our reliability improves efficiency:

Successful monitoring efforts depend on accurate and defensible data. We deliver reliable instruments and continuously develop safeguards and system checks to ensure you obtain the highest-quality data as quickly as possible.

Our employees understand your challenges:

Our staff has extensive field experience which helps them provide viable solutions and hands-on support for your monitoring challenges.

Our customers can reach us:

We have 17 global offices on 5 continents.

Contents

Quick Links

ysi.com/proplus
ysi.com/proODO
ysi.com/proOBOD
ysi.com/pro20
ysi.com/pro2030
ysi.com/pro30

Sampling & Testing

Applications
Groundwater
Wastewater
Aquaculture
Surface water

Parameters
Temperature
Dissolved oxygen
pH
ORP
Conductivity
Specific conductance
Salinity
Total dissolved solids
Resistivity
Barometric pressure
Ammonium/ammonia
Nitrate
Chloride
BOD

Professional Plus

- Measures any combination of dissolved oxygen, pH, conductivity, ORP, ammonium, nitrate, chloride, salinity, total dissolved solids, barometric pressure, and resistivity
- Interval or single-event logging with 5,000 data set memory and 100 site list and file folder capabilities; GLP conforming data
- Features on-screen help, backlit display and keypad, user-replaceable cables and sensors, and auto-buffer recognition
- Lab-grade pH and ORP and lab BOD also available

ODO® Optical DO

ProODO®

- Non-consumptive optical DO luminescent method eliminates the need for stirring
- Expanded DO range of 0-500%
- Field-rugged user-replaceable cables in lengths up to 100 meters
- Digital technology stores cal data in the sensor so you can place it on any ProODO instrument

ProOBOD™ Probe

- Self-stirring optical BOD probe
- Two-year warranty
- No warm-up required
- Extremely quiet operation
- Guarded cap protects sensor

Pro20

- Choose between polarographic or galvanic DO sensors
- Interchangeable probes and cables reduce down-time
- Measures dissolved oxygen and temperature in lab and field
- Industry's quickest DO response saves you time
- One Touch Cal feature calibrates within seconds

Pro2030

- Choose between polarographic or galvanic DO sensors
- Interchangeable probes and cables reduce down-time
- Measures dissolved oxygen, conductivity, salinity, TDS, and temperature
- Automatically compensates DO for changes in salinity

Pro30

- Conductivity, salinity, specific conductance, TDS
- Proven, rugged four-nickel electrode
- 3-year instrument and 2-year cable/probe warranty

Data Manager Desktop Software

- Free with ProPlus and ProODO
- Easy-to-use software to manage all data, set up instruments, or conduct real-time studies
- View graphical and tabular data
- USB connection powers the instrument

Quick Links

ysi.com/levelscout ***ysiecosense.com***
ysi.com/photometers ***ysi.com/laboratory***

Sampling & Testing

EcoSense

Laboratory

Applications
Groundwater
Wastewater
Aquaculture
Surface water
Industrial

Parameters
Temperature
Dissolved oxygen
pH
ORP
Conductivity
Level
Specific conductance
Salinity
Total dissolved solids
Resistivity
Barometric pressure
Ammonia
Calcium
Chlorine
Hardness
Iron
Nitrate
Alkalinity and more

Level Scout®

- Stainless steel or titanium housing easily fits down 1" wells
- Measure vented gauge or absolute level and temperature
- Up to 288,000 data set memory accessible with Data Scout software
- Convenient user-replaceable batteries allows it to be left unattended for extended periods
- In-line vent filter has no desiccant to replace. It is maintenance-free, allowing for worry-free deployments

Photometers 9300 & 9500

- 100+ tests, including hardness, ammonia, calcium, and nitrate
- IP-67 waterproof
- Non-hazardous reagents with long shelf life

Handhelds pH100A

- pH and mV
- IP-67 waterproof
- 50-data set memory

DO200A

- DO and BOD
- IP-67 waterproof
- 50-data set memory

EC300A

- Conductivity, salinity and TDS
- IP-67 waterproof
- 50-data set memory

Pen-Style pH10A

- pH
- Auto-buffer recognition
- 1-, 2-, or 3-point calibration

ORP15A

- ORP (absolute or relative mV)
- 50-data set memory

EC30A

- Conductivity, salinity
- 1-year warranty
- IP-67 waterproof

Dissolved Oxygen & BOD 5000 & 5100

- Lab standard for DO and BOD
- Auto-Cal function

Conductivity 3100 and 3200

- High-precision electrodes with temperature sensors
- Simple to advanced

pH pH1200

- Lab grade pH, mV
- Auto-buffer recognition

800 897 4151 US
+1 937 767 7241

Quick Links
ysi.com/sondes
ysi.com/castaway

Sampling, Logging & Profiling

Applications
Short-term studies
Lake & stream sampling
Groundwater wells
Tide gauge measurements
Water level
Sound velocity profiles
Saltwater intrusion
Hydrographic surveying
Coastal research
Fisheries

Parameters
Conductivity
Temperature
Depth
Vented level
pH
ORP
Dissolved oxygen
Turbidity
Nitrate
Ammonium
Chloride
Salinity
Sound speed

600LS sonde
- Designed for spot sampling level measurements and tide gauge measurements

600R
- Conductivity and temperature sensors and options to add pH and Rapid Pulse™ dissolved oxygen
- Ideal for large monitoring programs and educational applications

600XL and 600XLM sondes
- Ideal for water level monitoring, ground water and surface water monitoring
- Includes DO, temperature, and conductivity sensors and options to add pH or pH/ORP, depth, and vented level
- XLM has batteries for unattended, *in situ* monitoring

650MDS
Multiparameter Display System
- Connects to any 6-Series multiparameter instrument
- Easily log real-time data, calibrate, and set up sondes for deployment
- Upload data to a PC
- Optional barometer and GPS interface

600XL/600XLM V2 sondes
- Ideal for water level monitoring, ground water and surface water monitoring
- Includes DO, temperature, and conductivity sensors and options to add pH or pH/ORP, depth, and vented level
- Includes one optical sensor port for dissolved oxygen, blue-green algae, chlorophyll, rhodamine, or turbidity
- XLM has batteries for unattended, *in situ* monitoring

CastAway®-CTD
- 5 Hz response and sampling rate
- Accurate to 0.1 PSU, 0.05°C
- Internal GPS
- Bluetooth wireless data download
- No user calibration required
- No tools, computers or cables required

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Quick Links
ysi.com/sondes
EXOwater.com

Long-term Monitoring

Applications

Unattended monitoring
Source water
Lake profiling
Dredging
Underway sampling
PAR studies
Algal bloom monitoring
Coastal studies
Saltwater intrusion

Parameters

Conductivity
Temperature
Dissolved oxygen
Chlorophyll
Blue-green algae
Turbidity
Rhodamine
Depth
Vented level
PAR
pH
ORP
fDOM

6600 V2 sonde

- Large sensor payload capability and long battery life
- Choose between 2 and 4 optical ports for dissolved oxygen, blue-green algae, chlorophyll, rhodamine, and turbidity
- Also available with a pH wiping system

6920 V2 sonde

- Economical, 15-parameter logging system
- Battery powered for long-term, *in situ* monitoring and profiling
- Choose between 1 and 2 optical ports

600OMS V2 sonde

- Perfect for applications such as turbidity or oxygen monitoring
- Accepts 1 optical sensor as well as conductivity, temperature, and depth

6820 V2 sonde

- Cost-effective sampling system with up to 15-parameter reporting capability
- Ideal for profiling and spot-checking
- Choose between 1 and 2 optical ports

EXO1 sonde

- Surface and groundwater monitoring down to 250 m (828 ft)
- Bluetooth wireless communication
- Quick and easy calibration of multiple sensors
- Welded titanium sensors including conductivity, dissolved oxygen, fDOM, pH, ORP, turbidity, and total algae

EXO2 sonde

- CTD plus 3-5 additional sensors
- Coastal and marine monitoring down to 250 m (828 ft)
- Seamless integration and "daisy chaining" into monitoring systems
- Flexible sensor payload/configurations
- Welded titanium sensors
- Antifouling wiper helps to extend deployments to more than 90 days

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Quick Links

ysi.com/IQSN2020
ysi.com/aquaculture
ysi.com/wastewater
ysi.com/5200
ysi.com/5400

Continuous Monitoring & Control

Wastewater Aquaculture

Applications

Wastewater process monitoring
Aquaculture monitoring and control
Fisheries

Parameters

Conductivity
Temperature
Dissolved Oxygen
pH
ORP
Salinity
Turbidity
TSS
Ammonium
Nitrate
Potassium
COD
BOD
DOC
SAC
TOC

IQ SensorNet

- Process monitoring for up to 20 parameters
- Change or move parameters at any time
- 3-year warranty
- 1 cable for power and communications
- Up to 48 output channels
- Control pumps, blowers and more
- Simple, modular system
- Communications via modem, MODBUS, RS-232, Bluetooth wireless technology
- Use compatible modules without extra wiring

5500D/5400 Monitor

- MultiDO monitors using optical DO technology (5500D) or galvanic technology (5400)
- Control multiple set points for DO
- Email and SMS alarms
- Event logging records conditions, calibrations and more
- Network up to 32 instruments

5200A Monitor

- Multiparameter monitor: DO, temperature, conductivity, pH, ORP, salinity
- Network up to 32 instruments
- Ethernet TCP/IP or wireless communication
- Email and SMS alarms
- Conditional feed timer with Feed Smart® software
- Monitor and control one tank or a whole operation

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Quick Links
sontek.com/oceanography.html
sontek.com/laboratory.html

Velocity, Currents & Flow

Applications
Bottom boundary
Currents
Discharge
Tide level
Flow/low flow
Sediment transport
Flumes
Near-shore monitoring
Waves

ADPs (Acoustic Doppler Profilers)
- Rugged, multi-purpose current profilers
- Configurations for real-time monitoring and autonomous deployment
- Profiling ranges up to 200 meters
- Options include bottom tracking, directional waves, and integrated external sensors

Argonaut®-XR
- Affordable and easy-to-use current profiler
- Automatically adjusts sampling volume with changing tide level or river stage
- Bottom-mounted for near-shore deployments
- Wave height and spectra

Argonaut®-MD
- Oceanographic single-point current meter for deployments up to one year
- Clamps directly to mooring line or use cage
- Standard compass/tilt and temperature sensors, and optional pressure and conductivity sensors

MicroADV
- Three-axis velocity measurement for hydraulics research in labs
- Sampling rates up to 50 Hz; sampling volume 0.09 cc
- Excellent for low-flow and turbulence studies

ADVOcean
- Rugged ADV for hostile environments such as surf zone
- 3-dimensional velocity measurement
- Hydra version for autonomous deployment includes compass/tilt sensor, pressure sensor, and optional external sensors

+1 858 546 8327

Quick Links
sontek.com/hydrology.html

Velocity, Currents & Flow

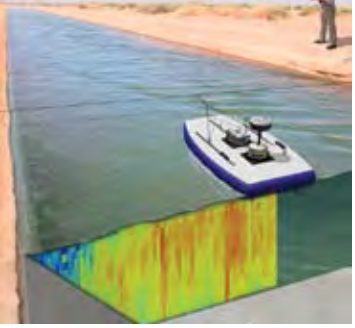
Applications
Discharge calculation
Stream indexing
Real-time flow
Irrigation
Wastewater effluent

Argonaut®-ADV
- Single-point, shallow-water flow monitoring
- Rugged ADV head and internal battery pack for autonomous deployment
- Ideal for streams, marshes, lakes, and water treatment facilities

Argonaut®-SL
- 2D, side-looking velocity, level, and flow meter
- Calculates flow/discharge via theoretical or index-velocity ratings
- Installs on side of river or open channel for easy access and quick maintenance
- Measures remotely, avoiding flow interference from piers or pilings

SonTek-IQ
- Specificall designed for open channels
- Velocity profiles in three dimensions with cells as small as 2 cm (0.8 in)
- Robust measurements in complex flow conditions
- Velocity, level, flow and total volume ranging from 0.3-16 ft (0.09-5 .0 m)
- Outputs: SDI-12, Modbus, 4-20 mA, ASCII and RS-232

SonTek-IQ Pipe
- Designed for closed conduits
- Velocity profiles in three dimensions with cells as small as 2 cm (0.8 in)
- Robust measurements in complex flow conditions
- Velocity, level, flow and total volume in pipes with diameter between 1.5-16 ft (0.45-5 .0 m)
- Outputs: SDI-12, Modbus, 4-20 mA, ASCII and RS-232



Velocity, Currents & Flow

Applications
Discharge calculation
Stream indexing
Real-time flow
Irrigation

RiverSurveyor

- Accurately measures discharge from moving boats
- Computes complete 3-D velocity profile and bathymetric channel cross-section in minutes
- Optional tethered platform for measurements from bridges
- Features multi-frequency velocity beams for robust bottom tracking and vertical beam for precise bathymetric surveying
- Internal DGPS with RTK option
- Embedded echosounder

FlowTracker Handheld ADV

- Wading discharge or velocity measurements in streams, weirs, flumes, and open channels
- Easily attaches to top-setting wading rod
- SmartQC for instant feedback on data quality
- Supports multiple river discharge methods and current velocity measurements
- Output data directly into FlowPack
- Multi-language

FlowPack Software

- Store flow, velocity, and stage measurements in one software
- Generate velocity-index ratings and comprehensive reports

Flow Display

- Options for 4-20 mA outputs
- Connect to the SonTek-IQ and read flow data in the field without connecting to a laptop

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Quick Links
waterlog.com

Hydrological Monitoring

Storm 3 Browser-based Datalogger
- Simple and intuitive browser-based GUI
- GUI works on PCs, laptops, tablets and smart phones
- Direct (USB) or Wi-Fi connection
- Linux-based OS

H-522+ DCP Data Collection Platform with Integrated Satellite Transmitter
- Satellites supported: GOES/METEOSAT/ INSAT
- Menu-driven setup
- Integral GPS with random and self-timed transmissions
- Upgradable to future protocols such as NOAA/NESDIS V2.0

System 5000 Datalogger
- Easy-to-read color display with LED backlight and touch screen
- Built-in graphical user interface
- LINUX-based operating system
- 256 MB internal data logging memory (expandable to 4 GB)

H-2221 High Data Rate Satellite Transmitter
- Highest accuracy radio for reliable satellite transmissions in extreme environments
- Supports 100, 300 and 1200 BPS (GOES)
- Menu-driven setup
- Low standby power
- Integral GPS with random and set-timed transmissions
- Upgradable to protocols such as NESDIS V2.0

H-3553 Self-contained Bubbler
- Bubbler/pressure sensor in one unit
- Built-in display version
- Depths to 115 ft (35 m)
- No needle valve or diaphragm problems
- Automatic or manual controlled purge up to 90 psi
- Purge sustain feature
- Dependable mass flow rate control
- Nitrogen tank not required

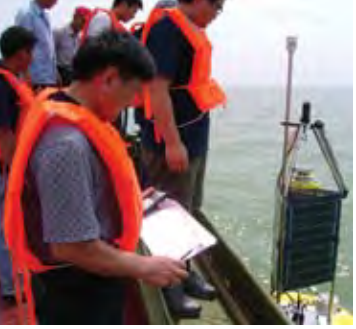
Applications
Water level monitoring
Dams and bridges
Reservoir and tanks
Remote data delivery
Real-time alerts

H-3600 Series Radar Sensor
- Non-contact level measurement replaces stilling wells and other infrastructure
- Not susceptible to damage from debris
- Less maintenance than tide and stage sensors
- Measurement range up to 230 ft (70 m)

H-3123 Submersible Pressure Sensor
- 0.02% FSO accuracy
- SDI-12 output
- Measurement transmitted digitally over long cable lengths without error
- Vented pressure sensor

H-340-SDI Tipping Bucket Rain Gauge
- Magnetic reed switch sensor
- 0.01" or 0.2mm tip versions available
- SDI-12 output

H-3342 Absolute Shaft Encoder
- Absolute, optical encoder preserves correct position even if power is lost
- Accuracy 0.00024 ft
- Built-in display with "Push to Read" button
- SDI-12, 4-20 mA outputs



Quick Links
ysisystems.com

Integrated Systems

Environmental Monitoring Modules

- **Coastal Buoys** for high energy environments and large sensor payloads
- Proven design deployed around the world
- Standard wave, current, and water quality solution without customization
- In-house design and manufacturing for solutions with alternative telemetry, prototype instruments, larger hulls, and custom software solutions
- Engineered with oceanographic-grade materials

- **Inland Buoys** for lakes and rivers
- Can be deployed by several people in small watercraft
- Designed for years of reliable operation
- Tamper- and vandal-resistant for public areas
- Batteries situated to lower center of gravity

- **Small Buoy** for short-term, project-based deployments
- Integral deployment tube protects multiparameter water quality sonde
- Submersible rechargeable battery pack acts as buoy ballast weight
- One base station collects data from network of buoys
- Easily deployable

PISCES

- Mobile, towable monitoring platform for river and high-current applications
- Meteorological sensor and current meter options
- Easy to deploy
- Options for multi-depth sampling and flow-through cell configuration

Applications
Baseline studies
Dredging
Emergency response
Fisheries
Non-point source/TMDL
Point source/discharge
Stormwater & CSO
Source water
Lakes
Estuaries
Bays
Continental shelf

Parameters
Water quality
MET
Currents
Nutrients
PAR
Hydrocarbons

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Quick Links
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Integrated Systems

Applications
Remote data delivery
Real-time alerts
Reservoir monitoring
Aquaculture
Algal bloom monitoring
Discharge
Bottom mapping
Drinking water intake

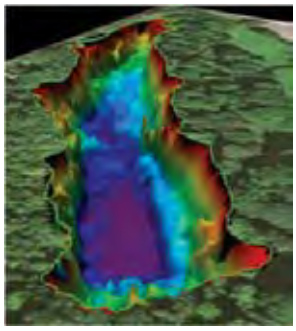
Parameters
Water quality
MET
Currents
Nutrients
Bathymetry
Side-scan sonar

EcoNet™

- Delivers remote data to web or workstation
- Automated data reports, alarms, and alerts
- No programming necessary; changes made through graphic interface
- Add up to 15 sensors and more than 50 parameters to a single station
- Simplifies network with hosting, delivery, reporting, and maintenance services from single supplier

EcoMapper™

- Completely autonomous underwater vehicle
- Deployable by one person
- High-resolution mapping of water quality, current, and bathymetry over large areas
- Easy-to-use mission planning software
- Triple frequency side-scan sonar
- 6/10 beam Doppler velocity log
- Iridium tracking capabilities
- 100 meter max rating
- Handheld remote control option



Vertical Profiling System

- Monitor water quality at various depths
- Continuously monitor stratification and mixing without trips to the field
- Detect short-term events–storms, sediment transport, algal blooms –anywhere in water column
- Automated, unattended profiling helps track changes with complete data set
- Reduce equipment maintenance by using one sonde to profile entire water column

Quick Links
ysisystems.com
ysiservices.com
ysihydrodata.com

Services

We can partner with you to provide:

- Project definition
- Site evaluation
- Systems design
- Integration and testing
- Construction and installation
- On-site training
- Data collection and delivery
- Extended support and service contracts
- Project management
- Rental

SeaKeeper 1000™

- Automated underway sampling system
- No crew interaction needed
- Actively contribute to environmental and climate research
- Satellite communication from anywhere in the world
- YSI installs and maintains the system

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+1 727 565 2201

What can Xylem do for you?

We're 12,500 people unified in a common purpose: creating innovative solutions to meet our world's water needs. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. We move, treat, analyze, and return water to the environment, and we help people use water efficiently, in their homes, buildings, factories and farms. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise, backed by a legacy of innovation.

For more information on how Xylem can help you, go to www.xyleminc.com

xylem
Let's Solve Water

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www.ysisystems.com

600OMS V2 Optical Monitoring System

Dissolved Oxygen, Turbidity, Chlorophyll, Blue-Green Algae, or Rhodamine in a Low-Cost Package

Measure any one of the parameters above in combination with temperature, conductivity, and depth or vented level in fresh, sea, or polluted water.

The YSI 600OMS V2 and optical sensors

The 600OMS V2 can take advantage of the newest optical sensors from YSI: ROX Reliable Oxygen (YSI 6150) and two new blue-green algae sensors (YSI 6131 phycocyanin and YSI 6132 phycoerythrin). Utilize the field-proven YSI 6136 turbidity sensor, the YSI 6025 chlorophyll sensor, as well as the revolutionary YSI 6130 rhodamine WT sensor. The OMS V2 also incorporates innovations in sensor configuration such as a conductivity and temperature module that fits into the sonde body.

- **Wiped optics for maximum anti-fouling protection**
- **Ideal for long-term deployments**
- **Low power requirements**
- **Field-replaceable optical sensors**
- **150,000 reading memory**
- **Integrate with DCPs**
- **Compatible with EcoWatch® for Windows® data analysis software**
- **Compatible with YSI 650MDS display and datalogger**

Pure Data for a Healthy Planet.®

Low-cost, single parameter optical monitoring system

Sensor performance verified*

The 600OMS V2 sonde uses sensor technology that was verified through the US EPA's Environmental Technology Verification Program (ETV). For information on which sensors were performance-verified, turn this sheet over and look for the ETV logo.

To order, or for more info, contact YSI Environmental.

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ISO 9001
ISO 14001
Yellow Springs, Ohio Facility

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*Sensors with listed with the ETV logo were submitted to the ETV program on the YSI 6600EDS Information on the performance characteristics of YSI water quality sensors can be found at www epa gov/etv, or call YSI at 800 897 4151 for the ETV verification report Use of the ETV name or logo does not imply approval or certification of this product nor does it make any explicit or implied warranties or guarantees as to product performance

YSI incorporated
Who's Minding the Planet?®

YSI 6000OMS Sensor Specifications

	Range	Resolution	Accuracy
ROX™ Optical Dissolved Oxygen• % Saturation	0 to 500%	0.1%	0 to 200%: ±1% of reading or 1% air saturation, whichever is greater; 200 to 500%: ±15% of reading
ROX™ Optical Dissolved Oxygen• mg/L	0 to 50 mg/L	0.01 mg/L	0 to 20 mg/L: ± 0.1 mg/L or 1% of reading, whichever is greater; 20 to 50 mg/L: ±15% of reading
Conductivity••	0 to 100 mS/cm	0.001 to 0.1 mS/cm (range dependent)	±0.5% of reading + 0.001 mS/cm
Salinity	0 to 70 ppt	0.01 ppt	±1% of reading or 0.1 ppt, whichever is greater
Temperature	-5 to +50°C	0.01°C	±0.15°C
Depth Medium Shallow Vented Level	0 to 200 ft, 61 m 0 to 30 ft, 9.1 m 0 to 30 ft, 9.1 m	0.001 ft, 0.001 m 0.001 ft, 0.001 m 0.001 ft, 0.001 m	±0.4 ft, ±0.12 m ±0.06 ft, ±0.02 m ±0.01 ft, 0.003 m
Turbidity• 6136 Sensor*	0 to 1,000 NTU	0.1 NTU	±2% of reading or 0.3 NTU, whichever is greater**
Rhodamine• ETV	0-200 µg/L	0.1 µg/L	±5% reading or 1 µg/L, whichever is greater

• Maximum depth rating for all optical probes is 200 feet, 61 m.
•• Report outputs of specific conductance (conductivity corrected to 25° C), resistivity, and total dissolved solids are also provided. These values are automatically calculated from conductivity according to algorithms found in *Standard Methods for the Examination of Water and Wastewater* (ed 1989).

**In YSI AMCO-AEPA Polymer Standards.

	Range	Detection Limit	Resolution	Linearity
BGA - Phycocyanin•	~0 to 280,000 cells/mL† 0 to 100 RFU	~220 cells/mL§	1 cell/mL 0.1 RFU	$R^2 > 0.9999$**
BGA - Phycoerythrin•	~0 to 200,000 cells/mL† 0 to 100 RFU	~450 cells/mL§§	1 cell/mL 0.1 RFU	$R^2 > 0.9999$***
Chlorophyll• 6025 Sensor* ETV	~0 to 400 µg/L 0 to 100 RFU	~0.1 µg/L§§§	0.1 µg/L Chl 0.1% RFU	$R^2 > 0.9999$****

• Maximum depth rating for all optical probes is 200 feet, 61 m.
BGA = Blue-Green Algae
RFU = Relative Fluorescence Units
~ = Approximately

† Explanation of Ranges can be found in the 'Principles of Operation' section of the 6-Series Manual, Rev D.

§ Estimated from cultures of *Microcystis aeruginosa.*
§§ Estimated from cultures *Synechococcus sp.*
§§§ Determined from cultures of *Isochrysis sp.* and chlorophyll *a* concentration determined via extractions.

**Relative to serial dilution of Rhodamine WT (0-400 ug/L).
***Relative to serial dilution of Rhodamine WT (0-8 µg/L).
****Relative to serial dilution of Rhodamine WT (0-500 ug/L).

YSI 6000OMS V2 Sonde Specifications

Medium		Fresh, sea or polluted water
Dimensions	Diameter Length Weight Weight with Batteries	1.65 in, 4.2 cm 21.3 in, 54.1 cm 1.3 lbs, 0.6 kg 1.4 lbs, 0.7 kg
Power	External Internal Battery Option	12 V DC 4 AA Alkaline cells, 25 to 30 days at 15 minute sampling interval at 25°C

Ordering Information

600-01	6000OMS V2 sonde, conductivity, temperature, optical port
600-02	6000OMS V2 sonde, conductivity, temperature, optical port, internal batteries
600-03	6000OMS V2 sonde, conductivity, temperature, optical port, shallow depth
600-04	6000OMS V2 sonde, conductivity, temperature, optical port, shallow depth, internal batteries
600-05	6000OMS V2 sonde, conductivity, temperature, optical port, medium depth
600-06	6000OMS V2 sonde, conductivity, temperature, optical port, medium depth, internal batteries
600-07	6000OMS V2 sonde, conductivity, temperature, optical port, shallow vented depth
600-08	6000OMS V2 sonde, conductivity, temperature, optical port, shallow vented depth, internal batteries

PLANNING ACT 2008

AND

THE INFRASTRUCTURE PLANNING (EXAMINATION PROCEDURE) RULES 2010

THE ABLE MARINE ENERGY PARK DEVELOPMENT CONSENT ORDER 2012

(PINS REFERENCE NUMBER: TR030001)

WRITTEN REPRESENTATIONS OF E.ON UK PLC

(UNIQUE REFERENCE NUMBER: 10015527)

APPENDIX 11

Draft DCO – Schedule 9 Protective Provisions

Part [ ]

For the Protection of E.ON UK Plc

SCHEDULE 9

PROTECTIVE PROVISIONS

PART [ ]

FOR THE PROTECTION OF E.ON UK PLC

Interpretation

In this Part:

"**E.ON**" means E.ON UK Plc whose registered office is at Westwood Way, Westwood Business Park, Coventry, West Midlands CV4 8LG (company registration number 02366970).

"**the anglian water pipeline**" means the pipeline located at grid reference [*grid reference to be confirmed between E.ON and the undertaker*]

"**the outfall and intake**" means that part of the pipelines which are located in the river at grid reference [*grid reference to be confirmed between E.ON and the undertaker*].

"**the pipelines**" means the intake and outfall pipelines situated within plots 04023, 04024, 04027, 04028, 04029, 05003 to 05016 (inclusive), 05019, 05026, 05027, 05028, 05036, 05037, 05038, 05044, and 06006 which are the subject of a Deed of Easement dated 9 July 2004 between Able UK Limited and E.ON.

"**the river**" means the River Humber.

For the protection of E.ON the following provisions shall, unless otherwise agreed in writing between the undertaker and E.ON, have effect.

The Pipelines

Notwithstanding the provisions of Article 41, no stage of the authorised development shall commence until a construction method statement to protect the pipelines (offshore & onshore) and intake and outfall has been prepared by the undertaker and submitted to and agreed with E.ON. The construction method statement shall include provisions in respect of:

- The location and methods of reinforcement of crossing points over the pipelines; and
- A mechanism for the enforcement of the undertaker's use of designated crossing points over the pipelines and the agreed reinforcement methods; and
- Adoption of a prior notification and consent regime which would require the undertaker to:
    - notify E.ON of its intention to carry out any development within the vicinity of the pipelines and intake and outfall, such notification to be provided at least 48 hours prior to any such development occurring; and
    - seek E.ON's consent to the carrying out of the proposed development within the vicinity of the pipelines and intake and outfall, such consent not to be unreasonably withheld; and

the authorised development shall thereafter be carried out in accordance with the approved construction method statement.

Anglian Water Pipeline

No diversion of the anglian water pipeline shall take place until a scheme for its diversion has been agreed between the undertaker, Anglian Water and E.ON. The scheme shall include provisions covering the location of the diverted pipeline and method of diversion including any necessary modeling work required in connection with the diversion. The diversion of the anglian water pipeline shall be carried out in accordance with the agreed scheme.

Capital Dredging

No capital dredging shall commence until a scheme of mitigation has been agreed between the undertaker and E.ON in order to protect the outfall and intake. Capital dredging shall be carried out in accordance with the approved scheme of mitigation.

Sedimentation

No tidal work shall commence until a plan for the monitoring of sediment transport caused by the tidal work has been prepared by the undertaker and submitted to and approved by E.ON ("the sediment monitoring plan"). The sediment monitoring plan shall require that:

(i) the undertaker monitors the water quality in the immediate vicinity of the outfalls and notifies E.ON with the results of its monitoring; and

(ii) notification of monitoring results shall occur no less frequently than every 2 weeks during the carrying out of the tidal works and no less frequently than every month during the operation of the quay; and

(iii) when recorded monitoring levels reach [*level to be agreed between E.ON and the undertaker*] then the undertaker is to carry out dredging at its own expense in accordance with a programme of dredging, the details of which are to be set out in the sediment monitoring plan.

General

Any dispute arising between the undertaker and E.ON under this Schedule shall be determined by arbitration as provided in article 58 (arbitration).