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**Your ref:** EN60004  
**Our ID:** 10031562  
**Date:** 2 November 2015

### DEADLINE 3 SUBMISSIONS & NOTIFICATIONS

Dear Sir/Madam,

**A REPLACEMENT HIGH-PRESSURE GAS PIPELINE WITHIN A BORED TUNNEL BENEATH THE HUMBER ESTUARY AND ASSOCIATED DEVELOPMENT, INCLUDING A CONNECTING PIPELINE, MINOR MODIFICATIONS TO PAULL ABOVE GROUND INSTALLATION AND ASSOCIATED TEMPORARY LAY DOWN, WORKING AND MITIGATION AREAS. FROM PAULL, EAST RIDING OF YORKSHIRE TO GOXHILL, NORTH LINCOLNSHIRE.**

Please find below our Deadline 3 submissions and notifications.

#### **Flood Risk Assessment Addendum**

We would like to provide the following comments in response to the FRA Addendum submitted by the applicant at Deadline 1:

1. We are pleased to see that the Interim tidal levels have now been included within the FRA addendum, however we notice that the climate change figures applied in Table 3-2 are incorrect. The FRA provider appears to have used the South West and Wales figures instead of those for the East of England. Both the Flood and Coastal Defence Project Appraisal Guidance (UK) Supplementary note and latest climate change guidance for planners on the Planning Policy Guidance identify that the first epoch of climate change can be calculated at 4mm/yr, the second at 8.5mm/yr and third at 12mm/yr. The baseline for the Humber interim water levels is 2014, not 2013. Correctly applied, a sea level uplift of 311mm over the design life of the project to 2056 is expected. Applied to the interim Humber water level, this equates to a 2056 level of 5.841mAODN for a 0.5% event and a 2056 level of 6.201mAODN for the 0.1% event.

Whilst the figures quoted in the FRA are not correct, we do not feel they are sufficiently different due to the baseline year error to warrant the need for the FRA to be further updated. However we have included the corrected calculation for the benefit of the Examining Authority, to allow them to transpose the increased figures into the indicative flood depth information provided throughout section 3.1 of the FRA.

2. Flood Bund clarification - The Site Layout Plans (DCO Document Reference 2.4) still appear not to show a continuous flood bund surrounding the drive pit. There are top soil storage areas, but these don't appear to be continuous. However, the formally submitted documentation clearly states that a continuous flood bund to a height of 3.4mAODN will be provided around the drive pit. As such, a suitable requirement must be included to secure this measure. The requirement should specify a minimum height of 3.4mAODN, rather than the 1.4m (above ground level) mentioned in some of the documents. It is essential that the heights in metres quoted in paragraphs 3.1.10 and 3.1.13 are stated in metres AOD, otherwise they indicate ambiguous relative height increases instead of heights calibrated to Ordnance Datum. In addition, the heights in metres cited in section 3.1.13 for Paull, should match those in Table 3.5 - currently they do not.

3. Tunnel Collapse – section 3.3 addresses the matter of potential tunnel collapse in considerable detail (although we note that the link to the report about the previous tunnel collapse only works for subscribers to the publication in question). There are clearly two principal components to risk: probability and consequence. We are content that Appendix B paints an adequate picture of the potential consequences of such an event, however unlikely, but we would like to make clear that we do not feel able to assess or scrutinise the predicted probability of such an event, as it lies outside our remit and expertise. As such we must defer to the ExA in relation to the acceptability of the overall risk predicted.

Although this matter remains a point of disagreement with the applicant, the provision of bunds (regardless of their stated purpose) reassures us that the potential consequences of a tunnel collapse will be at least partially mitigated during the construction period when this risk is apparent - although higher bunds would reduce the potential consequences further.

Appendix B identifies the extent of overtopping of the bunds, should the tunnel collapse during tides with a 100% (1 in 1), 20% (1 in 5) and 10% (1 in 10) chance of occurring in any one year. It is worthy of note for the Examining Authority that 'artificial glass walls' have been included in the model due to the extent of topographic data available to the applicant. There is therefore potential for flows to extend past the identified boundaries in the scenarios presented. For the applicant's information, the bunds located at a height of only 1.4m (above ground level) would not prevent the ingress of tidal waters into the drive pit following a breach in the tidal defences during a current day 0.5% tidal scenario. It should be ensured that any proposed emergency response adequately addresses this risk.

4. Climate change allowances have now been provided and adjusted for accuracy (see our earlier comment) for the design life of the kiosks of 40yrs.

5. Minimum Cover - we will be reassured by the proposed amendment to the DCO wording to provide for a minimum of 1.7m of cover beneath the area which may form part of a managed realignment site at Goxhill in future.

6. Impacts following a breach – for the ExA’s information, the temporary components of the development such as the welfare units and fuel stores are to be raised onto platforms elevated a minimum of 1.4m above ground level. Given that flood depths on site are expected in the current day scenario to be 1.5-1.75 metres and no area of safe refuge is proposed, the EXA must be content that the safety of the site and its users can be managed appropriately through the proposed Flood Incident Response Plan. As we do not provide an evacuation role in a flooding emergency, we are not able to advise on the suitability of any proposed plan and recommend that advice be sought from the Humber Emergency Planning Unit.

7. Increases in flood risk to third parties through the temporary occupation of land available for flood water storage in the fluvial floodplain - Appendix D is not a true representation of fluvial flood extents at Goxhill as the only map produced appears to be a composite map showing both the fluvial and tidal floodplain. Therefore we remain unable to advise the ExA of the short-term increase in fluvial flood risk to third parties or whether the approach of calculating the uplift in the design 1% flood level (current day) has been undertaken correctly. If the applicant has distributed their temporary storage by a larger extent of floodplain, the quoted figure could be too low and not representative of the actual expected increase. Also, due to the vast extents covered by this apparent composite output, the conclusion of where risks have been increased is also broad. A more suitable assessment would allow specific properties or receptors to be identified. We recommend that further detail is requested by the ExA to clarify the impacts of increased fluvial flood risk to third parties.

8 Mitigation - the FRA Addendum has clarified and justified why no mitigation, beyond the continuous flood bund and Flood Incident Response Plan, are deemed necessary.

9. Discharge of water - the discharge of water into the Humber using pipework over the existing flood defence, as described in section 3.8, may not be necessary, as the adjacent Thorngumbald pumping station could be used to pump additional flows in Thorngumbald Drain. However, it would depend on the quality and quantity of any proposed discharge, but the details of this could be agreed at a later stage. At present, it is suffice to state that use of the Thorngumbald pumping station is a possible alternative solution which may negate some of the potential negative impacts associated with the use of ancillary pumps and pipework over the existing flood defence. We recommend that this option is considered in greater detail, and the DCO is amended to allow this option to be pursued if it is considered preferable.

### **Hydro-geological Information**

Following a review of the following documents which were submitted by the applicant at Deadline 2:

Mini Pumping Test Factual & Interpretative Report (J14-468-022R-Rev0);

Hydro-geological Impact Assessment Addendum (J14-468-016R-Rev2);

we would like to provide the following comments:

While there remains some uncertainty surrounding this issue, this new evidence is sufficient to provide confidence that the proposed scheme’s potential effects on groundwater in the surrounding area can be adequately mitigated against. There is a risk that the ground conditions identified through the site investigation work undertaken so far, could be different to those encountered by the MWC through their proposed pump testing prior to the commencement of works. However, we are content that the mitigation strategy proposed is sufficiently flexible to deal with a range of potential hydro-geological conditions, by varying the depth, diameter and number of re-injection wells proposed to manage groundwater.

**Mini Pumping Test Factual & Interpretative Report** - The report includes a summary of the Hyder HIA, the groundwater control concept (which includes groundwater recharge), conceptual modelling with sensitivity analysis, and details of the mini pump test. The report starts by recognising the importance of implementing appropriate and proven engineering mitigation. The mini pump test provides site specific data which is used to demonstrate the suitability and potential effectiveness of the proposal by looking at the transmissivity of the chalk at different depths.

Pump tests were conducted on boreholes L01, L02D, L04D and L06D with one test per day being undertaken. Groundwater level monitoring was undertaken on each of the wells during each test. Chemical monitoring was also undertaken on the four wells and the nearby Fir Tree Farm borehole. Data has been corrected for tidal cycle influence and the methodology for this has been provided. This has resulted in drawdown results that can then be used to calculate the transmissivity for each of the screened zones in the pump test boreholes.

The report suggests that anisotropic conditions exist – i.e. a difference between horizontal and vertical permeability, and proposes that this can be confirmed in due course by pump tests undertaken by the Main Works Contractor. The results suggest similar transmissivity at L04 and L06, but different behaviour at L02 where a lower pump rate was achieved. The report suggests this may be a result of higher fracture permeability. However, it is stated that the difference is within 1 log of the values used. This implies that they are not orders of magnitude different, even though the characteristics are different. The report indicates that the test on L01 was unreliable, and attributes this to possible well damage or poor installation.

Well L06 is used to calculate a leakage rate for the aquifer. This calculation adds weight to the presence of greater horizontal permeability than vertical permeability. This anisotropy is important and will be a positive benefit to the proposed construction and dewatering of the drive pit. Additional evidence for anisotropy is provided in the report by analysis of the tidal influence on groundwater levels recorded in the boreholes. Groundwater quality monitoring shows some variability in groundwater concentrations of chloride. Some pH results are below 7 and are not what would typically be expected of chalk groundwater. No correlations have been identified between groundwater quality and groundwater level.

The report provides a sound assessment of the vertical and horizontal permeability of the chalk aquifer. We have previously questioned the validity of pump tests from wells designed for monitoring purposes and not abstraction. OGI have used recovery data as well as drawdown data to assess the chalk characteristics. We agree that the information provided in this report does suggest that groundwater flow within the chalk is controlled by horizontal movement. The data presented supports those values identified within the Hyder HIA Addendum. The report acknowledges that the Main Works Contractor will be responsible for confirming the presence of anisotropic conditions in due course. This does raise the question, what if the MWC does not identify anisotropic conditions or conditions that are more homogeneous than anticipated? While this could be a risk, the data presented in the report demonstrates that it should not be the case.

**HIA Addendum** - The Addendum summarises the findings of the Hyder HIA, provides an overview of the concept of groundwater control, a sensitivity analysis of the chalk characteristics and how this affects drawdown and dewatering quantities, the mini pump test results and a re-evaluation of the findings of the modelling in light of these results.

The Addendum also discusses how groundwater impact mitigation will be controlled should variable ground conditions be encountered during the Main Works Contractor's (MWC) pump test and subsequent site works.

Of particular note are the receptors considered to be at risk of impact from dewatering. These are summarised in Table 3, Page 14. These are:

- 1) "WWII bomb decoy site, if fuel storage tanks exist, potential for contaminant mobilisation. Additional investigation by the MWC recommended."
- 2) "East Halton Beck, potential for reduction in baseflow to the beck with a low risk of impacting the long term WFD objective. Baseline monitoring to determine flows in the Beck recommended."
- 3) "East Marsh Farm. Small potential for derogation of features, Monitoring recommended."
- 4) "Chalk aquifer. Abstraction for the dewatering operation requires further discussion with the EA".

Chapter 6 proposes mitigation for the decoy site to include site investigation and groundwater recharge. The report states that the short duration of pumping should not affect the WFD status of East Halton Beck. Nevertheless, the report states that a baseline water quality monitoring programme is proposed to establish the current status. We recommend that this should be extended to any drainage ditches which could also be affected. For East Marsh Farm pond, the potential impact is considered to be dependent upon whether or not it is in continuity with groundwater. A future water features survey is proposed to verify its status.

The report states that, "additional investigations are ongoing/have been specified." The report states that the drawdown below historical groundwater levels outside the Pits is unlikely to occur and subsequent settlement due to a reduction in pore water pressure is considered a low risk. The report (page 15) states that, "additional site investigation is proposed to refine the geological model and confirm negligible drawdown at the nearest abstractions." It is not clear but it is thought this refers to the Mini Pump test.

The report also states that the hydro-geological assessment has led to the concept groundwater control design described in Chapter 3." It continues that, "the concept groundwater control system has been designed to allow straightforward modifications during the design and construction processes for any variable ground conditions encountered."

The report identifies two primary objectives which are to:

- 1) Allow the safe construction of the Feeder 9 replacement pipeline;
- 2) Minimise the hydro-geological impact.

Importantly the report states that, "a groundwater recharge system is to be implemented that will allow the Main Works Contractor to control the net abstraction rate for any ground conditions and maintain a hydro-geological barrier with negligible drawdown at distance. The report indicates that, "Additional receptor specific mitigation measures will be implemented as required to further ameliorate the impacts caused by the groundwater control." It is unclear in the report but we assume that this must relate to Table 3.

The report states that, "with drive pit construction expected to start in 2017, this allows sufficient time to further fine tune the groundwater control design, undertake

supplementary monitoring/testing and apply for abstraction and recharge licences without delaying the project.” It should be noted that without the benefit of the associated mini pump test report, our position would be that this approach is unacceptable.

The findings of the mini pump test have been incorporated into the HIA Addendum with the model being re-run to include the site specific data. In addition, the tidal response data has been incorporated. The report considers that this information demonstrates greater anisotropy than used in the original OGI model. This means a reduced vertical permeability in the chalk has been found.

The addendum report states that the MWC contractor will need to undertake a further pump test to appropriately design the required number and depth of internal and external wells. Importantly this is proposed to include pumping from groundwater within a response zone in the chalk below the toe level of the secant pile wall. To guide the MWC, OGI have produced a specimen pump test that can be undertaken by the MWC. The report indicates that in worst case conditions, the recharge system proposed will prevent drawdown at distance and that the appropriate number, depth and diameter of recharge wells can be designed by the MWC following the further pump tests.

We consider that the mini pump test has reduced the uncertainty over the site specific chalk characteristics. The revised modelling has demonstrated the parameters previously used in the model are appropriate. Uncertainty remains on the potential for differing ground conditions across the site. However, the HIA addendum has indicated that further pump testing by the MWC can inform the design of the proposed recharge scheme to mitigate against this.

We request confirmation of where within the DCO the mitigation measures described in these reports will be secured. It may be necessary to add greater clarity to the existing requirement 5, regarding the content of the site water management plan. The works associated with the reinjection boreholes may also need to be included in the works descriptions and works plans.

### **Water Voles**

We have previously raised concerns about the project’s potential impacts on water voles, as an indirect consequence of the project’s impacts on groundwater. On the basis that we are now content that the impacts on groundwater are adequately understood and a satisfactory mitigation strategy proposed, we’re content that water voles and their habitat will be adequately protected. The proposed mitigation will minimise the zone of influence and restrict the magnitude of the impact to something smaller than the fluctuations in groundwater levels which would be expected to occur naturally.

### **Biodiversity Enhancement**

We previously made representations about a lack of clarity regarding the identification of opportunities to enhance biodiversity as a result of the project. We note and welcome that additional information and clarification has been provided by the applicant on this matter. It appears that the opportunities for enhancement identified are terrestrial in nature. As such we are content to defer to other organisations who are better placed to advise on terrestrial enhancement opportunities.

### **Notifications – Hearing Attendance**

Given the above progress in relation to flood risk, groundwater and ecology, we no longer feel it is necessary for the Environment Agency to attend the topic specific hearings to speak on these matters. We would however be able to make ourselves

available should the ExA request our attendance. If so, it would be helpful to know in advance what matters the ExA would like our input on, such that we can ensure that the most appropriate specialists are present.

Our position regarding the Land Acquisition Hearing remains that we would like to attend to speak. However, the ExA should be aware that a meeting with National Grid's land agent has been arranged for Wednesday 4 November 2015. If our outstanding matters are resolved following this discussion, we may subsequently withdraw this request.

**Statement of Common Ground**

We have been in discussions with National Grid and their agents regarding the Statement of Common Ground. We have today signed an updated version of the document to reflect those matters which, at this juncture, have either been agreed, or which remain unresolved.

Should you require any additional information or clarification, please don't hesitate to contact me on the details below.

Yours faithfully

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