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RIVENHALL AIRFIELD  
**EVOLUTION OF THE**  
RECYCLING &  
COMPOSTING  
FACILITY

SUPPLEMENTARY  
PROOF OF EVIDENCE  
OF DAVID HALL

**10 SEPTEMBER 2009**

**Supplementary Proof of Evidence**

**Gent Fairhead & Co Limited**

**The Applicant**

**in relation to**

**Proposed Integrated Waste Management Facility, Rivenhall Airfield,  
Coggeshall Road, Braintree, Essex**

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**Proof of Evidence Prepared in Accordance with the Town and Country Planning  
Act 1990 (as amended) and the Town and Country Planning (Inquiries Procedure)  
(England) Rules 2000 as amended**

**Life Cycle Assessment and Climate Change (Global Warming) Potential  
David Hall**

**CALL-IN INQUIRY UNDER SECTION 77 OF THE  
TOWN AND COUNTRY PLANNING ACT 1990**

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10 September 2009

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## **1.0 INTRODUCTION**

1. David Hall will say:
2. I am a Chartered Geologist and a member of the Geological Society of London. I hold a Bachelor of Science Degree in Geological Sciences (from Aston University) and a Master of Science Degree in Hydrogeology and Water Resources (from University College, London). I am a Principal of Golder Associates (UK) Ltd in Nottingham where I have been employed since 1988. I have worked within the waste management industry within a Local Authority, in a Research Institute, and within private sector consulting since 1976. I have, for the past few years, been working with both Defra and the Environment Agency undertaking research into Landfill Sustainability, and with the Environment Agency in developing the software model called WRATE – LCA. The latter is a “state of the art” modelling package that allows the Life Cycle Assessment of waste management systems to be undertaken. As well as project managing the development of the software, I have also developed the landfill system processes that exist within the model.
3. I have undertaken the assessment of the carbon emissions and carbon balance of the eRCF based on an in depth knowledge of the modelling package and a history of working within the waste industry that spans 4 decades.

### **1.1 Scope of this Supplementary Proof**

4. In my main proof of evidence (Paragraph 68) I stated that Enviros Consulting had been engaged to undertake a peer review of the model that I have developed, but that their report was not available at the time of submitting my proof of evidence. I should make it clear that they did not deliver their report late – they were delayed as I was asking them to review work that remained “in-progress” during much of the review period but they delivered their report within the time agreed with them.
5. I attach a copy of their full report in Appendix GA/7/D/1. Their report raises a number of points, some of which were addressed prior to submission of my proof as I was in close communication with Enviros during the review process, but some I need to respond to. Enviros has used a traffic light system in their review (using green, amber and red – although no red lights were reported). I have therefore extracted the text from their report and tabulated it together with my response for all the “amber” alerts. I do not intend to respond to the “green lights”.

## 2.0 ENVIROS PEER REVIEW RESPONSE

6. In the following table I set out the main issues raised by Enviro and my response.

**Table 1: Response to Enviro Comments Raised as Part of the Peer Review Process**

<b>COMMENTS FROM ENVIROS WHERE A WARNING IS GIVEN</b>	<b>MY RESPONSE</b>
<p><b>TABLE 3 OF ENVIROS REPORT</b> <b>Waste Compositions</b> <b>ECC Recycling (District Collection)</b></p>	
<p>This composition is again based on that within the Essex Joint Waste Management Strategy 2008 but have been modified in order consider only Paper, Dense Plastic, Glass, Ferrous and Non Ferrous.</p> <p>The approach is logical and the composition is in line with what would be expected.</p> <p>However it is not clear if these materials and tonnages have been compared to recent actual data that will have been collected by ECC and reported to WasteDataFlow?</p>	<p>The data has not been compared specifically to that submitted by ECC to Defra in their WasteDataFlow returns as the data submitted rarely fit well with that required by WRATE. I am aware that the Environment Agency and Defra (as well as Golder and Enviro) have held discussions on making the data more compatible but currently there is no real progress towards defining a compatible data set.</p>
<p><b>HWRC Recycling</b></p>	
<p>Only Paper, dense plastics and organics are shown as recycled from HWRCs. It would normally be expected that metals, textiles and WEEE are recycled from HWRCs.</p> <p>These might not be accepted by the facilities modelled however this is not outlined in the comments.</p> <p>Have these material and tonnages been compared to actual recent data that will have been collected by ECC and reported to WasteDataFlow?</p>	<p>The waste fractions selected from the HHWRC are those that we would anticipate accepting at the MFR. We fully appreciate that many more waste streams would be accepted at these sites, but I believe ECC will manage the waste that we have excluded from the model. The same wastes are modelled and included in each of the scenarios that we have modelled so we continue to compare like with like, and deal solely with the wastes handled at Rivenhall.</p>

## AD PROCESS ASSUMPTIONS

### AD and Autoclave Processes Within the RCF Model

A user-defined process has been developed based on the 'Thermal Hydrolysis Cambi' default process. The allocation rules of the default have been updated to allow unspecified organics to be treated, this is a standard approach and the allocation rules have been checked and are shown to be correct. It would be helpful if notes were made in the allocation table to show where changes have been made.

The organic material is shown as being processed through the MRF before being separated from the MRF rejects and sent to the AD process. Some contamination would normally be expected in the organic material output from the MRF but this is not shown in this model. Thus, it is not clear if this organic material is source segregated and if it is why it is not direct delivered to the AD facility.

It is not clear why the specific MRF and AD processes have been selected - it may be more appropriate to use a default MBT facility that includes AD and the production of RDF as in the eRCF model.

The comments in the process properties section outline changes made to the waste fractions, however these are not repeated in the allocation table. Although this is not necessary for the process to work it is important to have a clear record of all changes made.

The PAS100 compost and other compost that are outputs from the facility are sent to an autoclave for sterilisation before being sent to an end market. This is an unusual step but the changes made to the default have been checked and are confirmed to be correct.

Noted, but I have stressed that the model provided to Enviro was "work in progress".

I am uncertain whether or not it would be possible to arrange for the District Collection Authorities to arrange for source separated organic collections and hence the approach of sending the organic waste through the MRF. There would be a carbon benefit by not handling this additional material through the MRF.

Our selection of technology from the WRATE libraries was undertaken to attempt to match the actual technology that will be used with what in our opinion was the closest match. This can be a subjective decision but rarely has a major impact on the results unless there are errors in the allocation rules.

We accept the comments from the Reviewer, but the model submitted for review was "work in progress".

The decision to include an autoclave at the end of the processing was one based on reducing the impact on potential odour release from material taken directly from the AD plant, and we agree is an unusual, but we hope innovative, step.

<p>Part of the AD output is shown to be PAS100 compost, it should be noted that it is not possible to receive PAS100 accreditation on compost produced from mixed MSW. However, this is unlikely to have an effect on the results from this WRATE model.</p>	<p>The compost would be PAS100 if the Collection Authorities were able to deliver source separated organic waste that was then fed directly to the AD plant. As the reviewer notes the type of compost generated will not affect the carbon balance and the results obtained.</p>
<p><b>AD Process Within the eRCF Model</b></p>	
<p>The user-defined process is based on the 'MBT AD composting and RDF HAASE process' this process was originally developed to take municipal solid waste. It is not clear why it has been chosen to represent the treatment of source segregated organic waste. It may be more appropriate to use a default AD facility within the WRATE model.</p> <p>The waste restriction within the process has been changed to allow it to accept 100% organic material and no metals. The allocations rules have been checked and are correct.</p> <p>The energy input to the facility from the national grid has been reduced from 18,000,000 MJ to 2,838,240 MJ. This accurately reflects the fact that the energy input will be from the on-site CHP facility, except for periods of planned down time (approx 10 days per year). The allocation rules have been checked and are correct.</p>	<p>Our selection of technology from the WRATE libraries was undertaken to attempt to match the actual technology that will be used with what in our opinion was the closest match. This can be a subjective decision but rarely has a major impact on the results unless there are errors in the allocation rules.</p> <p>I believe that the energy usage and export would be comparable irrespective of the actual plant used as the biogas generation is dependent upon the quantity of degradable carbon that is fed into the plant. The allocation rules I developed in order to amend the process are, I believe, based on sound science and have been confirmed as correct by the reviewer.</p>

**MRF PROCESS ASSUMPTIONS**

**MRF Within the Baseline Scenario**

The user defined process has been developed by adjusting the Process Outputs and Process Waste Outputs within the allocation tables. The process now shows 100% of material input is sent for recycling (other than glass where 100% is rejected). The default process assumed 17.9% rejects of material from the process which would be considered high, but having no rejects is considered to be unrealistic. The Environment Agency has shown that the average MRF reject rate is 10.85%.

The waste flow and allocation rules have been checked and are confirmed correct.

These review comments are quite correct and fair. However, I have not attempted to model the current waste management scheme in the same detail as the RCF and the eRCF. Some decisions were made that incorporate a good deal of conservatism. If I had set the recovery rates to less than 100 percent (which would have been appropriate) then the baseline scenario would not have scored as well as it did (or rather it would have performed worse than it has) as less material would have been recycled and more landfilled. I do not believe this issue could possibly materially affect the results obtained from the comparative study.

**MRF Within the RCF Scenario**

This MRF for RDF and the AD process (discussed above) within this scenario may be more accurately represented by an MBT process that processes recycle, produces RDF and includes AD (a similar process to that used in the eRCF scenario).

As discussed in the AD process section above, the organics are shown as being processed through the MRF and then separated from the rejects before being sent to an AD facility. We would expect some contamination of this material rather than the 100% organic waste modelled if the organic material is not source segregated.

Our selection of technology from the WRATE libraries was undertaken to attempt to match the actual technology that will be used with what in our opinion was the closest match. This can be a subjective decision but rarely has a major impact on the results unless there are errors in the allocation rules.

My earlier comments in relation to source separated organic wastes applies here as well – and it may be that it is source separated organics that the plant deals with.

<p>The comments section outlines changes made to the process output however these changes have not been made in the allocation table.</p>	<p>The version of the model sent to Enviros for review was “work in progress” and during the meeting following substantial completion of Enviros’ work I explained that beyond the changes not being implemented, if they had the process would no longer balance. A deal of further work was needed to ensure that the process worked and Enviros have now seen the final version of the model.</p>
<p><b>MBT PROCESS ASSUMPTIONS</b>  <b>MBT within the eRCF Scenario</b></p>	
<p>The amber light for this process relates to 2 errors within the External Management tables of this process. The table shows only 92.336% of non ferrous metals being sent for recycling and 245.61% being sent to landfill, these should be 100%.</p>	<p>I am grateful for Enviros bringing this necessary correction to my attention. Such errors should not occur within WRATE as error checking within the code should ensure that material balances. As it happens with this specific error, there was a material balance in the 92% of material that was being recovered was a large number and the 245% destined for landfill was a small number. Adding the mass together that underlies the percentages showed that 100% of the mass was being dealt with. The effect of the error is that I have marginally underestimated the recycling of non-ferrous metals and thus underestimated the benefit of the scheme as assessed. I report the revised results later in this supplementary proof.</p>
<p><b>EfW PROCESS ASSUMPTIONS</b>  <b>EfW Within the eRCF Scenario</b></p>	
<p>It is recognised that the facility is taking high calorific SRF and paper from the pulping facility and the energy outputs would therefore be higher than with MSW. This assertion is supported by claims that the Ecodeco process produces an SRF with a CV of circa 18.5 MJ/kg compared with an MSW CV of circa 9.5 to 10.5 MJ/kg. The SRF has therefore approximately double the</p>	<p>The draft version of the Enviros report delivered a firm “Amber” warning for the approach taken in the model that I asked them to review. However, subsequent to instructing them, and in recognition that the model was “work in progress” I went on to amend the method of assessment. I have no longer modelled the export of steam from the CHP plant, but have altered the paper recycling process to</p>

<p>energy content of raw MSW, this has been reflected in the electricity yield from the combustion plant. However, the heat yield increased by 5 fold when compared to the default rate values for the combustion of MSW. This increase cannot be explained by the CV of the waste alone and thus this claim requires further justification.</p>	<p>account for the energy usage on site. This is the same approach as is taken for all the other processing on site where we reduce the energy consumption of the processes as they are supplied from the CHP plant, rather than recognising the full electrical output of the CHP plant.</p> <p>I am surprised that the reviewer considered the heat output to be too high given that their own research has identified a higher CO2 off set for the Sheffield CHP plant (compared to our original modelling of the Rivenhall Process). Albeit that the approach to modelling the combining of the CHP plant and MDIP plant has moved on to use an alternate method, I have calculated the thermal balance of the CHP plant based on the waste throughput and find it to be in order. I have provided a copy of my calculations to Enviros.</p>
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- 7 All of the substantive comments raised by the reviewer have indicated errors or differences of opinion that would make the differentiation of the three options more pronounced, that is, that the baseline will likely perform worse than I modelled it, and the eRCF would perform better (from a carbon emission basis) both relative to the other scenarios, and on an absolute basis.

### **3.0 ERRATUM**

- 8 I have located an error in my proof in Table 4 (and Table 6 which is a replicate of Table 4). The results for the eRCF (2015) should read 139,917 (not -168,681 as reported). I can confirm that despite this error, the detailed results reported in Table 5 do sum to -139,917 tonnes CO<sub>2</sub>.

#### 4.0 CONCLUSIONS

9 I therefore conclude that the results in my proof of evidence show an underestimate of the benefits of the scheme, albeit that errors are small. I have amended the model to correct the distribution of non-ferrous metals from the Rivenhall MBT plant as identified by Enviros. Prior to correction the eRCF facility (should have) showed a benefit of 139,917 tonnes CO<sub>2</sub>. Following the amendment to the MBT plant the result has now been calculated to be -144,203 tonnes CO<sub>2</sub> in 2015, a difference of 4286 tonnes. This improvement is primarily recognised within the recycling section of the results. The equivalent results from 2020 were -125,888 and now amend to -130,174 tonnes CO<sub>2</sub>.

<b>Result Sector</b>	<b>Original Results Prior to Review</b>	<b>Results Following Review</b>
Total CO2 emissions (2015)	-139,917	-144,203
Total CO2 emissions (2020)	-125,888	-130,174