An Bord Pleanála

04.PA0045.

Development	Resource Recovery Centre development, comprising a Waste to Energy Facility (waste incinerator with energy recovery) for the treatment of non-hazardous and hazardous waste. The development also includes an upgrade to a section of the L2545 road; coastal protection measures on Gobby Beach; a connection to the national electricity distribution grid; raising the ground levels in part of the site; the provision of an amenity walkway along the eastern and part southern boundary of the site and associated works.
Location	Ringaskiddy, County Cork.
Applicant	Indaver Ireland.
Type of Application	Application to the Board pursuant to section 37E.
Inspector	Derek Daly.

1.0 Re-cap of the issues raised by the Board in its request for further information to the applicant dated the 20th March 2017

1.1. Two matters arise in relation to the request for further information.

1.2. Firstly, the Board noted that on the final day of the oral hearing possible discrepancies in the context of Appendix 6.3 and Appendix 6.4 of the Environmental Impact Assessment relating to air quality were brought to the attention of the oral hearing. The Board prior to concluding an environmental impact assessment in relation to the proposed development requested the applicant to comment on any such discrepancies and, if necessary, correct any errors.

1.3. Secondly, the issue of helicopter safety was brought to the attention of the Board in submissions to the oral hearing. The Board invited a response to the submission of the Department of Defence dated the 11th of May 2017 and presented at the oral hearing on the same day.

1.3.1. The Board referred to comprehensively addressing all matters relating to the navigation of helicopters using the naval base at Haulbowline in particular but not limited to;

- Matters raised by the Department of Defence.
- Low gradient flight paths on take-off from and landing on the naval base.
- The impact of local climatic conditions including occasions of atmospheric pressure inversion in Cork Harbour on the character of the plume from the proposed stack.
- The possible requirement for an exclusion zone around the naval base based on best international practice.

2.0 Responses received.

2.1. I would in this regard refer to appendix A of this report in which I summarised the responses received.

2.2. These responses included;

- A response received by the Board from the applicant on the 15th May 2017, which took the form of a number of reports, a precis of the key matters and 2 appendices.
- Responses received from parties and observers further to the public advertisement of significant additional information. A total of 28 submissions were received from prescribed bodies and observers.
- The response submission received from the applicant on the 2nd of October 2017 which included a main response document where matters are addressed under a series of headings and a number of attachments which are responses by the applicant's consultants to specific matters.

3.0 **Assessment of responses.**

3.1. The two main matters raised by the Board related to firstly, when possible discrepancies in the context of Appendix 6.3 and Appendix 6.4 of the Environmental Impact Assessment and comment on any such discrepancies and, if necessary, correct any errors and secondly, the issue of helicopter safety. I propose to consider the responses received and then raise any other matter which has arisen in the responses.

3.2. **Air Quality Appendix 6.3 and Appendix 6.4**

3.2.1. This matter arose on the final day of the oral hearing when possible discrepancies in the context of Appendix 6.3 and Appendix 6.4 of the Environmental Impact Assessment were brought to the attention of the oral hearing.

3.2.2. Appendix 6.3 was a Soil and Sediment Dioxin and Dibenzofuran (PCDD/F) Report prepared for the applicant by AWN. The report was a sampling and analysis of soil and sediment at 12 no. locations in the Cork Harbour Area and at EPA Iniscarra, with the aim of determining background concentrations of PCDD, PCDF and dioxin-like PCBs in the vicinity. The samples were analysed for dioxins and furans with results compared to previous data recorded by AWN and EPA sampling in 2000.

3.2.3. Appendix 6.4 was a Modelling of PCDD/F Intake (dioxins and furans) for Ringaskiddy Waste to Energy Facility also prepared for the applicant by AWN. As part of the modelling soil sampling and ambient air monitoring data, was used to

establish a baseline for PCDD/F (dioxins and furans) intake for a theoretical Maximum At Risk Individual (MARI) in the vicinity of the proposed Ringaskiddy Waste to Energy plant. The MARI for the purpose of the model was assumed to live at the point of maximum dioxin and furan deposition from the proposed development and to be a subsistence farmer, who obtained all their meat, milk and vegetables from a 100m diameter site, upon which the maximum deposition flux impacted. The dioxin and furan intake of the MARI, therefore, is ingested from this environment and the level of intake can then be quantified to determine the levels of intake.

3.2.4. It emerged at the oral hearing that attachments submitted in support of the reports presented data which did not relate to the appeal site modelling and the data in the attachments could not be relied upon to verify the outcomes as presented by the modelling.

3.2.5. In the response by the applicant it is indicated and confirmed by the applicant that there are no discrepancies in **Appendix 6.3** of the EIS. In relation to **Appendix 6.4**, which was a report on Modelling of PCDD/F Intake, two attachments D and J were the wrong print outs and included in error and the correct print outs are submitted in the response.

3.2.6. In a further response Prof Paul Johnson of TCD was engaged by the applicant to carry out a review of appendix 6.4 which was originally prepared by AWN and his report considered the robustness of the modelling, methodology, inputs and outputs and agreed with the conclusions of the modelling report submitted as Appendix 6.4. His review indicates there is nothing to doubt the composite soils sample as the source of the input data for the modelling and the noted anomalies are of a minor magnitude.

3.2.7. Arising from this review identifying transcription errors, the applicant submitted a new and marked up version of the modelling report prepared by AWN which corrects the minor errors.

3.2.8. This report is as dated the 17th of January 2017 and applies a model for an adult theoretical Maximum At Risk Individual (MARI) in relation to dioxin and furan (PCDD/F) intake. Essentially the conclusions of the Appendix report remain unchanged as do the conclusions stated in section 6.5.3.6 of the EIS that the

proposed development will have no impact on dioxin and furan intake and that the facility will have no impact on human health.

3.2.9. It is indicated in this AWN report dated the 17th of January 2017 that based on Prof Johnson's corrections there is an actual slight reduction in impact for the adult MARI from 1.7% to 1.5% of the limit value. The documentation also includes the attachments on which the modelling is based.

3.2.10. Specifically, in relation to this issue a number of the observer submissions make reference to the matter. The comments indicate that there is no reference to the contamination of humans by bio-accumulative dioxins and risks when malfunction occurs; the evidence in relation to appendix 6.4 regarding the error is not credible. It is also indicated that establishing a MARI is of vital importance and the submission of inaccurate information is inexcusable.

3.2.11. There is concern expressed by observers in relation to the levels of dioxin intake in the Ringaskiddy area which is 3 times the tolerable level recommended by the WHO. It is also indicated that there is no safe level of Tolerable Daily Intake. The data submitted is based on MARI and MARI child but omits the most vulnerable at risk individual which is the foetus which would receive an intake of 240 times greater the tolerable level at birth reducing to 50 times the tolerable level at 6 months.

3.2.12. The responses included a number of detailed submissions on the subject in particular from CHASE and Dr Gordon Reid. Essentially Dr Reid takes the view that the submitted attachment J is not able to be linked with the predicted soil levels of dioxins/furans with the predicted dioxin/furan intake for MARI as outlined in table 7.1 of appendix 6.4 of the original EIS. Of 17 congeners every single one has a different value and this Dr Reid believes cannot be explained as a minor transcription error.

3.2.13. The applicant has also replaced the main body of attachment 6.4 (document 02 of the further information) and Dr Reid contends that errors and discrepancies identified are not explained, the methodology applied is similarly questioned and there is no explanation of the discrepancies identified at the oral hearing.

3.2.14. The submission of CHASE has questioned and does not accept that wrong print outs were submitted in error, that there is no credibility in relation to the information submitted and there are questions in relation to the modelling, data used and its testing. It is also indicated that it is difficult to assess Professor Johnson's finding

without knowing the terms of reference and whether Prof Johnson was tasked with an overall review and the nature of the review and the documentation reviewed.

3.2.15. The submissions received by the applicant and the observers present divergent views questioning the credibility of a simple error as the basis of the problem.

3.2.16. In effect the applicant's case is that the overall conclusions in relation to impacts were correct and complies with statutory limits and the information as now submitted corrects the position. The appraisal by Professor Johnson is submitted to further state that the modelling, methodology, inputs and outputs are robust, that the conclusions of the modelling report submitted as Appendix 6.4 are correct, and that the noted anomalies are of a minor magnitude.

3.2.17. The observers have clearly indicated that this revised documentation requires further scrutiny but raises questions on whether this can be addressed satisfactorily.

3.2.18. I consider that the key issues arising from the submission are:

- Consideration of levels of exposure and statutory and regulatory guidance in relation to limits and level of exposure
- Appropriate modelling in relation to assessment of exposure.
- Application of MARI as the appropriate model response.

3.2.19. Although it is questioned by observers whether there is a safe level of exposure there are current limits in relation to emissions and exposure which are required to be addressed by other statutory requirements and licencing.

3.2.20. In this regard I would note that limits on emissions including many identified and associated with the proposed development are defined and regulated by the EU Directive on Industrial Emissions (IED) (2010/75/EU) and will require an IE licence from the EPA.

3.2.21. In relation to PCDD / PCDFs which is subject of appendices 6.3 and 6.4 there is an absence of internationally recognised ambient air quality concentration or deposition standards. In the absence of a recognised standard the recommended approach applied by the USEPA and the WHO to assessing the risk to human health from Dioxins/Furans is applying risk assessment analysis.

3.2.22. The issue in this context is not necessarily the identification of actual emissions from the development which has been presented but an evaluation of what is a perceived level of exposure and impact on human health. Based on Professor Johnson's review, there is nothing to suggest the level of emissions exceed unacceptable levels or pose an unacceptable risk to human health.

3.2.23. With regard to the appropriate modelling in relation to assessment of exposure it is noted that any increased level of intake is questioned by observers but the modelling as revised and submitted was to address discrepancies identified in the raw data to verify in the findings of the modelling in the EIS and the new information submitted addresses the matter and provides further clarification and review based on the new raw baseline data. The overall conclusion indicates levels of tolerable intake at a very low level of the current permissible standard. It may be questioned what inputs should apply but there is nothing, I consider, to suggest the modelling is not robust. It could be argued that an increase in levels at one location may in fact be offset by an overall decrease in levels as a result of material being incinerated at the proposed development that may otherwise be incinerated in less controlled environments in the wider geographical area. This approach may be considered acceptable in the context of the Air Quality Clean Air for Europe Directive (2008/50/EC) which considers changes to air quality at one location may be acceptable if an overall reduction in concentrations is achieved. This would provide for consideration of increased levels at for instance the appeal site if demonstrated that it was offset by reductions elsewhere.

3.2.24. The matter also arises as to whether the application of MARI is the appropriate assessment of this assessment.

3.2.25. There is also a question of what is the appropriate MARI to consider, what level of exposure should be considered, is it more appropriate to consider child and foetus intake in relation to assessment of exposure and as the matters concern substances which are cumulative is there any safe level and should priority in the assessment of exposure rest at considering the most vulnerable such as children.

3.2.26. The issue also arises as to whether TARI (typical at risk individual) is the appropriate response. MARI offers an ability to apply modelling over a wider spectrum as it is a uniform method for comparable analysis and assessment and therefore forms a

uniform baseline for assessment. It is, however, a theoretical model which provides a baseline for cross-study comparisons, rather than 'real life' situations. The theoretical MARI individual does not reflect a typical diet or the diet of a person in the locality or the Irish diet or the diverse source of food for this diet.

3.2.27. Although MARI presents limitations in assessing potential impacts, it does, however, allow for assessment of the more unlikely and extreme level of a potential individual open to exposure and for comparison to other studies which apply a similar MARI baseline modelling. In relation to consideration of adult and or child MARI the application is based on modelling a level of exposure over time as the levels will accumulate within the body over time. In this context, the use of an adult MARI is reasonable.

3.2.28. However even with the application of the MARI in the current case the level of tolerable intake of PCDD/ PCDFs is within the very low spectrum of 1.5%/1.7% of permitted limit values.

3.2.29. There is difficulty in assessing results on sites in attributing the source of an airborne deposit identified on the site and the requirement of assessment in this proposed development is the anticipated level of increase arising from emissions from the proposed development and this I consider is demonstrated.

Conclusion

3.2.30. Having regard to the above, I am of the view that the information submitted has addressed the discrepancies as identified at the oral hearing, and would not indicate that the main findings and robustness of the modelling as presented would be altered, or that the conclusions reached are unsupported

3.3. **Air Navigation.**

3.3.1. The Board invited a response to the submission of the Department of Defence dated the 11th of May 2017, presented at the oral hearing on the same day and to comprehensively addressing all matters relating to the navigation of helicopters using the naval base at Haulbowline in particular but not limited to;

- Matters raised by the Department of Defence.
- Low gradient flight paths on take-off from and landing on the naval base.

- The impact of local climatic conditions including occasions of atmospheric pressure inversion in Cork Harbour on the character of the plume from the proposed stack.
- The possible requirement for an exclusion zone around the naval base based on best international practice.

3.3.2. In relation to matters raised by the Department of Defence the applicant noted that the Department of Defence submissions were informed by concerns in relation to the impact of the plume on operational safety and the safety of the aircraft.

3.3.3. The applicant submissions of the 15th of May 2017 focusses on two main issues, firstly the impact of emissions from the stack on safety of helicopters and secondly the impacts on helicopters and operational flight from the location of the facility, the building mass and the stack.

3.3.4. Specifically, in relation to **emissions** the applicant commissioned a new report and conducted a plume modelling assessment to consider matters raised which was prepared by **Dr Edward Porter**. The report refers to submissions made at the oral hearing and to the application of dispersion modelling and descriptions of worst case scenarios but was not specific to the scale of the proposed development or any site specific study. The plume modelling assessment as submitted in response to the request for further information is based on site specific analysis.

3.3.5. The report considers impacts, noting the character of the plume and applying modelling based on studies most relevant to helicopter safety citing investigations by the Mitre Corporation in 2012 and also examining a number of parameters identified as impacts in research material. The impacts identified by the Mitre Corporation relate to oxygen, temperature and vertical velocity.

3.3.6. In relation to oxygen the Mitre study identifies oxygen levels below 12% as potentially hazardous to helicopters. The oxygen content in the proposed plume at stack top is stated as approximately 6.4% content but could be as low as 6%. In relation to temperature, temperatures of in excess of 50^{o}C are identified as a hazard and the report refers to an initial temperature of 145^{o}C. In relation to vertical velocity, a velocity of 4.3m/s as referred to as a critical level.

3.3.7. Dr Porter's report based on the modelling has concluded that;

- Oxygen levels and concentrations from the stack top were modelled and based on the modelling, it was concluded that within a distance of 3.5 metres of the stack top the oxygen level will be greater than 12% as outlined in figure 2 of his report;
- Temperatures of less than 50^{o}C will occur at less than 3.5 metres from the stack top as outlined in figure 3; and
- A velocity of less than 4.3m/s will occur within 3.4 metres of the stack top as outlined in figure 4.

3.3.8. The report therefore in effect concludes in relation to emissions that there will be no effect on helicopters in the vicinity of the stack top at a distance of 3.5 metres in relation to the identified hazards to helicopters in flight.

3.3.9. I would note that many of the observer submissions question the statement in relation to sufficient dispersal at a height of 3.5 metres above the stack.

3.3.10. In response to initial submissions made and in relation to the impact of local climatic conditions including occasions of atmospheric pressure inversion in Cork Harbour on the character of the plume from the proposed stack a further study was submitted which examined the potential plume its characteristics and dispersal. In relation to this matter the objectors questioned whether the use of meteorological data used in the initial modelling based on Cork Airport is appropriate and contended that data from Roches Point and the Cork Harbour area should have been used.

3.3.11. The applicant, in response to Roches Point, which also provides meteorological data is an unmanned station and does not include all relevant meteorological data such as cloud cover to provide data for robust modelling. The AERMOD model was run using a 150 metre grid vertically and horizontally using Roches Point data. However, to prepare a model examining vertical temperature and plume interaction all relevant data has been used from Roches Point supplemented with data from Cork Airport.

3.3.12. The modelling submitted as outlined in the Plume Modelling Assessment of May 2017 was also then supplemented to determine the vertical zone and indicates the plume will be below 50^{0}C within 6.8 metres of the stack for every hour based on five-year period. This distance of 6.8 metres exceeds the 3.5 metres identified by the Mitre criteria but they are based on actual meteorological data to assess dispersal as

distinct from emission data arising from the emissions from the stack and how with distance oxygen levels, temperature and velocity levels decline with distance from the top of the stack

3.3.13. Based on this modelling the limit of potential adverse impact in relation to adverse impact on an operational aircraft would be low and within safe tolerance levels in relation to temperature and oxygen levels within the 150 metre radius vertically and horizontally of the plume. The 150 metre radius is of significance in the context of the Department of Defence submission to the Board and its requirements of a definitive position in relation to a zone of safety vertically and horizontally of 150 metres from the stack (see section 4.5 of report).

3.3.14. The issue of interaction of the plume and the wind turbine was also further assessed by the applicant in relation to matters raised in submissions. There is evidence of an increase in turbulence arising from the presence of a turbine vertically and with distance away from the turbine. The results of the modelling, however, contend that the wind turbine is deemed not to have a significant impact and will remain below ambient air quality standards in worst case scenario indicated as a difference of a maximum of 4.3%. The overall conclusion is that the plume will be contained to well within 150 metres from the stack top.

3.3.15. In relation to **helicopter flight** the applicant's engaged navigation experts DBS Consultation Ltd and Jensen Marks Aviation Consultant Ltd. concluded and confirmed a view that it is their opinion that the proposed development does not create any additional constraints to helicopter flights or any additional operating restrictions in the area in relation to low gradient take-off and landing at Haulbowline, and that, regardless of what regulations the Irish Air Corps operate to, they should never be in such close proximity to the stack that the plume could affect the flight of the airframe. It is also indicated that flight safety underpins modern aviation.

3.3.16. In relation to flight patterns, it is noted that the Irish Air Corps are not required to comply with Irish Aviation Authority regulations but based on the IAA standard a 150 metres separation from the stack would apply in any direction except in the course of landing and take-off.

3.3.17. Other operational constraints are identified including wind direction and other obstacles. Based on the current baseline limitations and identified obstructions the

DoD, it is argued that aircraft are very unlikely to overfly the Indaver site, as to avoid the existing obstructions they will avoid and stay well clear of the stack site and also that the plume is not large enough, based on air modelling data, to affect flight arrival and departure from the naval base. There is also no published military or civilian restricted zone in Cork Harbour which has a number of major vertical obstacles or any indication that such a restriction zone would be applied.

3.3.18. It is also indicated that as the modelling of the plume has identified that the dangerous area is limited to 3.5 metres both horizontally and vertically and this 3.5 metre distance to the stack would not be entered by a helicopter using normal clearance precautions.

3.3.19. In relation to low gradient flight paths on take-off from and landing on the naval base the report looks in detail at the likely scenarios for flight take-off and landing at the base and reiterates the position that the NMC, pylons and turbines represent more significant obstacles with or without under slung loads on the aircraft.

3.3.20. Observer submissions in particular Mr Michael Griew, disagrees with the applicant, arguing that the assumptions views on flight paths and emissions in the applicant's authors reports have grossly underestimated the vertical extent of the plume leading and that the likelihood that emissions would be drawn into and trapped within the vortex like stream of air generated by the existing wind turbine located approximately 300 metres to the south on the DuPuy site.

3.3.21. As a consequence, the helicopter would be flying towards an invisible and potentially critical threat. The potency of the gas/air mixture and whether it would impact on engine performance is unknown. In effect any modelling must take into account turbulence arising from the wind turbine. This matter it is noted is addressed by the applicant in an assessment of the interaction of the plume and the Du Puy wind turbine.

3.3.22. Specifically, **the Department of Defence** submission indicates that the Air Corps have considered the existing obstacle environment and have advised that its observations are not based on the physical obstacle created by the stack but on the special effects that may result from the plume. In this context in order to ensure the safety of operations, the Air Corps request that Indaver explicitly state the volume within which all risk to helicopters arising from the exhaust plume is contained (i.e.

the distance beyond which a helicopter, in all conditions, may fly without risk from the plume). Should Indaver confirm that this risk will be contained within 150m of the stack then it will not impact on Air Corps operations.

3.3.23. In relation to the matters of safety and operations The main concern raised by the Air Corps at the oral hearing centred on the distance required to circumnavigate the plume arising from the stack.

3.3.24. In this respect I note the following:

- The primary concern is in relation to the operation of helicopter having possibly to fly through and over a plume and that this risk will be contained within 150m of the stack.
- The information submitted would indicate that the plume would not present a risk within 150 metres of the stack. Any risk is, therefore, limited to within 6.8 metres of the stack and aircraft will not operate in such a proximity to the stack.
- I note that reference is made to the vortex arising from the interaction of the plume and the nearby wind turbine but based on the information as submitted this issue would not arise outside of the 150 metre radius.
- The DoD requested that should Indaver confirm that this risk will be contained within 150m of the stack then it will not impact on Air Corps operations. Indaver subsequently have confirmed this to be the position.

Conclusion

3.3.25. In conclusion, I am satisfied that there is nothing based on the information submitted to indicate that the development would impact on low gradient flight paths on take-off from and landing on the naval base. There is nothing based on the information submitted that air emissions would impact on the aircraft outside of the 150 metres radius identified as a necessary distance of safety by the Department of Defence.

3.3.26. In relation to the possible requirement for an exclusion zone around the naval base based on best international practice it would not appear to arise and the DoD response does not appear to present any case for such an exclusion zone.

3.4. **Other Matters - Land Use Policy**

3.4.1. I wish to bring to the attention of the Board that in the applicant's submission there is reference to a change to the Ballincollig Carrigaline Local Area Plan, adopted 21 August 2017. Part of the appeal site, the eastern section adjoining the foreshore has been rezoned from I-15 an industrial related zoning to RY-I-20.

3.4.2. The revised RY-I-20 objective in the LAP is as follows;

"*Suitable for the extension of the opposite Third Level Educational campus and enterprise related development including marine Related education, enterprise, research and development. Consideration will also be given to established operators in Ringaskiddy for the provision of ancillary office accommodation and for Research and Development facilities.*

Any existing access to the nearby Martello tower which crosses this site shall be protected and provision for open space buffer to any existing access shall be provided.

This area may be used as a feeding ground by bird species for which Cork Harbour SPA is designated".

3.4.3. This presents a change from its previous a more clearly defined industrial related zoning objective which mirrored a similar zoning in the Cork County Development Plan.

3.4.4. The western section of the site is zoned RY-I 15 with the objective "*Suitable for large standalone industry with suitable provision for appropriate landscaping and protection of the access points and provision for open space buffer to the Martello Tower and its associated pedestrian accesses. Any development proposals shall protect the special function and integrity of the setting of the Martello Tower and maintain the existing line of sight from the Martello Tower to the other four fortifications in the Harbour (Fort Camden Meagher, Carlisle Davis, Westmorland and the Martello Tower on Haulbowline Island).*

This area may be used as a feeding ground by bird species for which Cork Harbour SPA is designated".

3.4.5. The Cork County Development Plan, I wish the Board to note, has not altered in relation to the zoning of the site.

3.4.6. I would however note that all RY-I zoning objectives in the 2017 LAP are within a section under the heading of industry.

3.4.7. The applicant in the submission to the Board has indicated that this amendment in the LAP is inconsistent with national policy and county development plan.

3.5. **Appropriate Assessment**.

3.5.1. I have reviewed the information submitted following the Board's request for Further Information in the context of Appropriate Assessment and consider that the information submitted does not alter my overall appraisal as set out in my original report in relation to Appropriate Assessment.

4.0 Recommendation

4.1. In relation to the matters raised I am satisfied that the information submitted addresses deficiencies in content, in particular in relation to the baseline information as indicated in appendices 6.3 and 6.4 of the EIS which was an issue in my original report and a stated reason for refusal (Reason No 3).

4.2. In relation to air navigation and safety of flights to and from the Haulbowline Naval Based the information submitted by way of further information addresses matters of concern raised in my report and also I consider addresses matters raised by the Department of Defence and the documentation submitted would indicate that the presence of the facility including the stack and the operation of the proposed facility would not present an unacceptable risk to aircraft navigation or impair the operation of the naval base. I am satisfied that the concerns stated in my original recommendation and a stated reason for refusal (Reason No.5) have, therefore, been addressed.

Derek Daly
Planning Inspector

7th March 2018

Appendix A - Summary of the responses/submissions received

1.0 A summary of the response received by the Board from the applicant on the 15th May 2017

1.1. The response submission takes the form of a number of reports, a precis of the key matters and 2 appendices.

1.2. In relation to the matters raised by the Board in relation to the EIS, the applicant confirms that there are no discrepancies in **Appendix 6.3** of the EIS.

1.3. In relation to **Appendix 6.4**, which was a report on Modelling of PCDD/F Intake, two attachments D and J were the wrong print outs and included in error and the correct print outs are submitted in the response.

1.3.1. The submission includes a review by **Prof Paul Johnson** of TCD who considered the robustness of the modelling, methodology, inputs and outputs and agreed with the conclusions of the modelling report submitted as Appendix 6.4. The review is dated September 2016. Prof Johnson noted a number of transcription errors in the transferring of results from computer modelling files to the relevant reports. The review indicates there is nothing to doubt the composite soils sample as the source of the input data for the modelling and the noted anomalies are of a minor magnitude.

1.3.2. Arising from this review identifying transcription errors, the submission now enclosed includes a new and marked up version of the modelling report which corrects these minor errors.

1.3.3. This report is dated the 17th of January 2017 and applies a model for a theoretical Maximum At Risk Individual (MARI) in relation to dioxin and furan (PCDD/F) intake.

1.3.4. In effect the conclusions of the Appendix report remain unchanged as do the conclusions stated in section 6.5.3.6 of the EIS that the proposed development will have no impact on dioxin and furan intake and that the facility will have no impact on human health. Based on Prof Johnson's corrections there is a slight reduction in impact for the MARI from 1.7% to 1.5% of the limit value. The documentation also includes the attachments on which the modelling is based.

1.3.5. The basis of how the error in the appendix emerged is also outlined in an addendum dated 28th of April 2017 by **Dr Fergal Callaghan**.

1.4. In relation to the naval base and navigation safety and the Department of Defence (DoD) submission dated the 11th of May 2016 and other submissions of the Department of Defence were informed by concerns in relation to the plume and by an analysis that a plume from a larger facility to the proposed development could have a worst case effect on helicopters up to 100 metres from the stack top.

1.4.1. The submissions of the 15th of May 2017 by the applicant focusses on two main issues, firstly the impact of emissions from the stack on safety of helicopters and secondly the impacts on helicopters and operational flight from the location of the facility, the building mass and stack.

1.5. Specifically, in relation to **emissions** the applicant commissioned a new report and conducted a plume modelling assessment to consider matters raised which was prepared by **Dr Edward Porter**. The report refers to submissions made at the oral hearing and to the application of dispersion modelling and descriptions of worst case scenarios but was not specific to the scale of the proposed development or any site specific study. The plume modelling assessment as submitted in response to the request for further information is based on site specific analysis.

1.5.1. The report considers impacts, noting the character of the plume and applying modelling based on studies most relevant to helicopter safety citing investigations by the Mitre Corporation in 2012 and also examining a number of parameters identified as impacts in research material. The impacts identified relate to oxygen, temperature and vertical velocity.

1.5.2. The oxygen content in the proposed plume at stack top is stated as approximately 6.4% content but could be as low as 6% and the Mitre study identifies oxygen levels below 12% as potentially hazardous to helicopters. Other hazards identified are temperatures of in excess of 50^{o}C and the report refers to an initial temperature of 145^{o}C. Distance from the stack top in both cases to identify non-hazardous levels the report indicated required investigation. Another area which required investigation was vertical velocity as to atmospheric pressure high velocity could give rise to increased levels of turbulence and velocity of 4.3m/s as a critical level. In relation to

velocity, data from Cork Airport was used in the modelling in relation and temperature inversions.

1.5.3. Oxygen levels and concentrations from the stack top were modelled and based on the modelling it was concluded that within a distance of 3.5 metres of the stack top the oxygen level will be greater than 12% as outlined in figure 2.

1.5.4. In relation to temperature modelling concludes temperatures of less than 50^{o}C less than 3.5 metres from the stack top as outlined in figure 3.

1.5.5. In relation to vertical velocity again applying modelling a velocity of less than 4.3m/s will occur within 3.4 metres of the stack top as outlined in figure 4.

1.5.6. The report has concluded no effect on helicopters in the vicinity of the stack top at a distance of 3.5 metres in relation to the identified hazards to helicopters in flight.

1.5.7. In reaching this conclusion the site specific analysis has taken into account local climatic conditions including occasions of atmospheric pressure inversion on Cork Harbour.

1.6. Aviation. I would note that in submissions there is reference to metres and feet in relation to distance.

1.6.1. In relation to **helicopter flight** the applicant's aviation experts **DBS Consultation Ltd and Jensen Marks Aviation Consultant Ltd** having considered Department of Defence submissions have confirmed a view that it is their opinion that the proposed development does not create any additional constraints to helicopter flights or any additional operating restrictions in the area in relation to low gradient take-off and landing at Haulbowline and there is nothing in International Regulation or Guidance which would preclude the operation of a stack in the area of a helicopter landing site.

The report also indicates that regardless of the regulations the Irish Air Corps operate to they should never be in such close proximity to the stack that the plume could affect the flight of the airframe.

It is indicated that flight safety underpins modern aviation. The report submitted considers but is not limited to the issues perceived by the DoD.

1.6.2. The applicant consultant's' report refers to the initial submission of the DoD which referred to concerns from a southerly direction and the implications for operations at the naval base. During the oral hearing the objection expanded to all directions. It is

noted that the Irish Air Corps are not required to comply with Irish Aviation Authority regulations but in preparing the report there is an assumption of adherence to civil separation standards. The IAA standard refers to 150 metre separation and that does not apply exclusively to a vertical plane but a 150 separation applies to not closer than 150 metres in any direction except in the course of landing and take-off.

1.6.3. Operational procedures for helicopter flight are outlined and that wind direction is an important consideration for helicopter operations as most critical stages of flight are conducted into wind but crosswind and downwind operations are also achievable based on helicopter performance. Wind direction becomes less critical outside of take-off and landing. The flight path to landing at a committed point does not necessarily need to be directly into wind allowing the pilot a degree of directional flight path before committing to land at the desired point. The effect of engine failure stated by the DoD and its effect on flight profile with shallower climb/descent gradients is accepted.

1.6.4. The report examines the baseline aviation environment, the landing areas on the naval base, other obstacles including pylons, wind turbines and the National Maritime College (NMC). In relation to the appeal site if there are avoidance criteria for the HMC and it would be reasonable to conclude that there are, then the “no-fly” zone of the NMC would apply to the appeal site which would also be within this zone. The rise in the elevation of lands to the south would also suggest that when the presence of the powerlines is considered, in the event of a forced landing and take-off, best practice would suggest the need for a safer option such as flight over sea.

Turbines to the south with issues of height separation and turbulence would also have implications for flying over the appeal site and there are distances of separation determined by research in this regard a factor of 16 rotor diameters is referred to purely in relation to turbulence (note figure 11 which identifies potential turbulence areas). Aircraft using the naval base operate within the zone of turbulence on approach and take off.

1.6.5. Based on the current baseline limitations and identified obstructions the DoD are very unlikely to overfly the Indaver site, as to avoid the existing obstructions they will avoid and stay well clear of the stack site. There is nothing to suggest that helicopter

performance and the AW139 craft as examined in this regard cannot operate safely within the separation distances required.

1.6.6. The report assesses low gradient flight paths for take-off and landing considering the appeal site in isolation and with other obstacles and constraints and also if the stack was constructed on the appeal site. Helicopter operations could continue to and from Haulbowline but there are avoidance margins for more significant obstacles in the area. Although the Irish Air Corps are not bound by civil avoidance criteria they would still apply a safety risk mitigation in their operations.

1.6.7. The report indicates that they do not agree with the DoD that other obstacles in the area are not causing any issue within aviation operations and the DoD submission does not address wind turbine turbulence.

1.6.8. Wind speeds and direction vary but the plume is not large enough to affect flight arrival and departure from the naval base.

1.6.9. There is no published military or civilian restricted zone in Cork Harbour. There is no need or case for such restriction to operations based on international best practice.

1.6.10. It is also noted the Haulbowline is within the controlled air space of Cork Airport.

1.6.11. Reference is made to additional flight procedures in relation to ships and oil rigs and these require operations in difficult conditions which the DoD claim would have an effect on their operations from Haulbowline as a result of the plume from the proposed stack

1.7. **Graham Liddy** prepared a report in relation to **aviation safety**.

The report indicates that there are no circumstances which would require a landing or departing helicopter to fly through the dangerous section of the Indaver plume.

The dangerous area is limited to 3.5 metres both horizontally and vertically and would not be entered by a helicopter using normal clearance precautions.

There are already significant limits on operations in the area of the plant caused by existing obstacles, a no-fly zone and terrain in the event of an emergency and the proposed plant would not require the imposition of further restrictions on helicopter operations at the naval base.

1.7.1. Reference is made to the relatively low output of the proposed plant compared to other plants in the harbour area.

1.7.2. The ships of the naval service have similar output to the plant.

1.7.3. In relation to the incident at the Poolbeg plant the accident report indicates encounters with such gas plumes should not occur where the aircraft is in compliance with vertical and horizontal separation from structures. The IAA have not deemed it necessary to impose a no fly zone other than the requirement to observe the standard obstacle clearance.

1.7.4. In relation to the FAA study the context of the study must be considered in relation to stack velocity and the Ringaskiddy velocity is low compared to stack considered in the FAA study. Aviation itself is the hazardous activity and it is not the plumes which are considered as an unacceptable hazard.

1.7.5. There are identified local restrictions in Cork Harbour identified by the naval service in appendix G which includes the Maritime College and the author cannot see how approval of the development would further restrict operations.

1.7.6. The football pitch is the main landing area and not the Main Square which is used for overnight parking in the absence of a hangar at the pitch.

1.7.7. The author disputes the practice set out in the DoD submission in relation to the “high recce” which is a standard procedure carried out when approaching an unfamiliar landing area. It is worth noting wide circling would not occur at a familiar landing area such as the naval base.

1.7.8. The author refers to the take-off procedure and the issue of head wind and the procedures carried out but indicates that irrespective of the conditions the helicopter would achieve the necessary height clearance in the distance from the take off to the proposed development measured at 1,175 metres and similar arguments apply to landing. A clear run of approximately 1-2 km is not correct as stated in the DoD submission and UK guidance refers to 500 metres distance at take-off for obstacle free clearance within a 6^{o} cone and based on a 6^{o} climb the top of the stack would be cleared by 339 feet. The report reiterates the position that the NMC, pylons and turbines represent more significant obstacles with or without under slung loads on the aircraft.

1.7.9. The Liddy report restates the position that the DoD comment that none of the existing obstacles affect take off and landings is inaccurate.

1.7.10. The primary requirement and responsibility of a pilot is avoidance of collision and the adoption of a 1,000 ft clearance around the stack is not warranted and the air corps do not adhere to this requirement in Haulbowline and other locations or in relation to plumes from their ships.

1.7.11. It is not correct to state that IAA considerations to not apply to the air corps referencing requirements in relation to the Cork Control Zone based on a 15 km radius of Cork Airport.

1.7.12. The report restates the position that irrespective of whether the proposed development is constructed or not aircraft would avoid the area owing to existing obstacles and the hazards arising from the plume is confined to a small area above and laterally from the plume as indicated by Dr Porter.

1.7.13. There would be no reason in low gradient flight paths to have difficulty in achieving clearance over the stack but a pilot has a wide range of approaches none of which require going near the stack or plume. The plant would not in any event given the existing obstacles add any further hazard implications for operations or flight safety.

1.7.14. Local climatic conditions including atmospheric pressure inversions on the character of the plume will not it is indicated affect aviation safety or place restrictions on helicopter operations at the base. In this regard scenarios of the inversion layer below and above stack level are considered and also calm conditions. It is indicated that low flying over the stack should be avoided but there is as already clarified no requirement to fly directly forwards the stack and a distance of 3.5 metres is identified as the extent of the plume having levels to affect aircraft.

1.7.15. An exclusion zone has never been requested by the naval service in relation to Haulbowline but has in other locations and Finner Camp is referenced in this regard. The level of helicopter in the Haulbowline area is low compared to other locations of higher activity which also do not have exclusion zones. It is also stated that Haulbowline is already within the controlled air space of Cork Airport, there are established safety practice in relation to obstacle clearance and there is no justification for a restricted zone.

1.7.16. It is noted that no objections were made in relation to turbines which pose a greater difficulty to safety.

1.7.17. There is no designated helicopter pad on Haulbowline and reference is made to the operations undertaken by pilots involving low flight in hostile environments applying good airmanship.

1.8. **Arup and Brady Shipman Martin** have submitted a number of drawings indicating location of obstacles in the Harbour area and exclusion areas associated with these obstacles.6.4.16.1

1.9. There is also reference that submissions have used reports and studies on the EfW CHP plant at Devonport naval and operational since 2015 in support of indicating no interference with operations at Devonport to support a similar position in support of the Haulbowline Naval Base. In locating the CHP plant there was agreement in relation to the location of main building and flue a stack clear of the flight path.

1.10. The submission also refers to ongoing difficulties at national level in relation to suitable recovery capacity in relation to waste and that landfill has been activated to meet ongoing treatment of waste notwithstanding exporting of waste at 500,000 tpa. The annual level and tonnage of export is expected to decrease highlighting the need for an additional 300,000 tonnes of residual waste treatment capacity.

2.0 A summary of the responses received from parties and observers further to the public advertisement of significant additional information

2.1. A total of 28 submissions were received from prescribed bodies and observers.

2.2. **Transportation Infrastructure Ireland**

2.2.1. The submission is transport related and refers to road improvements and recommends a contribution in relation to road improvements.

2.3. **Thomas J and Kathleen MacSweeney Monkstown**

2.3.1. Refers to the description of the significant further information which the observer contends indicates partiality to the applicant and indicates an assessment has already been made.

2.4. **Mary Murphy and others Monkstown**

2.4.1. Reference is made to submission of inaccurate data at the oral hearing and can all the data submitted be true.

2.4.2. They are happy to agree with the DoD comments and conclusion.

2.4.3. Reference is made to the recent incident at Poolbeg and to the incident in Antwerp, Belgium.

2.4.4. Planning permission should not be granted.

2.5. **Evelyn O'Brien Carrigaline**

2.5.1. The submission restates objection to the proposal and say no to the application.

2.5.2. There is no reference to the contamination of humans by bio-accumulative dioxins.

2.5.3. There is only reference to average emissions but no mention of higher emissions.

2.5.4. Reference is made to fish liver sampling.

2.5.5. The statement in relation to sufficient dispersal 3.5 metres above the stack is questionable.

2.5.6. Reference is made to incidents at Poolbeg and Antwerp.

2.6. **Kinsale Environment Watch**

2.6.1. Restate position in relation to the proposed development.

2.6.2. In relation to air navigation the applicant had an opportunity to respond at the oral hearing and it is bizarre that the Board questions the DoD who know the operations of the naval base which is the only such facility in Ireland.

2.6.3. The explanation in relation to dioxin errors is questioned.

2.6.4. The need for absolute fair process is raised.

2.7. **Mary Bowen and Chris Ramsden Passage Branch of CHASE**.

2.7.1. There remains deficiency in the content and impact analysis of the EIS.

2.7.2. Reference is made to Dr Good's request for more sampling.

2.7.3. Reference is made to concerns for residents, naval personnel and staff and students in the NMC, to the incident at Antwerp and issues in relation to fire and responses to fire.

2.7.4. The effect of the wind turbine on the plume out of the stack is ignored.

2.7.5. Other evidence was presented at the oral hearing on risk to aviation safety and the evidence presented by DoD cannot be superseded.

2.7.6. The evidence in relation to appendix 6.4 regarding the error is not credible. Reference is made to effects of dioxins and furans, that they are bio-accumulative and risks increase when a malfunction occurs.

2.8. **Department of Defence**

2.8.1. The Air Corps have considered the existing obstacle environment and have advised its observations are not based on the physical obstacle created by the stack but on the special effects that may result from the plume.

2.8.2. In order to ensure the safety of operations, the Air Corps request that Indaver explicitly state the volume within which all risk to helicopters arising from the exhaust plume is contained (i.e. the distance beyond which a helicopter, in all conditions, may fly without risk from the plume). Should Indaver confirm that this risk will be contained within 150m of the stack then it will not impact on Air Corps operations.

2.9. **Gerald O'Mahony and others Ringmahon**

2.9.1. Requesting reconvening oral hearing.

2.9.2. Do not accept the 3.5 metres conclusion in relation to risk at the top of the stack.

2.9.3. Issues arise in relation to verifying Indaver's figures and the need for further scrutiny.

2.9.4. The logic in relation to aircraft safety as set out by the applicant in particular Mr Liddy is flawed and the fact that the Irish Navy believe there is a danger must be taken very seriously.

2.9.5. It would be wrong to permit a development which puts personnel at risk.

2.9.6. The site was wrong 17 years ago and remains wrong today.

2.10. **Cork Environment Alliance**

2.10.1. The submission is merely an attempt to correct and explain incorrect information.

2.10.2. Request oral hearing be reconvened.

2.10.3. Establishing a MARI is of vital importance and the submission of inaccurate information is inexcusable.

2.10.4. Can figures submitted be believed.

2.10.5. Issues of evacuation of the naval base are raised and would the naval service not be the best judge of the safety of air crews rather than consultants of the applicant.

2.11. **Paul Nash Cobh two submissions 10a and 10b**

2.11.1. Refers to Devonport which is a different site and the Royal Navy safety statement does not infer that the landing site in question is used as an emergency and rescue function.

2.11.2. Reiterates objection to the proposal stating reasons relating to emissions, human health and safety and unsuitability of the site.

2.12. **Joan Hayes East Cork for a Safe Environment**.

2.12.1. Refers to the procedures adopted in the current proposal and the conduct of the applicant in present and past cases.

2.12.2. Reference is made to the professional opinion expressed by the naval service and the incident in Antwerp.

2.12.3. Reference is made to plans to develop the Irish Steel site.

2.13. **Development Applications Unit**

2.13.1. The submission refers to terrestrial and underwater archaeology and to the requirement for a condition to implement mitigation strategies.

2.14. **Charlie and Mary Nash and others Cobh**

2.14.1. Reiterates objection to the proposal stating reasons relating to emissions, human health and safety and unsuitability of the site.

2.15. **Oakhurst Residents Cobh**

2.15.1. Reiterates objection to the proposal stating reasons relating to emissions, human health and safety and unsuitability of the site.

2.16. **Una Chambers and others Crosshaven**

2.16.1. Reference is made to the long running battle with the community in relation to the proposal.

2.16.2. The issues raised by the Board are not addressed.

2.16.3. There are discrepancies in Dr Porter's submissions in that it is indicated that the plume spread as initially reported is stated as based on a larger facility but in his report indicating the modelling is based on the Ringaskiddy incinerator stack.

2.17. **P.D.F.O.R.R.A**

2.17.1. Reference is made in relation to concerns in the event of evacuation of its members' civilian contractors and other members of the public if it were to arise?

2.17.2. This arises from restricted access and egress to the Island.

2.18. **Simone O'Flynn Carrigaline**

2.18.1. Concern is expressed in relation to the levels of dioxin intake in the Ringaskiddy area which is 3 times the tolerable level recommended by the WHO.

2.18.2. There is no safe level of Tolerable Daily Intake.

2.18.3. The data submitted is based on MARI and MARI child but omits the most vulnerable at risk individual which is the foetus which would receive an intake of 240 times greater the tolerable level at birth reducing to 50 times the tolerable level at 6 months.

2.18.4. The area does not need another dioxin producing activity.

2.19. **Micheal Martin T.D and Cllr Mary Rose Desmond.**

2.19.1. Restating continued objection.

2.19.2. Do not believe the information submitted in relation to the plume is accurate

2.19.3. The position of the naval service was clear and should not be overruled given the strategic importance of the naval base.

2.20. **Mary Kate Chambers and others Cork city**

2.20.1. The explanation of the error is farcical.

2.20.2. The information relating to the velocity of the plume defies the laws of physics.

2.20.3. The MARI should include the effects on the foetus and infant and effects are bio-cumulative.

2.20.4. Reference is made to the absence of an evacuation plan and to the Poolbeg and Antwerp incidents.

2.21. **East Cork Harbour for a Safe Environment**

2.21.1. Reference is made to the procedures of the Board and its Mission Statement.

2.21.2. Reference is made to the circular economy and the view of the EU on this and the need to pursue alternative technologies.

2.21.3. The unsuitability of the site is referred to.

2.22. **CHASE**

2.22.1. The submission includes a number of enclosures.

2.22.2. **Joe Noonan Solicitor** refers to;

Dr Reid identified the errors in the material presented to the Board.

The errors extend beyond EIA into the area of AA and by definition there must be a substantial doubt within the requirement of AA. Doubt also remains based on examination of the information submitted and Dr Gordon Reid demonstrates this in his submission.

The cornerstone of the planning system is that the public should be able to rely on assertions and assurances made by experts retained by the developer.

Reference is made to the history of the site and to what Indaver promised at the oral hearing and what they have delivered.

Reference is made to inputs and outputs and the calculations between the two figures were incorrect and it would be a simple matter to correct the figures and no other change would be necessary.

It is noted that the applicant was working on a report and a reply it had not been asked for.

Reference is made to bias by the Board towards the applicant.

Reference is made to the issue of air navigation safety and the manner it was addressed at the oral hearing including timelines and responses and therefore for the Board to give an opportunity to Indaver to respond is incomprehensible and unacceptable.

2.22.3. **Dr Gordon Reid** prepared a report on the integrity and validity of the dioxin like toxicity intake carried out by Dr Fergal Callaghan for Indaver.

Broadly agrees with the submitted attachment D.

Cannot, however, state that the submitted attachment J is not able to be linked with the predicted soil levels of dioxins/furans with the predicted dioxin/furan intake for MARI (table 7.1 of appendix 6.4 of original EIS). Of 17 congeners every single one has a different value and this Dr Reid believes cannot be explained as a minor transcription error.

The applicant has also replaced the main body of attachment 6.4 (document 02 of the further information). It also now seems that that tables 5.1 and 7.1 of appendix 6.4 are incorrect as the predicted contribution to MARI intake in table 7.1 is different to what was presented at the oral hearing.

Basic errors have not been corrected after the errors have been pointed out.

Dr Johnson has overlooked very substantial problems in the modelling and the minor transcription errors between attachment J and table 6.4 are simply not credible as transcription errors and the applicant has not presented a version of attachment J that accounts for the data presented in the original table 7.1. Differences are simply not explained.

Dr Johnson noted more than errors in input values and these are outlined in section 2.4 of Dr Reid's submission.

The explanation of the errors is questioned and the methodology applied is similarly questioned and there is no explanation of the discrepancies identified at the oral hearing.

There is not sufficient detail to allow the claim that the proposed development will have no significant impact on dioxin and furan intake to be assessed given the unreliability of the data and verifiable detail as to how they were arrived at. Dr Reid is not satisfied with the conclusions drawn in relation to human health.

The data attachment H is also referred to in this regard in relation to the methodology applied in presenting and evaluating the data.

It is also indicated that in the modelling that the assumptions, deviations and omissions are in such a direction as to reduce the apparent MARI intake of dioxin-like toxicity and when they are corrected lifetime average toxicity levels are above EU and WHO tolerable intake.

Dr Reid considered the consistency of the data and Dr Johnsons report and refers to a position that whatever data Dr Johnson saw is not the data presented to the Board (pages 8 and 9). This difference or discrepancy applies to other areas of data reviewed and also to the resultant outputs and predictions arising.

The observation confirms a view of Dr Reid that the material submitted to the Board was not the same material that Dr Johnson considered and the differences cannot be explained by typographical errors and there is no credible explanation submitted.

The modelling offered by Indaver of Dioxin/furan uptake by the theoretical Maximum At Risk Individual is rife with omissions and deviations from the stated methodology and these are outlined in pages 13 to 15. The site chosen in the model is questioned i.e. 4A and not 3A a site closer to the point of maximum deposition.

Dr Reid presents a recalculation of MARI uptake and indicates site 3A would have presented higher deposition rates than site 4A (page 17 and table on page 20).

The use of a 70-year exposure is inappropriate and disregards MARI child's intake in that a child intake is much higher than a MARI adult intake ranging 2.2 to 2.8 higher. Therefore, a child intake requires to be given priority. It is noted that Dr Callaghan reports on MARI child intake in the EPA licence report for Carranstown but omits a similar provision in relation to Ringaskiddy.

There is an absence of DL-PCBs in the modelling contrary to guidance and this may be relevant to the Cork Harbour SPA and the issue of AA.

The MARI model in effect applies a diet in which the individual has a grossly insufficient diet of one third of the energy need of the theoretical farmer and does not reflect a typical diet or the diet of a person in the locality or the Irish diet.

Dr Reid has outlined in page 30 his intake values which exceed EU tolerable intake in relation to a MARI child, a MARI adult and a young mother and would reflect true levels based on the modelling.

The evidence suggests high existing baseline levels and question whether approval should be given for an additional source of dioxin/furans.

2.22.4. **CHASE**

It is not accepted that wrong print outs were submitted in error.

There is no credibility in relation to the information submitted.

A number of points are raised which were included in Dr Reid's submission regard the modelling, site chosen for testing, the typical MARI diet.

CHASE have difficulty in understanding how some of these reports predate the ABP request for further information.

In relation to the plume modelling applying data for Cork Airport is incorrect as it differs from Cork Harbour and the appeal site.

In relation to air navigation Mr Savage's report is based on air modelling the credibility of which is challenged and refers to the view that the plume is not static and predictable.

There is reference to the Devonport site and that the helicopter landing facility and the industrial facility were never open at the same time. The site bears no resemblance to Ringaskiddy.

Reference is made to issue of evacuation from Haulbowline and the area.

Reference is made to the inadequacies of the information submitted in relation to public health.

The facility should be refused and it is in the wrong place.

2.22.5. **NLCC Solicitors note on report of Prof Johnson**

The Board are requested to consider the terms of reference and that Prof Johnson was not tasked with an overall review or validation of the modelling study or the model methodology as such.

The report does not confirm consistency only the source of the sampling site 4A.

Inconsistencies were identified and as a result table 7.1 of the original EIS is amended.

The issue arises what documents were reviewed and are they the same as in the original EIS and the submission makes reference to a number of matters in this regard.

2.23. **Michael Griew**

2.23.1. Disagrees with the Liddy finding that there are no circumstances which would require a landing of taking off helicopter to fly through the dangerous section of the Indaver plume and the DBS/JM conclusion that the plant does not pose any additional threat to the safety of Helicopters from the naval base.

2.23.2. The submission initially refers to the horizontal plume.

There are errors which lead both authors to grossly underestimate the vertical extent of the plume leading to analysis on an erroneous assumption.

Comments relating to the use of the soccer pitch are irrelevant since its closure to helicopters for health and safety reasons and the submission concentrates on the Main Square landing area.

The submission sets out the worst case scenario of a pilot and choices faced by a pilot including failure of one engine.

The pilot will apply certain procedures to achieve the best rate of climb air speed and reach a safe height and in this regard initially approaching obstacles would override any other considerations.

The submission considers potential routes but if the incinerator stack is introduced because of its proximity to the wind turbine and the likelihood that emissions would be drawn into and trapped within the vortex like stream of air generated by the turbine the helicopter would be flying towards an invisible and potentially critical threat. How potent the gas/air mixture is and whether it would impact on engine performance is unknown.

2.23.3. In relation to the vertical plume Dr Porter's report concentrates on the lateral spread of the plume and not the vertical plume. The report from the Mitre Corporation was used by Dr Porter but is silent on the Mitre report's information on vertical extent of the plume and associated danger area.

It also clearly indicates in the response to the Board request for further information that responses made at the oral hearing gave an impression that data was not based on site specific modelling but the information submitted at the oral hearing included site specific analysis of the plume which could have been used in relation to analysis of the vertical plume. (I would refer to Dr Porter's submission at the oral hearing on the 4th May 2016 in this regard).

Applying the data and the AERMOD modelling the concerns of the DoD are reasonable in relation to a 1,000 feet avoidance zone given elevated temperature at 430 feet above the stack and the addition of the standard 500 feet obstacle clearance.

The reports in relation to helicopter safety were based on a 3.5 metre assumption above stack height and clearing the physical obstacle of the stack is not enough.

2.23.4. The submission refers to the comparison of hovering over ships by the applicant's submission but there are not comparable to the stack proposed and cites examples in this regard.

2.23.5. Reference is made to the Devonport site and the submission indicates that the MOD only considered in its safety statement the height of the stack and not the plume emanating from the stack. It is also noted that the landing site at Weston Mill Lake is closed and was closed before the incinerator was built.

2.23.6. The statement that the area of the proposed development is a no go area is disputed and helicopters have flown over the site.

2.23.7. There is a need for a report on the combined effects of chimney plumes and wind turbine outflow. There is also a need for specific on site meteorological data to be used in an assessment and modelling.

2.24. **Collaborative Community Submission Group**

2.24.1. The Board are requested not to consider any material submitted given past inconsistencies.

2.24.2. Reference is made to Aarhus Convention.

2.24.3. The DoD are the sole body with responsibility for military aviation.

2.24.4. Reference is made to the circular economy and that the EC recommends a moratorium on new facilities; decommissioning of older ones and measures to phase out incineration.

2.24.5. This is in line with policy developments on waste and an emphasis on recovery and recycling.

2.24.6. The potential for recovery in Ireland is high and EU incineration capacity is regarded as excessive for the projected decline in feedstock supply. In this context Ireland needs to adopt a more ambitious approach to resource recovery planning.

2.24.7. Incineration is not conductive to a modern circular economy.

2.25. **Rodney Daunt**

2.25.1. The issue of bag filters was raised at the oral hearing and how tears in the filters would be detected and the efficiency of the filters.

2.25.2. This is relevant in relation to emissions of very fine particulates and the level of dioxin emissions.

2.26. **Cllr Marcia D'Alton**

2.26.1. Reference is made to the issue of dioxin levels and Dr Reid's findings on the levels in the Cork Harbour area.

The issue of dioxin exposure is critical to the health of the Cork Harbour environment and the need for expertise to assess this matter.

2.26.2. In relation to air safety and navigation the reports submitted by the consultants for the applicant do not overcome doubts have regard to the concerns raised by the Irish Air Corps.

Concentration on a single helicopter type is irrelevant as the type of aircraft used by the Air Corps will change in the future as it has in the past.

2.26.3. It is important to consider that the proposed development has a potential lifespan of 75 years and the weighting of the consultants of the wind turbine with a life span of 25 years in their assessment of safety.

2.26.4. There is no reference to the use and flight of other helicopters in Cork Harbour and the Coastguard is specifically referred to.

The Air Corps are to be lauded for taking a precautionary approach and to plan and avoid a failure to plan.

The Air Corps best understands what the Air Corps needs.

2.26.5. The incinerator stack is not small in international terms.

2.26.6. Photographs of fires at incinerator plants are indicated and the characteristic of the plume is difficult to predict.

2.26.7. Reference is made to potential for a future waste transfer station on the site and the implications of such a development.

2.26.8. Assessments by the air navigation consultants of the applicant are based on Dr Porter's plume modelling assessment.

2.26.9. A different modelling tool ADMS-5 was used in the further information compared to AERMOD which Dr Porter in the EIS advised was the appropriate regulatory model and was used in the EIS. There is no explanation of this or of critical model inputs used in the further information. There are significant differences between both models.

2.26.10. Reference is made to the wind turbine in the air navigation reports and the noted effects on turbulence and the EIS which in relation to the effects of the turbine on the plume indicates it is not significant.

2.26.11. There is a lot of research on the localised effects from wind turbines on air patterns and stability of the atmosphere and this was not studied in relation to Ringaskiddy. There is evidence of how the behaviour of the plume and its constituents will be affected by the proximity of the turbine and also that modelling must consider variations in both temperature and molecular weight and downwind effects from the turbine on the plume.

2.26.12. The air navigation consultants very much corroborate the concerns raised by third parties in relation to the proximity of the wind turbine and its effects on the dispersal of the plume all of which has implications for the air quality studies in the EIS and the impact on the adjoining SPA.

2.27. **Lorna Bogue**

2.27.1. Reference is made to national context of waste policy.

2.27.2. Reference is made to the Devonport facility and that the facility has had problems including a fire.

2.27.3. The issue in Ringaskiddy relates to the interference with normal operations.

2.27.4. Reference is made to process followed by the Board in this appeal

2.28. **Martin Murtagh and others Cobh**

2.28.1. Why has a flawed report in relation to dioxin been allowed to be superseded.

2.28.2. The issue of accurate information relating to local conditions is raised with reference to the relative elevation of property in the Cobh area.

2.28.3. The 3.5 metre clearance from the top of the stack is questioned in the context of relative levels with Cobh.

2.28.4. There are serious concerns in relation to exposure to dioxin and other incinerator emissions in relation to health arising from the proposed development.

2.28.5. The problems in relation to evacuation of the Cobh area is raised.

2.28.6. There is no justification for the plant.

2.29. **Elizabeth Scannell Monkstown**

2.29.1. Incineration is not the answer to the growing accumulation of waste.

2.29.2. It is important that we retain our heritage and vigilance in environmental matters.

3.0 A summary of the response submission received from the applicant on the 2nd of October 2017 Planning History

3.1. The response received includes a main response document where matters are addressed under a series of heading and a number of attachments which are responses by the applicant's consultants to specific matters.

3.2. The main response document

3.2.1. **Traffic and transportation.**

The issues raised by TII will be addressed by the applicant and requirements and conditions adhered to.

3.2.2. **Archaeology**

Mitigation measures will be adhered to and monitoring carried out in relation to ground disturbance.

3.2.3. **Helicopter Navigation Safety**

In response to the **DoD** Indaver confirm that the site specific risk heights have been found to be limited to a distance of 3.5 metres from the stack up and this confirmation was included in the expert report of Dr Edward Porter to the Board on the 15th of May 2017

In response to other submissions all other submissions are adequately addressed and do not warrant further consideration.

In relation to **Michael Griew** reference is made to **attachment 1** of the response by Graham Liddy and the conclusion of Mr Liddy is that the proposed development will not impact Air Corps operations given the confirmation already referred to. The Devonport case study was included as a useful example of international best practice. The proposed facility will not prohibit the conducting of flight operations from ships in the vicinity of the facility.

Other submissions raise the Devonport facility which was included as an example that waste to energy does not prohibit the operation of helicopter flights.

3.2.4. **Land Use Policy**

The proposed development is consistent with the continued development of industrial, education, energy, pharmaceutical projects and also investment in tourism.

It is compatible with planning and waste policy.

Reference is made to a recent amendment of the LAP to rezone the site from I-15 to RY-1-20 and it is indicated that this amendment is inconsistent with national policy and county development plan.

3.2.5. **Tourism and Recreation**

It is considered that the proposed development will not have an adverse effect on tourism and is consistent with other planned and permitted development in the vicinity.

3.2.6. **Waste Management and Capacity**

Submissions refer to the proposed development as not required and at odds with the circular economy.

Reference in this regard is made to regional policy and the 300,000 tonnes of residual municipal waste treatment and 50,000 tonnes of hazardous waste identified and the need for the plant. The EU proposed circular economy package references in submission do not make reference to the unique circumstances and challenges of individual member states and in isolation of national and regional policy.

3.2.7. **Health and Safety: Fire Safety**

The development has been designed in relation for adherence to stringent regulations and it is proposed to incorporate all relevant considerations in relation to emergency and health and safety procedures.

Indaver cannot comment in relation to sites.

3.2.8. **Health and Safety: Air and Climate**

Reference is made to submissions which raised turbulence from wind turbines and that a report with this submission attachment 2 concludes no significance in relation to the effect of the turbine and all pollutants remain below ambient air quality standards.

Referring to the submission of **Cllr Marcia D'Alton** and the effect of the wind turbine this matter is addressed in attachment 2.

In relation to matter of the bag filters raised by **Rodney Daunt**, the continuous dust measurement in the stack will detect the smaller tears that are not detectable by the pressure drop as total dust is measured not particles over a certain size. Any tears in the bags can identified if outside of normal range, the bag can be visually inspected removed and replaced. The bags remove 99% of the dust and the control measures reduce dioxin levels.

3.2.9. **Health and Safety: EIS Appendix 6.4**

Submissions were received by Dr Gordon Reid and others relating to modelling of PCDD/F and attachments D and J and the review by Prof. Johnson.

A response is submitted by Dr Fergal Callaghan and is Attachment 3 of this submission. The report concluded that the determination arrived at on the impact on human receptors remains valid. The MARI may experience a slight increase but the values are still below relevant EU guidance. The levels for people are insignificant compared to general exposure to PCDD/F.

3.2.10. **Miscellaneous Issues**

Many submissions raise matters which do not pertain to the present application and are not commented upon.

3.3. **Attachment 1 response by Graham Liddy**

3.3.1. The DoD are responsible for the conduct of military operations. Their response to the Board dated the 12th July 2017 indicates that the Air Corps are satisfied that the proposed development will not impact on aircraft operations subject to a specific statement from Indaver.

The matters raised by the DoD are allayed by the submissions made by Indaver.

3.3.2. In relation to the matters raised by Mr Griew, there is no confirmation that the football pitch is closed. There may be health and safety considerations relating to dust but the Air Corps would not allow such considerations to interfere with vital operations and the Air Corps would not forego the relative safety of the football pitch for the more hazardous Main Square.

3.3.3. In relation to take offs the figures refer to minimum height and it is not a limiting maximum. The pilot has the option to climb to a greater height to clear virtually any obstacle of concern given the range of options and additional power at the pilot's disposal.

3.3.4. Pilots avoid carrying heavy loads over built up areas.

3.3.5. There are hazards associated to helicopters from exhaust stacks high temperature gases in excess of 50^0C and oxygen depleted gas. The helicopter is designed to run on weak gas mixture but swirling actions arising from the turbine will accelerate the rate at which the exhaust plume is diluted to safe levels.

3.3.6. The engine used in the helicopter is a proven and reliable engine and the author is not aware of anything to the contrary in this regard.

3.3.7. The author relied on Dr Porter's report in relation to the vertical plume.

3.3.8. It is valid to compare marine engines and the proposed development as both use processes to extract as much energy from the combustion gases prior to release to atmosphere.

3.3.9. Pilots are used to operating in difficult conditions such as fires and platforms.

3.3.10. The author reiterates his position on the higher hazard posed by the wind turbine.

3.3.11. There is no justification for Mr Griew's concerns.

3.4. Attachment 2 Air Quality Response by Edward Porter

3.4.1. This report confirms that the extent of the plume in terms of risk levels of oxygen, vertical velocity and temperature is limited to a region much lower than 150 metres. Issues raised in submissions are addressed under headings.

3.4.2. **ADMS vs AERMOD Air Dispersion Models**.

Both models are given equal weighting by the EPA but ADMS has several advantages over AERMOD in terms of determining the parameters of interest, vertical velocity, oxygen and temperature.

In relation to vertical velocity, AERMOD cannot produce the parameters but ADMS can.

In relation to temperature AERMOD cannot track the path of the plume with distance from the stack and time but ADMS can and does so on an hourly basis and results indicate the vertical distance is limited to 6.8 metres worst case for a temperature of 50^0C and this should be considered in the physical restriction zone of 150 metres for context.

In relation to oxygen concentration ADMS can track at an hourly basis and determine oxygen change, AERMOD can be used to indirectly calculate oxygen concentration.

3.4.3. **Oxygen/ Plume Interaction using AERMOD**

AERMOD has been used to calculate the pollutant concentration and a calculation has been applied to model the percentage of oxygen in the plume with distance from the stack top. This results in determining a maximum vertical and horizon distance and I would refer to figure 2 which indicates the maximum plume direction horizontally and vertically.

The modelling would indicate a maximum of 14 metres vertical and horizontal distance where oxygen content is 12% or greater. The modelling is based on hourly data for four years from Cork Airport and includes all meteorological conditions including inversions.

Variations between AERMOD and ADMS are to be expected but the use of both models confirms the region of risk significantly below the physical restriction zone of 150 metres.

3.4.4. **The meteorological data used in the model (Cork Airport) is not appropriate.**

In relation to Roches Point it is unmanned and does not include all relevant meteorological data such as cloud cover however all relevant data has been used supplemented with data from Cork Airport. Comparisons of modelling data from both stations in figures 3 and 4 and a slightly lower distance is indicated in relation to Roches Point.

3.4.5. **Vertical Temperature/ Plume Interaction**

The modelling submitted as outlined in the Plume Modelling Assessment of May 2017 has been supplemented to determine the vertical zone and indicates the plume will be below 50^0C within 6.8 metres of the stack for every hour based on five-year period (figure 5).

3.4.6. **Oxygen/Plume using AERMOD at 150 metres from Stack**.

The AERMOD model was run using a 150 grid vertically and horizontally using Roches Point data. The oxygen concentration is 20.78% with a predicted temperature of 15.1^0C and this should be compared to the risk levels of 12% oxygen concentration and 50^0C 150 metres from the stack.

3.4.7. **Wind Turbine Effect due to Dupuy Wind Turbine on Ringaskiddy RRC Plume**

The submission refers to the likely highest potential interactions and likely effects when the wind is blowing from a northwest direction and southeast and examines the frequency of these wind directions and the annual frequency is outlined for a four-year period averaging 11.9% from the northwest and 5.6% from the southeast and that 82.5% of the year there is no interaction.

3.4.8. **Impact of Wind Turbines on Dispersions due to the Velocity Deficit.**

AMDS permits calculations of changes to wind/turbulence due to the presence of a wind turbine on an hourly basis and models the dispersion of the plume and an assessment was carried out with and without turbines of NO_2 emissions. The results are outlined in table 2 and the author contends that the wind turbine is deemed not to

have a significant impact and will remain below ambient air quality standards in worst case scenario indicated as a difference of a maximum of 4.3%.

3.4.9. **Impact of Wind Turbines on Wind Field Parameters**

It is indicated that there is a reduction in mean wind speed in the region of the wind turbine but there is no apparent velocity deficit at a distance of 400 metres from the turbine. There is evidence of an increase in turbulence arising from the presence of a turbine vertically and with distance away from the turbine.

3.4.10. Summary

The report concludes with a summary of the main issues section 2.9 of the report but the overall conclusion is that the plume will be contained to well within 150 metres from the stack top.

3.5. **Attachment 3 Response to Dr Gordon Reid's submission**.

3.5.1. It is indicated that the facility will be subject to the requirements of an EPA licence and compliance with relevant limit values and occurs at the plant at Duleek/Carrantown.

3.5.2. Reference is made to what the Theoretical MARI is and to what the general population as distinct from the MARI actually do in relation to food habits and acquisition of food.

3.5.3. Likely Actual Impacts to give an estimated PCDD/F compared to the Theoretical MARI Impacts.

Setting aside the MARI analysis the assessment shows the actual impact of the facility is miniscule with respect to dioxin dose.

Milk intake is used as the estimated PCDD/F dose in relation to background level and the calculation is indicated in table 2 and the process contribution is then added to the baseline level with table 3 indicating the increase in PCDD/F dose.

The likely dioxin dose is also indicated for Irish foodstuffs and this indicate dose for an Irish consumer is indicated in table 4 based on a range of foodstuffs likely to be consumed with and without fish.

3.5.4. Dioxin like PCBs (Polychlorinated Bi-phenals) are currently not regulated under the IED Directive but it noted that the calculated levels of PCBs are less than the levels

predicted by the MARI model used in the current assessment and based on this, the MARI model provides a good prediction of likely dioxin dose excluding fish uptake.

Fish was excluded as the assessment considers the point of maximum deposition on land and many fish species migrate over vast distances of water.

3.5.5. The process contribution it is indicated is 0.1% of the calculated dioxin dose for a consumer eating the diet outlined in table 4. It is also indicated that internationally 95 to 99% of dioxin intake is from diet and this would be the case in relation to Ringaskiddy where a figure of 98.3% of exposure would be from food available purchased and consumed on the Irish market.

3.5.6. **Comment in Air Quality Value**

There is an error in table 5.1 and when corrected there is an increase of 1.1% of predicted dose increase, which is well below the threshold for PCDD/F intake, increasing the level from 0.29 pg/kg bw/day to 0.2935 pg/kg bw/day where the threshold is 2 pg/kg bw/day. The revised table 5.1 is included.

Table 7.1 is also updated increasing the predicted dose intake by 1.1% from 0.32 pg/kg bw/day to 0.323725 pg/kg bw/day where the threshold is 2 pg/kg bw/day.

3.5.7. **Attachment H of Appendix 6.4 of EIS**

The attachment is raw data before conversion to TEQ. A typographical error is corrected and submitted as Appendix B. There is no change in the data.

3.5.8. **Background Soil Dioxin Used in the Model**

There were elevated readings at site 3A and bonfires were considered as a reason for these readings. For this reason, site 4A was selected as more representative. 4Amis also appropriate and similar to in relation to dosage identified in foodstuffs and application to modelling.

3.5.9. **Exposure over 70 years**.

Tolerable Daily Intake is a value defined over a long period of time rather than a short time. There is no basis for an assumption that an infant is at increased risk.

3.5.10. **PCBs**

The focus of the assessment was on dioxins which are regulated as PCBs are not regulated.

3.5.11. **Food intake for MARI**

The basis of the food intake values is related to official data such as the CSO but as already noted the intake values and dosage levels are similar.

3.5.12. **Fish**

Given the nature of the fish species in the harbour area and their migration routes fish was not considered relevant to the current assessment.

3.5.13. **Carbohydrate**

Carbohydrates are a much smaller proportion of PCDD/F intake than milk and the table on overall intake reflects actual consumption as distinct to theoretical consumption.

3.5.14. **Breastmilk**

There is acknowledgement of higher exposure above tolerable levels but international studies weigh this against overall benefits and the short term duration and the intake and exposure over a long term is more significant.

3.5.15. Clarity in relation to Attachments D and J and the file names that Professor Johnson reviewed are indicated.

3.5.16. The submission concludes by restating that the proposed facility will have no significant impact with regard to PCDD/F.