CALDER VALLEY SKIP HIRE

ENVIRONMENTAL PERMIT APPLICATION REFERENCE S13/006

RFI NOTICE DATED 27 JUNE 2024

OBJECTION FROM ..... dated 3 November 2024

EXECUTIVE SUMMARY

1. I was struck by the sheer number of objections to this Permit Application from local residents, their depth of feeling against the SWIP, and their overriding concerns about the impact of emissions on health in the community, the competence of the applicant to operate a SWIP following a number of fires on the site, and the way in which the decision of the Hearing Inspector had been circumvented.

2. This Objection considers in detail some of the technical aspects of the Permit Application and addresses the CVSH Response dated 27 June 2024 to Questions Raised by CMBC. In doing so it finds significant evidence the Applicant will not operate the SWIP in accordance with the permit,

3. Regulatory guidance for Waste Incineration EPR5.01 provides guidance on setting permit conditions to limit emissions to air, water and soil. It appears to have been ignored by both CVSH and CMBC. No meaningful design appears to have been carried out despite regulatory guidance stating that it is normal to do so, and stating that Authorities will need to know the precise nature of the installation they are being asked to permit.

4. In its Response to CMBC questions dated 29 July 2024, RPS stated *"the permit applicant does not need to demonstrate that specific plant is designed, equipped and will be maintained and operated in such a manner that the requirements of IED Chapter IV are met"* However, such demonstration by the applicant appears to be precisely what the permit applicant is required to demonstrate through the Environmental Permitting Regulations.

5. There are significant differences between the specifications and design data published by the incinerator supplier, Inciner8, and what the Permit Application and RPS Responses state.

    - The Permit Application states a burn rate of 1-2 tonnes per hour, but inciner8 technical documents state a burn rate of up to 600kg per hour and that operating at above that burn rate is "dangerous"

    - The Permit Application states that fossil fuel burners are not required to be used during normal operation, but Inciner8 technical documents provide information to suggest that fossil fuels burning during normal operation is required and makes up 39% of heat generated.

    - The Permit Application states that incineration is controlled during operation by varying air injection into the furnace, but Inciner8 technical details indicate that such air control is not part of the incinerator specification.

- The Permit Application further states that control of incineration is via temperature and oxygen monitors, but the Inciner8 technical details only show temperature monitors. This will affect the speed of the incinerator to react to spikes in emissions.

6. The Permit Application describes a plant that functions differently from what is stated in the equipment specifications and data from Inciner8 which relates to equipment that is already supplied and installed. Plant and equipment that cannot meet the operational requirements stated in the Permit Application to process 1-2 tonnes of RDF per hour.

7. Heat balance calculations based on the equipment technical specifications provide further evidence that operating the plant above a burn rate of 600kg per hour will lead to overheating and potential damage to equipment

8. Mass balance calculations based on the equipment technical specifications indicate that the burn rate of 600kg per hour may be very much a maximum, and that normal operation should not exceed 500kg per hour.

9. The mass balance calculations also demonstrate that stack emissions at 1000 to 2000kg per hour burn rates would be around 2 to 4 times the mass of emissions used for the stack height calculation to the Planning Permission and used for the inputs to the Human Health Risk Assessment and Air Quality Assessment.

10. The multiple problems related to the intended operation of the incinerator described above indicate that the Applicant does not understand the limitations of the equipment in the SWIP or how to operate it.

11. Public Comments 9 on the CMBC website alleges multiple non-compliances of the Permit Application with permitting regulations and guidance. This Objection and Public Comments 9 identify fundamental problems with the intended operation of the SWIP by the Applicant to the extent that it appears that the Applicant cannot operate the SWIP in accordance with its own proposed permit or in accordance with permitting regulations.

MAIN DOCUMENT

REGULATORY MATTERS

1. The following are relevant for the determination of applications for a SWIP:

    - Environmental Permitting (England and Wales) Regulations 2016 ("**Permit Regulations**")
        - Regulation 13
        - Part 1 Schedule 5
        - Schedule 13
        - Schedule 6

    - Defra.2020. Environmental Permitting: Core Guidance. For the Environmental Permitting (England and Wales) Regulations 2016 (SI 2016 No 1154) ("**Core Guidance**")

    - Defra.2012. Environmental Permitting: General Guidance Manual on Policy and Procedures for A2 and B Installations: Local Authority Integrated Prevention and Control (LA-IPC) and Local Authority Pollution Prevention and Control (LAPPC) ("**LA Guidance**")

    - Environment Agency.2009. How to comply with your environmental permit additional guidance for: The Incineration of Waste (EPR 5.01) (**"EPR Incineration Guidance"**)

2. A House of Commons Debate Pack dated 6 February 2020 states at Page 4 paragraphs 2 and 3

    "The principal regulations implementing the EU permitting requirements in England and Wales are the Environmental Permitting (England and Wales) Regulations 2016 as amended. Regulation of incinerators in England is split between the Environment Agency and local authorities. The EA regulates incinerators with a capacity of greater than 3 tonnes per hour for non-hazardous waste and 10 tonnes per day for hazardous waste. Incinerators below this size are regulated by local authorities.

    There is Environmental permitting guidance for waste incineration published on Gov.uk which provides more detailed information. The environmental permit will set conditions which limit the discharge to air, water and soil of specified substances. Further information is set out in the Environment Agency's How to comply with your environmental permit additional guidance for: The Incineration of Waste (EPR 5.01) February 2009."

3. The Environmental Permitting Regulations, the LA Guidance and the EPR Incineration Guidance are the relevant documents for implementing permitting requirements and setting permit requirements.

4. Article 44(a) of the IED requires that *"an application for a permit shall include a description of the measures which are envisaged... to guarantee that the plant is designed, equipped and will be maintained and operated taking into account the categories of waste to be incinerated or co-incinerated"*

5. When it comes to how Article 44(a) is interpreted for a permit application then the Environmental Permitting Regulations and related guidance are relevant. The Core Guidance paragraph 5.9 states

"Where proposals involve substantial expenditure, whether on construction work, equipment, software, procedures or training, operators should normally make an application when they have drawn up full designs but before any work commences (whether on a new regulated facility or when making changes to an existing one)."

6. The LA Guidance Page 42 paragraph 4.12 states

   "In the majority of cases, operators should apply for a permit when they have drawn up full designs, but before starting construction work

7. The LA Guidance Page 45 paragraph 4.24 states

   "Authorities will need to know the precise nature of the installation they are being asked to permit and how the operator proposes to deal with the environmental effects of the installation. It is essential that the application is sufficiently detailed and with sufficient supporting maps and diagrams to allow an authority to examine all elements of the activities and installation for which a permit is being sought, covering everything from receipt of material to the despatch of waste and finished products."

8. The Environmental Permit S13/005 Appeal Decision Paragraph 22 states *"There is no published guidance for determining Schedule 13 SWIP permit applications. However, I have had regard to the General Guidance Manual on Policy and Procedures for Part A2 and B Installations"*

   The Hearing Inspector appears to have been misinformed about published guidance for determining Schedule 13 SWIP permit applications as demonstrated by reference to the House of Commons Debate Pack dated 6 February 2020. However, he has recognised the need for guidance and used the correct guidance in his determination.

9. The position of CMBC in its closing statement to the Hearing on Permit Application S13/005 was that *"no consideration is required as to the specification or suitability of the precise pieces of plant that are proposed to be operated"* and that *"if the plant acquired is not fit for purpose and is incapable of meeting the emission level set that is the Operator's concern and is incapable of substantiating a justification for some other and lower level"*

   The CMBC closing statement appears to contradict the LA Guidance that *"Authorities will need to know the precise nature of the installation they are being asked to permit"*

10. Fast forward to the statements in the RPS Response dated 29 July 2024 to Request for Information Notice Paras 2.1.7 and 2.1.9 that *"the permit applicant does not need to demonstrate that specific plant is designed, equipped and will be maintained and operated in such a manner that the requirements of IED Chapter IV are met"* and *"it is commonplace for permit applications to be made on the basis of generic plant"*

    The position in the RPS Response dated 29 July 2024 contradicts the LA Guidance that *"Authorities will need to know the precise nature of the installation they are being asked to permit"*

11. It is concerning that the design obligations in the various EPR Guidance documents together with the multiple obligations in the EPR Incineration Guidance are not included in any documents provided by CVSH or in any considerations by CMBC. Instead, there had appeared to be be an understanding by CVSH and CMBC that the IED is the main reference document

for a decision on environmental permit compliance, that design was not required and that there is no guidance to inform such compliance.

KEY CONCERNS

12. The LA Guidance Paragraph 6.21 states *"In accordance with paragraph 13 of Schedule 5 to the EP Regulation, an application must be refused if the applicant will not operate the facility in accordance with the permit."* Whether the operator can operate the facility in accordance with the permit is the criteria to determine the permit application, not as stated by CMBC in its closing statement at the Hearing *"to determine the specification of the resultant emissions that have to be achieved"*

13. Public Comments Document 9 published on the CMBC website identifies and provides an assessment of multiple non-compliances of the Permit Application with the EPR Incineration Guidance, and is supported by this Objection.

14. This Objection will demonstrate that there are also significant and material differences between the specifications and design data published by Inciner8 and the Permit Application and RPS Responses. These give clear indication that the SWIP cannot be operated in accordance with the Permit Application without potentially severe consequences for the environment, public health and operator safety.

Incinerator Burn Rate

15. Reference to the Inciner8 I8-1000G Technical Datasheet for its largest general waste incinerator shows a "burn rate of up to 600Kg". The proposed processing of 1-2 tonnes per hour of RDF described in paragraph 1.1.2 of the RPS Permit Application demonstrates the intention of CVSH to maintain a feed rate of more than 1 tonne per hour throughout operations which is considerably higher than the Inciner8 maximum burn rate.

16. The consequences of exceeding plant charging rates are described in the EPR Incineration Guidance Page 41 Item 5 which states

    "Charging rates outside the installation design capacity undermine environmental performance.... At all installations close attention should be paid to the procedures that are in place to ensure that the designed charging rate is not exceeded."

17. The Operation, Maintenance and Installation Handbook for the Inciner8 7-Burner Incinerator Model with Autoloader Version 1.2 January 2019 - I8 – 1000 (A,G,M variants) with CE7 Advanced Control Panel, which was included as evidence for the S13/005 Environmental Permit Application Appeal states on Page 14

    "Operating the machine beyond its design limits can damage the machine, it can also be dangerous. Do not operate the machine outside its design limits, this includes overfilling the chamber with waste fuels and operating at too high temperatures. Do not try to upgrade the machine performance with unapproved modifications or grades of fuel."

    This is clear evidence that the incinerator cannot be operated safely or in accordance with regulatory guidance at the proposed feed rate of 1-2 tonnes stated in the RPS Permit Application.

Size of plant equipment

18. As demonstrated in the Objection from 1017 Residents to Application S13/005 and in numerous comments on Permit Application S13/006, the plant and equipment cannot be contained within the existing building and the insufficiency of the space is substantial. The Permit Application is non-compliant with the requirement of Planning Appeal reference APP/A4710/W/18/3205776 Procedural Matters Paragraph 3 to contain the plant installation within the existing building.

Missing Information

19. The Objection from 1017 Residents to Application S13/005 determined that nearly all process and technical information is missing, a long way distant from the LA Guidance that full designs should be drawn up before making a permit application.

20. The information that was missing from the previous environmental permit application reference S13/005 is missing from the current Permit Application reference S13/006. The Permit Application has not, therefore, complied with Paragraph 5.9 of the Core Guidance, and has not complied with paragraphs 4.12 and 4.14 of the LA Guidance, and the non-compliance is substantial.

21. The Permit Application paragraph 1.5.5 states that *"the application is being submitted on the same basis as the original application"* and that *"further information is provided to inform the redetermination in 2022 and certain documents from the hearing sessions in two appeal hearings in November 2022 and May 2023 have been incorporated."*

22. However,

- the only plan drawing of the installation reference JER1902-PER-001 Rev D which was included in the permit application S13/005 is missing from the Permit Application S13/006.

- The Permit Conditions agreed between CMBC and CVSH at the request of the Hearing Inspector are missing from the Permit Application.

- The Operation, Maintenance and Installation Handbook for the Inciner8 7-Burner Incinerator Model with Autoloader Version 1.2 January 2019 - I8 – 1000 (A,G,M variants) with CE7 Advanced Control Panel, which was included as evidence for the S13/005 Environmental Permit Application Appeal is missing from the Permit Application.

  As has been recorded by residents in comments there appear to have have been numerous instances of misleading statements and missing information from the Applicant throughout the permitting process for both Permit Application S13/005 and Permit Application S13/006.

Use of fossil fuel burners

23. The Permit Application states at paragraph 3.4.3

"The SWIP unit has two combustion chambers and is designed to achieve auto combustion of fuel in the primary chamber, with support burners if needed, and thermally oxidises the off-gas in the secondary combustion chamber to create heat. The primary chamber has five burners and the secondary chamber has two burners. Thermocouples are installed within the unit to measure and monitor temperature."

24. Paragraph 3.4.4 states

    "Once combustion of the fuel is established, it will be self-sustaining."

25. Paragraph 3.4.8 states

    "The SWIP has been designed to use gas oil as a start up fuel until the primary and secondary chambers meet the required inner wall temperature of 850^{o}C. Once the furnace unit has reached the required temperature, the RDF will be loaded into the primary chamber via the enclosed autoloading hopper and combusted in the primary chamber on a variable grate. At this stage the unit will become self-sustaining and autothermic."

26. However, the manufacturers I8-1000 general Incinerator Summary Sheet included with the Permit Application states an *"Average Fuel Consumption of 65.1kg per hour"*, and the manufacturers more recent I8-1000G Technical Datasheet on the Inciner8 website states *"Fuel consumption 40-50ltrs/hr."* There is no evidence in the Inciner8 documentation of the auxiliary burners only being used during start up. In fact, the I8-1000G Technical Datasheet states that *"When the secondary burner is activated a flame curtain is created which ensures the thermal decomposition of smoke and harmful emissions to produce a clean, odourless vapour exiting the chimney stack."* This is very different to the statements in the Permit Application, and the I8-1000 Technical Datasheet explains why the I8-1000 General Incinerator would consume auxiliary fuel during normal operation. Paragraph 3.4.8 of the Permit Application is misleading in stating that gas oil will only be used for start-up.

27. The use of 65.1kg per hour of auxiliary fuel in the normal burning process represents about 39% of the energy produced from incinerating 600kg per hour of RDF, and is a significant fossil fuel use that has not been identified in the Permit Application.

Control of air into furnace

28. The Permit Application Paragraph 3.4.6 states *"The primary air is delivered by forced draft fans, integral to the 4 off MAX25 burners. Additional primary combustion air will be delivered via the FD fan beneath the SWIP grate. The under-grate section of the SWIP unit is divided into three compartments to allow the excess air levels to be controlled to match the requirements of the initial devolatisation of the RDF as it is distributed over the grates and the slower burn out of the residual char which requires higher excess air levels. Secondary combustion air flows into the secondary chamber will be controlled by dampers whose position will in turn be controlled by the PLC system. The secondary air is delivered by FD fans, integral to the 2 off MAX 25 burners above the grate. Secondary combustion air (tertiary air) will be introduced into the secondary chamber to obtain the correct air to fuel ratio for combustion of the volatile gases released by the burning of the RDF and tertiary air will be added into the secondary chamber, prior to entry into the air-cooled heat exchanger."*

29. However, the Inciner8 Operation, Maintenance and Installation Handbook for the Inciner8 I8-1000G which was included as evidence in the Enquiry for the S13/005 Permit Application states *"Increasing air settings on the air damper at the side of the burner will provide a better air/fuel mix. This will also increase the burn rate. This should only be adjusted on the advice of Inciner8 or your Inciner8 distributor"*, and reference to the Ecoflam Max P 25 Technical Manual for the incinerator burners page 15 indicates that the air flow adjustment is a physical settings adjustment made at the burner, related to burner commissioning. Contrary to the

statement in paragraph 3.4.6 of the RPS Permit Application that *"Secondary combustion air flows into the secondary chamber will be controlled by dampers whose position will in turn be controlled by the PLC system"* there is no facility to control air flows by dampers during operation or via the PLC system.

30. The statements in the RPS permit Application that secondary combustion air flows are controlled by dampers linked to the PLC system contradict the information in the Inciner8 I8-1000 Manual, and provides further confirmation that the burners are used to control combustion, not air flows.

Control of Incineration Process

31. The Permit Application Paragraph 3.10.1 states

    "The SWIP will be equipped with a range of process instrumentation to monitor temperature and flue gas oxygen concentration at strategic locations throughout the process. Instruments are installed to provide continuous information to the PLC system, which monitors and adjusts key operational parameters to ensure efficient combustion of the RDF at all times. The instruments will supply data to the PLC based process control system overseen by SCADA supervisory control. The selected PLC is a superior design to that originally specified and includes enhanced automatic control systems providing real time information to the operator. This will control the combustion process and associated pollution control systems and derive key metrics for optimisation and monitoring of the combustion process by shift personnel."

32. However, the Inciner8 I8-1000G Technical Datasheet shows that HT thermocouples provide independent control of primary and secondary temperatures via the incinerator control panel. There is no evidence of use of gas sensors to control combustion. This is important because gas sensors react more quickly to changes in combustion conditions than thermocouples, allowing better control of, for example, emissions spikes.

33. Other than the description in the Permit Application paragraph 3.10.1 there is no further detail provided regarding how the control system will operate the plant, yet there is an obvious and direct link between control of the incinerator and control of emissions.

Flue Gas Emergency Valve

34. The Permit Application makes no reference to a dump stack, but the Solid Solutions Flow Simulation Report page 28 shows a photograph of a dump stack describing it as an emergency outlet. The emergency outlet has no bypass to the flue stack which means that flue gas emissions which have not been cleaned can go to atmosphere without monitoring for frequency or extent of operation of the dump stack and emissions exceedances, or the ability to shutdown the plant when the emergency outlet is used. The 99% + efficiency of ceramic filter gas cleaning suggests potential emissions of multiple times the legal limit from the emergency outlet, with significant implications for the environment and human health.

35. The **EPR Incineration Guidance** page 58 states that the operator should *"Only operate dump stacks for safety reasons or to prevent damage to gas cleaning plant; and operational frequencies greater than once per year are unlikely to be acceptable; and when a dump stack or emergency bypass operates this will be considered to be a period of abnormal operation and the process should be reduced or closed down; and dump stacks are to be routed to the*

main stack thus forming a bypass which will improve dispersion and allow monitoring equipment to quantify the release; and the reliability of heat removal systems should be demonstrated to be adequate."

36. The Permit Application has not been clear about its provision of a dump stack and it is non-compliant with the **EPR Incineration Guidance** to be bypassed through the emissions control system in the flue stack.

Flow Simulation Report

37. It is noted that the RDF is not defined in the Flow Simulation Report. The heat energy source is the five burners in the primary chamber, there was no RDF involved in the tests. The flow simulation was not based on the final configuration of the incinerator. The autoloader was not connected, the flue gas cleaning system was not connected.

38. What was noticeable from the photographs included in the Report was the very open nature of the simple incinerator grate. It would allow RDF to easily fall through into the ash chambers, and this is reflected in the gas flow diagrams which show gases circulating through the ash chambers as well as the incineration chamber. This appears to contradict the Permit Application paragraph 3.4.6 which states that RDF is distributed over the grates and paragraph 3.4.8 which states that the RDF will be combusted on a primary grate. Either it is anticipated that a different grate will be used in the final configuration of the incinerator which calls into question the validity of the Flow Simulation Report or the Permit Application description of the grate operation is misleading.

39. The Flow Simulation was set at a very low level of operation, less than 5% of normal operation and only around 1.2% of operation at 2000kg per hour of RDF burn rate. The test was not carried out in worst operating conditions and questions arise regarding the effect of ash build up on flue gas circulation and residence time, sufficiency of primary air for the burning process and the effect of 1000 to 2000kg per hour RDF feed rates.

Heat Balance

40. The incinerator generates heat from the burning of the RDF fuel and from the auxiliary fuel used in the operation of the burners that are integral to the incinerator. The maximum RDF feed rate is 600kg per hour as stated in the Inciner8 I8-1000G Technical Datasheet and its calorific value is 10 MJ/kg as stated in the Permit Application. Heat generated from RDF combustion is 600kg per hour x 10Mj/kg = 6,000Mj which is 6,000 x 0.2778 = 1667kWh

41. Similarly, the burner fuel feed rate is 65.1kg per hour and its calorific value is 36.38 MJ per litre as stated in the letter from RPS to CMBC dated 7 April 2021. Since 1 litre of gas oil weighs 0.84 kilograms the gas oil use is 65.1kg per hr / 0.84kg per litre = 77.50 litres/hour. At the CV of 36.38Mj/l stated in the letter from RPS to CMBC dated 7 April 2021 this equates to 77.50 x 36.38 = 2819Mj which is 2819 x 0.2778 = 783KWh.

42. Total heat generated per hour is 1667 + 783 = 2450KW. The amount of heat discharged through the flue stack per hour is proportional to the temperature difference between the flue efflux of 300^{o}C and the exit to the incinerator secondary chamber of 850^{o}C, which is 2450KW x 300/850 = 865KW. It follows that the heat available for electricity and for the dryer after the heat exchanger is 2450 – 865KW = 1585KW

43. From looking at the Zuccato Product Sheet ZE-200-LT included with the RPS Permit Application the maximum electricity that can be produced per hour is 0.20MWe and the maximum heat available per hour to the dryer after the ORC condenser is 1.280MW. The capacity of the ORC condenser and the ORC generator limits heat discharge to 0.20 + 1280 = 1480KW.

44. It follows that, based on heat balance, the maximum RDF feed rate must be less than 600kg per hour to avoid overheating of the incinerator. It seems that the incinerator and heat dissipation systems are intended to be operated at less than a 600kg per hour RDF feed rate. Feed rates of 1000kg per hour and 2000kg per hour are well outside the operating limits of the SWIP equipment as stated in the Permit Application. Such feed rates would lead to rapid overheating, a need for emergency shutdown, potentially serious damage to equipment, and potentially significant fugitive emissions through opening the emergency valve.

Mass balance: Air input

45. At an RDF feed rate of 600kg per hour the air requirement to achieve full burn out of the RDF is calculated as follows:

- The atomic mass of carbon is 12, and that of oxygen is 16. Therefore, the combustion of 12kg of carbon (into CO2) will require 32kg of oxygen. It follows that 1000kg of carbon will require 1000 x 32/12 = 2667kg of oxygen.

- The atomic mass of hydrogen is 1 and that of oxygen is 16. Therefore, the combustion of 1 kg of hydrogen (into H2O) will require 8kg of oxygen. It follows that 1000kg of hydrogen will require 8000kg of oxygen.

- Gas oil is typically composed of 85% carbon and 14% hydrogen. The use of the gas oil at 65.1kg per hour would be 85% carbon x 65.1kg per hour = 55.3kg per hour, and 14% hydrogen x 65.1kg per hour = 9.1kg per hour.

- The oxygen required to combust 55.3kg per hour of carbon would be 55.3 x 2667/1000 = 147kg per hour. The oxygen required to combust 9.1kg per hour of hydrogen would be 9.1 x 8000/1000 = 73kg per hour. The total oxygen required to combust 65.1kg per hour of auxiliary fuel would be 147 + 73 = 220kg per hour.

- An analysis document of waste in Germany published in the IPCC National Greenhouse Gas Inventories titled “Emissions from Waste Incineration” states that the calorific value of mixed waste ranging from 7,500 to 11,000Kj/kg relates to a combustible content in the range 28-40% by weight. Based on a calorific value of 10Mj/kg stated in the Permit Application the combustible content for the RDF would be approximately 36%

- At a combustible content of around 36%, the oxygen requirement to incinerate 600kg per hour of RDF would be 0.36 x 2667 = 960kg per hour.

- The total oxygen requirement to incinerate 600kg per hour of RDF including use of the burners would be 220 + 960 = 1180kg per hour.

- The amount of oxygen in the atmosphere is approximately 21% by weight. Therefore, 1180 x 100/21 = 5619kg of air is required to incinerate the maximum 600kg per hour of the RDF stated in the Inciner8 technical information.

- The EPR 5.01 Incineration Guidance Section 2.5 requires sufficient oxygen of about 6% to ensure adequate combustion at completion of combustion, and use of this 6% excess air allowance is confirmed in the Inciner8 technical information. This results in an approximate excess air requirement of 6 x 100/21 = 28.57% or 1605kg of air.

- Therefore, approximately 5619 + 1605 = 7224kg of air is required to incinerate 600kg of RDF including auxiliary fuel use. Since air has a specific volume of 820 litres per kg (0.82 cubic metres per kg) at standard temperature and pressure, the volume of air required to incinerate 600kg of RDF per hour would be approximately 7224 x 0.82 = 5924 cubic metres of air per hour.

46. There are five openings in the furnace through which the air can be delivered, each, as shown in the Flow Simulation Report, is 0.14m diameter. There are 5 inlets that will require to deliver 5924 cubic metres of air to burn 600kg per hour of the RDF. Each inlet would require to deliver 1185 cubic metres/hour or 1185/3600 = 0.33 cubic metres/second through a cross-section area of 3.14 x .07 x .07 = 0.0154sqm. The velocity of input air would be 0.33/0.0154 = 21.4m/s. This is similar to the efflux velocity from the stack, and it is an indicator that the SWIP is well balanced at a maximum feed rate of 0.60 tonnes per hour of RDF.

47. However, at an RDF feed rate of 2000kg per hour the 5 inlets would be required to deliver approximately 5924 x 2000/600 = 19747 cubic metres of air per hour. Each inlet would require to deliver 3949 cubic metres /hour or 3949/3600 = 1.097 cubic metres/second through a cross-section area of 0.0154sqm. The velocity of input air would be 1.097/0.0154 = 71.2m/s (that is 159mph!). It is unlikely that such high air input velocities could be achieved, and it is likely that there would be incomplete burn out of the RDF which would cause dust to displace into the flue gas and carry over into the secondary chamber and through to and potentially block the expensive flue gas cleaning filter, as described on Page 19 of the Inciner8 Operation, Maintenance and Installation Handbook.

Mass Balance: Flue gas mass

48. The mass of the flue gas is obtained by adding together the mass of each of the component parts which are (Mass of nitrogen + mass of carbon dioxide from RDF incineration) + (mass of nitrogen + mass of carbon dioxide from auxiliary fuel incineration) + mass of water vapour from RDF + mass of water vapour from hydrogen incineration in auxiliary fuel + mass of excess air.

    - The atomic mass of nitrogen is 14. The molecular mass of carbon dioxide is 44 (carbon12 + oxygen16 + oxygen16), and that of water is 18 (hydrogen1 + hydrogen1 + oxygen16)

- Mass of nitrogen generated in flue gas per hour from RDF incineration is 79% of the 5619kg air requirement including use of burners, which is 4439 kg per hour.

- Mass of carbon in 600kg per hour of RDF is 36% = 216kg. Carbon dioxide generated in flue gas per hour from RDF incineration is 216kg x molecular mass of carbon dioxide/atomic mass of carbon = 216 x 44/12 = 792kg per hour.

- Mass of carbon in 65.1kg per hour of auxiliary fuel is 55.3kg per hour. Carbon dioxide generated in flue gas per hour from auxiliary fuel combustion is 55.3 x 44/12 = 203kg per hour.

- Mass of water in 600kg per hour of RDF is 10% = 60kg per hour

- Mass of hydrogen in 65.1kg of auxiliary fuel is 9.1kg per hour. Mass of water generated from auxiliary fuel combustion is 9.1kg per hour x molecular mass of water/2 x atomic mass of hydrogen = 9.1 x 18/2 = 82kg per hour.

- Mass of excess air is by definition air not used in combustion. It is therefore carried through into the flue gas and is 1605kg per hour.

- Mass of flue gas is 4439 + 792 + 203 + 60 + 82 + 1605 = 7181kg per

hour. **Mass balance: Efflux gases**

49. The RPS Response to Information Notice dated 25 April 2024 Table 1 Item 1 states *"The applicant has confirmed that the built stack diameter and height is 0.4m and 12m respectively. This matches what was modelled in the air quality assessment. The efflux velocity (m/s) is calculated from the stack diameter (m) and the volumetric flow (m^3/s). These were agreed with the technology provider, Inciner8, in 2018."*

50. The CMBC Permit Application Form completed by CVSH states at Section 6 Table 1 an efflux speed of 21.3m/s and efflux temperature of 573.15K. It is noted that 573.15K is the same temperature as 300°C.

51. The cross-sectional area of the flue stack is calculated using the formula $A = \pi r^2$ where A is the cross-sectional area, r is the radius (which is half the 0.4m diameter).

    A = 3.14*0.2*0.2 = 0.1256m^2

52. The volumetric flow is obtained by multiplying the cross-sectional area by the efflux velocity, which is 0.1256m^2*21.3m/s = 2.675m^3/s. This is the same as 2.675*60*60m^3/hour = 9630m^3/hour.

53. Using an online flue gas calculator from Esteem Projects the density of flue gas at 300 degrees C is calculated to be 0.636kg per cubic metre at standard pressure. The efflux discharge derived from the Permit Application is approximately 9630 x 0.636 = 6125kg per hour.

54. From para 48 above, incinerating 600kg of RDF will lead to an approximate volume of flue gas at a temperature of 300C at the flue outlet of 7181/0.636 = 11290 cubic metres per hour. This compares with the volumetric flow derived from the Permit Application of 9630m^3/hour. It indicates that the 600kg burn rate stated in the Inciner8 I8-1000G technical document is very much a maximum, and normal operation would need the burn rate to be at least 15% lower at around 500kg per hour.

55. The SWIP cannot be operated anywhere in the range 1000 to 2000kg/hr RDF feed rate stated in the Permit Application. The consequences would be catastrophic as described in the Inciner8 Operation, Maintenance and Installation Manual.

56. Even if the SWIP could be operated between 1000 to 2000kg RDF input the mass of emissions from the stack would be around 200 to 400% times the mass of emissions used for the stack height calculation and used for the inputs to the Human Health Risk Assessment and Air Quality Assessment.

SUMMARY OF OBJECTION IN RELATION TO RFI NOTICE DATED 27 JUNE 2024 ON PERMIT APPLICATION REF. S13/006

INFORMATION TO BE SUPPLIED TO THE COUNCIL	**SUMMARY OF OBJECTION**
Confirm, by way of technical documentation supplied by the manufacturer, that the I8-1000 SWIP can facilitate a burn rate of 2000kg per hour.	The I8-1000 technical datasheet for the General Incinerator includes plastics and packaging, industrial and construction waste as suitable feedstock. It states a maximum burn rate of 600kg per hr, and the Operation, Maintenance and Installation Handbook for the I8-1000G states "Operating the machine beyond its design limits can damage the machine, it can also be dangerous." From Inciner8 technical documentation, the SWIP cannot be operated safely anywhere in the 1-2 tonnes per hour burn rate range described in the Permit Application. The EPR Incineration Guidance (EPR5.01) Page 41 Item 5 states *"Charging rates outside the installation design capacity undermine environmental performance.... At all installations close attention should be paid to the procedures that are in place to ensure that the designed charging rate is not exceeded."*
Confirm whether the burn rate has been used to inform any of the emissions calculations, and if so specify what burn rate has been used.	This Objection has used the maximum burn rate of 600kg per hour stated in the I8-1000 Technical Datasheet to inform heat and mass balance calculations. Incinerating 600kg per hour of RDF will lead to an approximate volume of flue gas at a

	temperature of 300C at the flue outlet of 11290 cubic metres per hour against the volumetric flow derived from the Permit Application of 9630 cubic metres per hour. This suggests that the SWIP should be operated at a feed rate that is at least 15% below the 600kg per hour maximum feed rate shown on the I8-1000 Technical Datasheet. It follows that burn rates between 1000kg per hour and 2000kg per hour will produce volumetric flows at the flue outlet between 2 and 4 times the volumetric flow derived from the Permit Application.
Confirm by way of technical documentation supplied by the manufacturer that the abatement equipment fitted to the I8-1000 incinerator can achieve the IED limit values that have been used in the Additional Air Quality Assessment and ES Addendum to the ES Chapter 7: Air Quality at a higher burn rate of 2000kg	It is not clear what the abatement equipment is or who it is manufactured by. The single sheet from Inciner8 included with the Permit Application offers three alternative options none of which match what is shown on layout plan drawing 9677/17/03C and shown in the Flow Simulation Report. The Permit Application describes SNCR but what is shown on the layout plan and in the Flow Simulation Report does not look like SNCR.
Confirm the flow rate simulation report remains accurate if the burn rate increases to 2000kg per hour.	The Flow Simulation Report was based on use of burners to the primary chamber at a very low heat output. No account appears to have been made of the location of the incinerator in a small enclosed shed with limited ventilation. The size of the building vent grille indicates that the existing building vent system might just cope with 500kg per hour burn rate. There would be insufficient air above the 500kg per hour burn rate to complete combustion. A burn rate of either 1000 or 2000kg per hour seems impossible without severe consequences for air supply to the incinerator leading to incomplete combustion.
Confirm the total bottom ash capacity of the I8-1000 incinerator	This appears to be 1.80m^3 as stated in paragraph 2.1.25 of the RPS Response dated 29 July 2024 to CMBC RFI Notice
Stipulate the approximate amount of bottom ash generated over a 24hr period with a burn rate of 1000kg per hr and 2000kg per hr	Based on paragraph 2.1.27 of the RPS Response dated 29 July 2024 to CMBC RFI Notice a burn rate of 1000kg per hr will produce 30kg per hr, which is 24 x 30 = 720kg of bottom ash per 24hr period. A burn rate of 2000kg per hr will produce 60kg per hr of bottom ash which is 24 x 60 = 1440kg per 24hr period. Various studies indicate that bottom ash from waste incineration will have a dry density of between 0.95 and 1.80 tonnes per cubic metre.

	Based on the 1000kg per hr burn rate the volume of ash in a 24hr period at the higher density would be 720/1.80*1000 = 0.40m^3 per 24hr period and at the lower density would be 720/0.95*1000 = 0.76m^3 per 24hr period. Based on the 2000kg per hr burn rate the volume of ash in a 24hr period at the higher density would be 1449/1.80*1000 = 0.80m^3 per 24hr period and at the lower density would be 1440/0.95*1000 = 1.52m^3 per 24hr period.

DOCUMENT LIST

- The Operation, Maintenance and Installation Handbook for the Inciner8 7-Burner Incinerator Model with Autoloader Version 1.2 January 2019 - I8 – 1000 (A,G,M variants) with CE7 Advanced Control Panel
- The Inciner8 I8-1000G Technical Datasheet
- The Objection from 1017 Residents to Application S13/005
- The Ecoflam Max P 25 Technical Manual
- The IPCC National Greenhouse Gas Inventories titled “Emissions from Waste Incineration”