SIRRL RESPONSES TO QUESTIONS FROM WAIMATE GPS

A group of Waimate General Practitioners recently put a number of questions to SIRRL about Project Kea, and the proposed Energy-from-Waste facility. SIRRL Director Paul Taylor and experts from Babbage Consulting were able to meet via Zoom with the GPs, provide information and discuss the issues raised. Below are the GPs questions and answers and, as the issues of a technical nature, the answers indicate where data is explained in the corresponding relodged consent documents. For wider FAQs https://www.projectkea.co.nz/questionsandanswers

Q. The (original) consent application acknowledges discharge of toxins to air, with monitoring of some being "real time" and others sampled intermittently. However, it is unclear whether the acceptable level used will be a temporal average, and if so, over what period, or an attempt to measure against background levels at remote sites?

A: *Dioxin (including Furans) are measured directly from the emissions stream as ng/Nm^3 of emission gas. Refer TR1 s9.2, 9.3, 9.4 and 10.*

Q. The latter is fraught with complications in attributing the source of contamination, although this is possible with more detailed analyses. Will SIRRL be correlating the unique congeners of flue gases with measurements made remotely, so that attribution can be established/ disproven?

A: *Emission measurement is taken directly from the emission gas stream post the ID fan, not at a remote location. Refer TR1 s9.3 and 9.4*

Q. The former may involve varying time periods and will typically present an average figure. Allowance may be made to discard a set number of readings within each period, and many facilities (but not all) take advantage of an option to actually report levels which are decreased by a set amount (up to 30% in the UK) to allow for "limitations in monitoring equipment". Does SIRRL plan to reduce reported emissions in this way?

A: *2010/75/EU ANNEX VI Part 3 provides for differing time periods for differing contaminants. Refer TR1 s10.*

Q. Given that highly toxic, and accumulating, dioxins, furans, PCBs & PAHs will be released to air, why does the consent proposal only indicate annual measurement of flue gas levels, and twice-yearly remote monitoring? Until a plant has operated with a standard feedstock for at least a year, it is impossible to know what levels of toxins may be released, suggesting that such infrequent sampling is no more than a hopeful minimal requirement?

A: *Dioxin and furan components will be sampled continuously and tested monthly in the first two years and then six monthly from year three onwards. Refer TR s9.2*

2010/75/EU does not require testing for PCB's and PAH's. These compounds behave/react chemically the same way as dioxins through the treatment process. Refer TR s9.4

Q Furthermore, the consent application refers only to dioxins, which may be intended to include the whole group, but might more conveniently be interpreted to exclude furans and PCBs. What dioxins and other complex organic compounds will actually be measured, and how?

A: *Measured contaminants include dioxins and furans as per 2010/75/EU ANNEX VI Part 2. Refer TR1 s10 for equivalence factors.*

Q: For flue gas emissions, where will the sensors be placed and what allowance is made for flue velocities and diluent gases?
A: *Sensors are placed post ID fan. Refer TR1 s9.3 and s9.4*

Q. The actual by-products (discharges to air and ashes) will vary, potentially significantly, with changing make-up of the feedstock. What variation in feeder fuel has been allowed for, both in monitoring and incineration technology and where does this appear in the consent application?
A: *Combustion and emission treatment technology is designed for waste ranging in CV from 7,000 to 13,000 kJ/kg and the range of waste covered by the waste acceptance criteria. Refer TR1 s3.4, 3.5 and TR16.*

Q. The indicated consumption of feedstock is 1000 tonnes/ day. Initially it was suggested that this would be adequately sourced within a range of Christchurch to Dunedin. More recently, there has been indication that much wider sourcing across New Zealand would be required.
A. *Waste is expected to come from the Christchurch, Dunedin, and Central Otago regions. Refer TR1 s3.1*

Q. Since other plants are also proposed there will be competition for this waste-stream
A. *We are not aware of any other proposed plants of this scale or type.*

Q. It has been suggested that waste may be imported from the Pacific Islands and rumoured that China would be a likely source (in view of the connection with a Chinese parent company).
A. *Waste is expected to come from Christchurch, Dunedin, and Central Otago regions. Refer TR1 s3.1*

Q. Waste from either of these latter sources is known to have much higher water and organic contents, and therefore very different emissions. There are examples of changing feeder fuel leading to unpredicted, uncontrolled and repeated breaches of safe discharge levels. Would SIRRL consider a lifetime proscription on feedstock content?
A: *Any change in feeder fuel outside the bounds of the Waste Acceptance Criteria Testing (WAC) would likely require re-consenting to accept an alternative waste source. Refer TR16.*

Q. The collection and storage of vast quantities of waste must [be] accompanied by a significant increase in vermin species; this will be especially true if the feedstock changes to include a larger organic content. We note that other applications have indicated that a sealed warehouse facility with negative internal air pressure and flows will help with control of odours and exclude vermin. However, a portal sufficient to allow large trucks access must be assumed to be adequate for bird and rodent penetrance, whilst the reality is that large incineration plants tend to operate with doors left open (as the internal environment is otherwise quite hostile towards workers). The practical solution is that considerable quantities of toxic bait are used. This is likely to enter groundwater, either directly through storm and wastewater, or via poisoned animals dying at some distance from the perimeter. There is also the possibility that carcasses will be consumed by domestic animals, such as dogs and cats. What mitigation does the company propose?
A*: With respect to both loose waste and baled waste receival and unloading refer TR1 s5.1, 5.2 and 5.3. With respect to vermin control refer to TR1 s5.3.3. With respect to odour control refer to TR1 s5.4.*

Q. Furthermore, it is counter-intuitive to transport huge quantities of waste by sea, road or rail (and we understand Kiwirail presently do not want to be carrying this traffic) with the associated exhaust emissions adding yet more heavy metal, dioxin-like compounds and greenhouse gases. How does SIRRL justify this environmental burden against a supposed policy of resource recovery, and would it not make more sense to propose such a facility within an industrial complex adjacent to a fully serviced port?

A: *Given the expected origin of the waste, transport by sea is not realistic. The entire facility has a net carbon benefit (not burden). Refer TR9.*

Q. Similarly, there appears to be a need for significant supplementary fuel: We are told that diesel oil is required only at start-up, but the quantity proposed for storage on site would indicate otherwise? All the fossil fuels result in significant release of, especially, heavy metals and greenhouse gases.

A: *Diesel is used primarily for start-up. The quantity used is around 54,000kg per start-up/shut-down cycle. Refer TR1 s6.2 and s7.3.*

Q. What modelling will be used for dispersion effects? The consent appears to derive predicted plume direction and extent from stack height, possibly exit velocities and prevailing winds. There are established and accepted models for discharges from flues which do not appear to be referenced in the consent application, raising concerns about the validity of assumptions presented. There is also no reference to the seasonally recurrent inversion layers occurring in this area, and the link to air buoyancy (independent of temperature) and dispersion.

A: *Wind speed and direction is extracted from CALMET and cross checked against the Waimate meteorological station. Refer TR5 s2.3. Atmospheric dispersion modelling was conducted using CALPUFF V7. Refer TR5 s5.0.*

Q. The air quality consent application refers to PM10 particles, but somewhat dismissively, suggesting they are of little importance, and hence will not be comprehensively monitored. In fact, PM10 and below are significant as health and disease predictors, and compose almost entirely the particulate discharge from incineration stacks. There is a clear association with many diseases, especially those affecting the respiratory and GI tracts, and skin, as well entry to the food chain through both plant and animal routes. Douglas et al, publishing on particulate exposure from modern municipal waste incinerators in 2017 found a small but significant contribution to PM10 particulates with SO2, nitrogen oxides, heavy metals, PCD dioxins, furans, polycyclic aromatics and polychlorinated biphenyls. PM10 have been established as a proven marker for heavy metals, PCDD, furans, PAH and other complex aromatics, and are associated with birth defects and intrauterine growth retardation. It is, therefore, very concerning that SIRRL do not propose comprehensive monitoring of PM10 and below, plus the specifically identified, disease-causing groups noted.

A: *Particulates are monitored online. Refer TR1 s9.2. Particulate limits achieve NES-AQ and CARP. Refer TR1 s10*

Q. The process will also produce considerable quantities of ash. The grate ash is proposed as suitable for landfill, whilst the fly ash will require further treatment. It is surprising that SIRRL, purportedly aiming for reclamation technologies, should not be considering some form of re-use of the grate ash?

***A**. In Aotearoa New Zealand, grate ash and fly ash are currently sent to landfill. SIRRL is currently in discussions with a significant aggregate user to work towards having ash certified in NZ for use as an aggregate, as is done in many other parts of the world. Refer TR1 s12.*

Q. It is worrying that there is no indication of the proposed landfill facility, and since that is not stipulated there cannot be any environmental assessment of such dumping. European regulations require extensive washing of grate ash prior to re-use or other disposal, reflecting the fact that all ashes leach heavy metals for an extended time- a significant loss in the first two years then decreases to a steady low leaching by 10 years. Additionally, ash leachate also leads to increasing salinity in ground water, which has devastating environmental and farming consequences. Why does SIRRL propose sending untreated grate ash to undesignated landfill sites?
A: *If not recycled then ash would be sent to a landfill which is consented to lawfully take the ash. Refer TR1 s12. (Note, the environmental assessment for landfill is tied up in the consenting process for that landfill).*

Q. Fly ash is considerably more toxic, with cadmium, chromium and lead being present from consumption of paper and plastics, as well as zinc and copper. The consent application refers to secondary treatment in a plasma furnace but says only that iron will be retrieved. Will other heavy metals be retrieved and recycled or is the intention simply to fix them in some inert form or to discharge to air- i.e., a cost based rather than recycling goal?
A: *In Aotearoa New Zealand raw fly-ash is currently sent to landfill, mines or ponds. Project Kea will vitrify the fly-ash to enable its use as an aggregate. Refer TR s12.2*

Q. *Kanhar, Cheng & Wang* (2020) indicate that plasma technology is good for chromium and nickel but poor for volatile metals, including cadmium, lead, mercury and zinc, these volatile metals being especially hard to stabilise against future leaching. The most inert presentation is to fix these metals in Portland cement, implying some intended re-use. However, even then leaching occurs over time, and not all metals can be captured- e.g., mercury. Blocks produced in this way have restricted use due to production of toxic dusts on cutting. It appears that, apart from an unspecified treatment in a plasma furnace, no other treatment is planned?
A: *The most inert presentation is not Portland cement, it is vitrification. Refer TR1 s12.2*

Q. What thermodynamic process is to be used in the plasma furnace (e.g., sintering, vitrification etc)? This is significant, as some processes require further washings, whilst others produce a secondary fly ash, also requiring treatment.
***A:** Vitrification. Refer TR 1 s12.2*

Q. Plasma technologies overall have only been developed over the last 35-40 years, and plasma furnaces for about half that time. Reliably maintaining the plasma is a high energy process, and prone to collapse of the plasma in an unpredictable way. This will adversely affect efficiency, and possibly safety. How will the plasma be maintained, and how will reliability be guaranteed?
A: *The process is currently operational. Refer s12.2*

Q. We have been assured that this technology has been used in Europe for the last 20 years, but also that this is new technology and "cutting edge". These are mutually exclusive statements. If this is

established technology, the fact that many European and Canadian plants are to be permanently closed down in favour of a circular economy, and to protect the ozone layer, should sound warning bells for New Zealand? If it is new technology then how does it overcome these issues, and where is the proof?
A: *Modern plant performance is proven by the ongoing performance monitoring. Refer TR5 for current operational plant performance data.*

Q. The consent applications, reflecting normal practice, refer to existing plants as a source of established data on emissions and residues, but there is a stark absence of any specific detail- which are these reference plants, and for what aspects of the application?
A: *Refer TR5 for current operational plant performance data.*

Q. Similarly, SIRRL have stated that this technology "differs from other New Zealand applications." How?
A: *To our knowledge there are no current operational large-scale Energy-from-Waste (EfW) plants in Aotearoa New Zealand. Refer full consent application.*

Again, SIRRL or its predecessor companies have submitted previous applications for similar plants. To what degree, and in what way, has the current application improved upon previous iterations?
A: *SIRRL (or any previously associated company) has not submitted any previous EfW applications for a similar plant.*

Q. Even if operating at or below the proposed emissions levels for toxins, the plant will produce huge quantities of greenhouse gases, in particular CO2 (1.3 tonne per tonne waste consumed) and nitrogen oxides. These may well present a greater environmental threat than other discharges, and are a major concern. It is fundamentally unjust that wealthy nations continue to contribute to this global damage, whilst other civilisations and ecosystems cause no such damage, but pay the cost. The government plans to introduce emissions charges for farming in 3 years, the airlines attempt to appear concerned by offering passengers the chance to purchase carbon credits etc, industries can benefit from tree planting programs. Does SIRRL have plans to contribute in a similar way, and if not does that reflect an uncertain profit margin which may be affected should the government legislate for carbon sequestration by industry?
A: *The EfW plant provides a positive GHG benefit when compared to the alternative landfill. Refer TR9*

Q. There is already significant depletion of the ozone layer over this region, with many adverse consequences but including excess levels of skin cancer. With the increased release of toxic heavy metals, dioxins and similar compounds plus damage to the ozone layer, we can expect an increase in cancers, birth defects and growth retardation, immune compromise and possibly metabolic disorders. Whilst this may, initially, be very small numbers the non-degrading and accumulating nature of many PM10s, dioxins, furans and PCBs as well as heavy metals makes future increases in disease burden likely. What level of increased disease is acceptable to SIRRL, what monitoring is proposed to test for this, and what responsibility will the company assume?
A: *Please refer TR6 covering human health risk assessment.*

Q. Cost to the local community will also be in terms of mental health and financial comfort. The submitted economic benefits paper presents many unlikely positives, but omits some certain costs,

and potential confounding factors. In particular, the significantly increased use of local roads by heavy vehicles will cause major degradation. Axle loading damage increases to the power 4, and a 50 tonne truck and trailer unit causes similar damage to several thousand light vehicles. These roads are maintained by the local authority, and the income is derived from rates. The Waimate District Council is already barely managing to upkeep a disproportionately extensive road network. Will SIRRL be offering a direct contribution to local roading, to offset the ratepayer burden from their business?
A: *Dedicated heavy traffic pathway to site is via SH1 and Carrolls Road. Carrolls Road will be upgraded as part of the project. Refer TR1 s5.1.2 and TR8*

Q. Comment is also made that construction of the plant will employ many local businesses, with optimistic figures supplied. A local Chinese owned and built milk factory made similar claims during the consent process, but later cited lack of local expertise and brought a significant proportion of construction workers from China. Can SIRRL be sure this will not happen for the current proposal?
A: *We looked into whether this happened and found that it was not correct.*

Q. The local community most affected (Glenavy, sited close by and within the prevailing flume) is already reporting increased levels of stress and disturbed mood. At this stage, a major concern relates to the predicted drop in house values, and with talk of moving away this is a major stressor. These concerns are secondary to the perceived danger posed by toxic discharges, and also arise from concerns about the incinerator's need to draw large quantities from the local aquifer. It is concerning that this may not have sufficient flow to remain viable, and being adjacent to the coast reflux salinity and extensive damage to irrigated farmland is predicted. What assessment has SIRRL made regarding this water source and its adequacy to supply the township, farming and irrigation, as well as the proposed plant. Does SIRRL have any plans to try and mitigate the stress experienced locally, noting that previous attempts have seen poor success?
A: *Re perceived dangers of discharges please refer TR5 and TR6. Re water source for the plant please refer TR1 s14.*

Q. We remain concerned about the potential for plant failures. All technology is prone to failure, and in the lifetime of such a plant at least one significant event is virtually a certainty. Multiple examples exist, from all industries, notwithstanding high levels of regulation and existing safety systems. Examples include Seveso, Italy (1976); Three Mile Island, US (1979); Chernobyl, Soviet Union (1980); Bhopal, India (1984); Pingxiang, China (2000); Herts Oil Storage, UK (2005); Kingston coal fly ash spill, US (2008). Persistent, low-level failures are equally concerning (Harlingen, NL) and may go undetected for long periods, whilst a plant may successfully operate within statutory levels and still be associated with excess levels of abortion and birth defect (Edmonton, UK). This latter is most likely due to the persistent low-level exposure to PCD dioxins, PCBs and furans, all of which SIRRL either propose to monitor very infrequently or not at all.
A: *The plants you list have at their core significantly hazardous processes i.e., nuclear reactors, chemical manufacture etc. The internal process of an EfW plant is entirely more benign.*

Q. In Britain, municipal waste incinerators may operate for up to 4 hours at, or above, safe levels in the event of an abatement failure. i.e., failures are recognised, and frequent enough that some authorities allow for them. Does SIRRL intend seeking such leeway, and if so at what stage would the application be made? It is noted that the WHO has stated that there is no safe limit for particulates.

A*: Limits are as per 201/75/EU. Refer TR1 s10.*

Q. ECAN's mission statement includes that we should be able to "breathe clean air and swim in the rivers, gather mahinga kai, benefit from the productive use of our land". SIRRL's current resource consent applications do not assure us that these values will be protected.
A*: It is a good mission statement which we believe the EfW plant fully supports when the alternative is landfill. Refer full consent application.*

Answers to questions from 10 Nov 22 post meeting.

Q. The first relates to sampling of complex organic chemicals. Paul indicated that dioxins were now to be sampled online and measured intermittently. I don't think I asked what online actually means? Is this continuous, a rolling average or a set sample every so often? I realise it will only indicate presence, but there must be a minimum level and hence the possibility of averaging; that may also be necessary if the actual levels are as low as stated.
A. *Sampling online means the sampling instrument is connected into the emissions stream and takes samples automatically at predetermined intervals. Refer TR1 s9.4*

Q The follow-on then, is how often samples will be collected and sent for actual measurement? I imagine this would be much less frequent?

A*. For dioxins a sample is taken from the emissions stream. Analysis of the composite samples is conducted every month for the first two years and then every six months for years 3 and beyond. Refer TR1 s9.2 and 9.4.*

Q. And most significantly, I think I may have pushed on a bit quickly, but we never established what you will be measuring- just PCD dioxins, or other members of the group as well- PAH, PCB & furans; or possibly the online monitoring is for non-specific PM10 and below (I'd gathered that was a different sampling process, but just checking)?
A*. Please see answers to previous questions.*

Q. It seems, on reflection, that (you) may have danced around the grate ash issue a bit. That might be unfair, but I now realise that although you talked about landfill being the only current option, and were hoping for rule changes to allow others, you consistently avoided acknowledging the issue of significant leachate from grate ash (although I mentioned it several times). That seems to be an issue with all grate ash, but the concern is higher with a municipal waste stream as the content is more variable (albeit not necessarily more toxic than from fossil fuel burning).
A. *Please see answers to previous questions and refer TR1 s12*

Q (You) also indicated that he was not aware of European plants and regulations washing processes for grate ash, which I think is surprising, and perhaps a little worrying if absolutely true. Investigating and offering this process might make the ash less threatening to the community, whilst simply trucking it away to unspecified landfills should be completely counter to any green principles- as noted, if you don't know where it's going, it's impossible to provide a relevant environmental assessment.

A. *Internationally there are many processes and uses for recycled ash and there is no single standard covering their treatment and use. Please refer TR1 s12*

Q. It sounds to me as if, at present, the vitrified fly ash could be less harmful than the grate ash, but the sheer volume of the latter is an issue you seek to minimise and gloss over.
A. The plant will produce around 80,000 tpa of grate ash and around 20,000 tpa of vitrified fly-ash. Refer TR1 s2. For details around disposal vs recycling please refer TR1 s12.

Q. We talked about metal reclamation, can you give a ball-park figure for various non-ferrous metals? i.e., prove that there is enough for this to be genuinely worthwhile. There must be a relatively early point at which it's better business sense to just let it go- and presumably that would be either into the ash or up the chimney. Re the latter, I think various volatile heavy metals were for monitoring, but don't recall seeing mercury?
A. *Based upon the nominal waste composition (refer TR1 s3.2) the expected quantities of recycled metals from the grate ash (ferrous and non-ferrous) are 5,500tonnes per year. Refer TR1 s2.0 and s13.1*

Q. And finally, I wonder whether you would be prepared to send me a link to your Technical Report no 9?
A. *A copy of TR9 has been sent to you.*

Q. I cannot locate this through ECAN but have come across various extracts which seem to imply a different slant to that you gave us- namely it's not so much that regional councils don't know how to do this, as that under present rules they are directed to ignore many aspects of greenhouse gas assessments, and in effect cannot themselves make an independent and over-arching assessment. So, they have to rely on your document only, which some sources are indicating as flawed in places. This ranges from definitions and use of renewable energy vs fossil derived fuels, and the actual way comparisons are drawn between methane emissions and CO2/ nitrogen oxides as well as some of the basic assumptions. But as we agreed, things tend to be highly polarised in this debate, and I would prefer to make my own judgement.
A. *We have undertaken a life cycle assessment done in accordance with international standards and peer reviewed. This has been done using international consultants as our investigations revealed that such a rigorous process is not yet done in Aotearoa New Zealand. Refer TR9.*

Councils can make their own assessment of global warming impacts from 1st Dec 2022.
To date government has not provided the expected new NES or guidance on how councils are to assess life cycle assessments.

Our LCA has been done and has been made publicly available irrespective of the fact that councils may/may not be able to consider GHG or may/may not have guidance on how to assess GWP.

<u>Answers to questions asked via media since our meeting</u>

Q. "Dr Langston said one major question SIRRL was yet to answer was which aromatic chemicals they would be monitoring?"

A. *Please refer previous answers and refer TR1 s10*

Q. "They say online monitoring of dioxins, but not whether they mean dioxins only, or the whole group of dioxins which includes dioxins, PCBs, furans and PAH?".
A. *Please refer previous answers and refer TR1 s10*

Q. "They also said there would be intermittent measurement of actual amounts but have declined to say how often."
A. *Please refer previous answers and refer TR1 s10*

Q. "Another question the doctors have is what SIRRL would do if dioxins levels exceed permissions, giving an example of a UK plant which is allowed up to 4 hours over the accepted level."
A. *If consent conditions are exceeded, then corrective actions are taken to ensure consent conditions are met.*

Q. "There was no comment on long term accumulative danger of dioxins, group, or heavy metals.
A. *Refer TR6 for assessment of acute and chronic human health risk arising from this proposed plant.*

Q. "He said SIRRL has "studiously avoided" any engagement on ash disposal, saying only that at present the only allowed option is landfill."
A. *Please refer TR1 s12 which talks to both recycling and disposal to landfill.*

Q. *"*But the lifetime assessment for the plant states that it will be recycled, and also that it will be relatively local, whereas landfill is another load of 280km truck journeys."
LCA considers both recycling and disposing of ash. Both scenarios still demonstrate EfW having a positive $CO_{2\text{-}e}$ compared to the alternative landfill. Refer TR9, Scenario 5.

Q. "They decline to comment on washing the ash before disposal, to decrease leaching of heavy metals (a recognised problem) and that also raises questions about non-ferrous metal reclamation, which usually involves copious washings.
A. *Please refer previous answers and refer TR1 s12*

Q. "They (say you) won't indicate what non-ferrous metals will be retrieved, nor give an indication of quantity, making us suspicious this will be minimal, and mostly just to give the impression of recycling."
A. *Primarily the non-ferrous metals retrieved are likely aluminium and perhaps copper but is dependent upon waste composition. Refer TR1 s13.1*

Q. "Dr Langston said SIRRL does admit it wants to resubmit its resource consent before changes in the Resource Management Act, and the "reason really is that the present form severely limits the extent to which a regional authority can assess greenhouse emissions."
A. *SIRRL have undertaken an LCA assessment using international expertise to a level far above what is normally undertaken in Aotearoa New Zealand. We encourage ECAN to undertake an assessment of our LCA as doing so will further endorse the environmental benefits of EfW over Landfill.*

Q. *"This is hardly a green endorsement," he said.*

A. *Please refer to and take the time to understand TR9.*