Questions put to SIRRL by Waimate GPs, prior to meeting 02 November 2022.
SIRRL answers.

1
The 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?**

Ideally will be on-line where technology exists. Alternative is that samples will be collected and sent for analysis. Plan is to measure the output of the plant, not to measure remotely. Daily average and 1 hr max levels will likely be used, unsure if latter is cont average or once in 24hrs etc.

2
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?**

There will be some comparison, but the plan is to measure output and so not need to have to prove or disprove correlation by chemical fingerprints.

3
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?**

Exceedances and reporting issues: plan is to report all readings irrespective of minimal requirements. Uncertain what options for reporting might be offered and accepted. Noted comment that whilst most UK plants take advantage of these options, the IoW does not- so it's not essential.

4
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?**

See above. Learnt from Belgian business partner that they monitor dioxins continuously, and accepting that is best practice SIRRL now propose to do the same. This will be online sampling (ie present above minima or not) but not measurement. That will have to be intermittent. Subseq enq have asked frequency latter.

At the same time, proposed that if the furnace is fully monitored, and the conditions for creating dioxins are known and avoided, then there should be minimal need to actually check… maybe.

5
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?**

SIRRL omitted to pursue this point, Doctor's have emailed asking exactly what will be measured.

6

For flue gas emissions, where will the sensors be placed and what allowance is made for flue velocities and diluent gases?

After the main fan.

7

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?**

Agree, plants designed to cope with wide range calorific values, feedstock will be stipulated .

8

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. Since other plants are also proposed there will be competition for this waste-stream, and 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). 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?**

Would hope to be able to burn all waste, but some with lower calorific value needs supplemental fuel- Diesel oil. The feedstock will be stipulated in the consent, and anything outwith that would require a new consent process. (But I note the waste stream paper does include "special waste" exceptionally.

9

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 truck 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 waste-water, 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?**

The internally rising access tunnel is probably quite a good bird deterrent. Waste will be 2 streams- MSW direct into the hopper, with industrial and construction waste being stored in a separate warehouse in bales. This will be a less attractive food source, and is not really different to any other large warehouse with a more attractive content- eg a grainstore. Bait locally and at perimeter is effective in such situations, and does not appear to cause local problems. MPI accepts this use.

10
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?**

Currently huge quantities of waste are moved to disparate landfill sites by road. Eg ChCh -> Invercargill!
Difficult to quantify but the argument is overall probably no huge increase, esp if rail becomes available.
(? how true that is)?
Site selected on basis space, water supply, railway line and proximity to national grid. Accepted previous proposals do not appear so well sited, but say were invited to west coast sites.

11
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.

Plant shut-down is annual for maintenance, all being well. Re-start requires 3000?/hr Diesel until minimum temperature is reached. Low calorific loads may result in temperature drop, in which case supplemental Diesel will be used.
(Not sure this features in the emissions analysis)?

12
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 and dispersion.

Accepted and standard NZ software used and the full analyses will be included with the represented consent application. Modelling needs to reflect terrain, and is supplemented by deposition studies to ensure accuracy. Highly specialised work and really an expert/ expert task.

13
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 as 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.

Accept PM10 and below very important, and esp PM2.5. These to be monitored on-line.
This will not assess accumulation over time and potential insidious increase in health risk over decades.

14
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? 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 2 years then decreases to a steady low leaching by 10 years. Additionally, ash leachate also leads to increasing salinity in groundwater, which has devastating environmental and farming consequences. **Why does SIRRL propose sending untreated grate ash to undesignated landfill sites?**

Currently all grate ash, from whatever source, can only go to landfill in NZ. This is regulatory, and SIRRL are hoping there may be a change so they can utilise this grate ash. In some jurisdictions it can be used as aggregate, and they have an interested party (?) if rules allow.
Admitted no awareness of European requirements for washing of grate ash before use, and consistently avoided engaging with me on leachate from grate ash. Further enquiries have been made.

15
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**- ie a cost based rather than recycling goal?

Plan is to reclaim ferrous and non-ferrous metals. Have enquired about which metals and quantities, i.e. is this economically viable? Also query on volatile heavy metals.

16
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- eg 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?**

Concrete blocks are good, but remain dangerous and are themselves then stored in landfill, so a better option is needed. Ideal is an inert product, and plan is vitrification.

17

What thermodynamic process is to be used in the plasma furnace (eg sintering, vitrification etc)? This is significant, as some processes require further washings, whilst others produce a secondary fly ash, also requiring treatment.

Vitrification by application of melting heat and various agents to produce a glass like compound that can be ground and used as aggregate, or at least sent to landfill. This is energy costly so not often done, but based on a successful Chinese plant associated with the shareholder company, and SIRRL say it was a non-negotiable despite the cost because fly ash is so toxic. (In this form it may be less dangerous than the grate ash).

18
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?**

Takes about 2-3MW to run, so is a significant cost, but believed to be the best option by far. It is not often used due to the cost.

19
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?**

Flue gas treatments have seen gradual improvements over the last 2 decades, and are now at a standard which is claimed as safe and reliable. Plasma technology as above.

20
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?**

Agreed, data was not included, but will be with the resubmission.

21
Similarly, **SIRRL have stated that this technology "differs from other New Zealand applications". How?**

This plant is waste stream specific and uses gasification technologies. Said they have not really looked elsewhere, but also that they have studied competitors and feel this is best…

22
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?**

Included vaguely above.

23

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?

Argument is that compared with landfill there will be a net carbon benefit. State that landfill methane capture is mostly way below the 95% claimed, but accepting best technology is 90% used that as base figure. This is all covered in Tech Report no. 9
They stated they are keen to resubmit promptly as regional councils do not currently have experience assessing greenhouse gases, so it will be a significant delay. Reading indicated ECAN etc currently can only consider environmental effects of greenhouse gases in some very restricted scenarios, but that changes Dec 01.
I find references to their report being flawed, and no good detail. Have asked for a copy of that report.

24
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?**

Obviously, the only answer can be none. Concern naturally.
As with toxins, these effects are slowly progressive usually, insidious and only identified when the harm is done- by which time it is very difficult to attribute responsibility.
Should ask what risks the plant will create, however small, that would not be there if it did not exist.
Environment too often loses out to economics. Human greed.

25
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 ton 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?

Upgrade to local road access stipulated in consent as part of project works, all cost to SIRRL.
? ongoing costs?

26
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?**

This is just not true, urban myth.

27
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?

Basic aquifer quantity assessed, and adequate resource allocation left.
Not yet put water assessment in as next phase due complexities. Take of 2500m3/day approx. equivalent one large irrigator, so significant but in the great scheme less so- but Morven-Glenavy water already undrinkable due nitrates.
Concept of reflux salinity new to some.

28
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.**

On balance, difference is that examples quoted all rel high risk industries, compared with this proposal. Pressure vessel is significant.
Main fear would be unintended fire, and as all indoors (incl warehouse storage) much easier to control with sprinkler systems.

29
In Britain, municipal waste incinerators may operate for up to 4 hours at, or above, safe levels in the event of an abatement failure. ie 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.

See 4, note failures do happen, not considered this question.

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.

Incidental qu – no business partnership planned with Yili, but have had discussions with various local businesses.

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