Reject the Tarago Toxinator

Response to Woodlawn ARC: SSD-21184278

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Overview

The EIS is for a project which is inherently harmful to any adjacent community, something which has been officially recognised in relation to at least one prior NSW proposal and is inherent in NSW Government policy enunciated since that prior proposal. As such, it is a proposed time bomb to be lobbed at Tarago and at the broader National Capital community in which it would be sited.

The project would create continually-increasing, long-term harm to the health of residents in the area, especially children, as well as livestock and wildlife.

The proponent has attempted to conceal or diminish recognition of this harm to people, as it seeks to improve profits for itself.

The EIS contains multiple instances of misleading statements (contrary to law) and fudging of data in order to prop up this dire proposal. The recurrence of identifiable misleading statements in the EIS demonstrates either a clear intent to mislead the government and community about the impact of the proposal, or a breathtaking incompetence – or perhaps both.

Irrespective of whether due to dishonesty or incompetence, those multiple misleading statements mean that the government must totally disregard all statements by Veolia and its consultants, and likewise any statements by other consultants whose income depends on persuading government officials to make decisions which satisfy the interests of industry protagonists such as Veolia.

This submission addresses reasons why the proposal should be rejected and the proponents pilloried for their callous and misleading attempt to lodge a massive health hazard into the vicinity of Tarago and the National Capital community.

The inherent defects

The Veolia proposal

The Veolia proposal is an attempt to establish a massive, toxin-emitting incinerator within Goulburn Mulwaree and alongside QPRC, as well as on Canberra's doorstep. Something the NSW government has now, by law, adamantly ruled out anywhere near Sydney.

If approved, it will cast its poisons widely, through the air and, potentially, groundwater, as long as it operates – and for many decades after it ceases to operate in the distant future.

In addition, with bioaccumulating toxins such as dioxins and heavy metals, the toxins will remain at high levels in people for many years even after they move out of the area and/or after the project is shut down.

> ***No NSW community should have a massive waste incinerator project closer to its boundary than the distance the NSW Government requires them to be from Sydney.***

The deliberately misleading "Advanced Energy Recovery Centre" label for the project is an attempt to put lipstick on the pig.

It is fundamentally a waste disposal project – that is Volia's business, after all. By incinerating a huge proportion of Sydney's waste, Veolia will be able to take much longer to fill up the big hole it owns at Woodlawn – so ultimately a lot more money for Veolia.

The reason it will make the hole last longer is that a large proportion of the waste will be converted to toxin-laced gas and particulates, which will spread across the region around Tarago and beyond. That will directly add toxins to the air we breathe, the water we drink and the food we eat, as long as we live in this region. Many of those toxins will persist for decades at very high levels in our bodies, even many years after someone moves from the region. ***For some people it will mean an earlier death, often a painful one, and for other people years of health problems and damaged quality of life. Some children born and raised in the area will have their physical and mental development impaired.*** All so the French company Veolia can make more profits for its non-Australian owners.

Rain and humidity condensation will trap much of the toxins and they, as well as particulates, will fall on our roofs, yards and streets. And thereby make their way into our drinking water, bathing water and food. They will also be absorbed by all animals in our region, including pets, food animals and wildlife, imperilling the latter.

The other output is toxic ash from the project, which will be dumped in Woodlawn's hole, with all the risks that brings.

NSW government policy on massive waste incinerators

In 2018, the NSW IPC rejected a proposal for a massive waste incinerator at Eastern Creek in Sydney's outer west. By the time the proposal got to the IPC, it was opposed by NSW Department of Planning and Environment (DPE), NSW Health and the EPA. It was also massively opposed by the community.

The IPC report:

- quoted DPE as stating "the impact to air quality and risk to human health are unknown"[1]
- stated council and public concern about[2]:
    - "impacts from the project's emissions that could lead to, among others, chronic cardiac and respiratory diseases;"
    - "that the project could create dioxins and furans as a by-product, which are highly toxic and cancer-causing chemicals, and would be released into the air, with no safe level of exposure to these chemicals"

The IPC concluded[3]:

- "the project's dominant social impact is the human health risk"

[1] *Independent Planning Commission Statement of Reasons Eastern Creek Energy from Waste Facility (SSD 6236),* 19 July 2018, p. 7.
[2] *Ibid*, p. 22.
[3] *Ibid*, p. 28.

- "The Commission finds that it is unable to determine the project's impacts on human health, which persuades the Commission to adopt a precautionary approach to the consideration and determination of the project's impacts on human health."

Subsequent to that rejection, the NSW Government has developed a policy for massive waste incinerators masquerading as energy production facilities. The essential feature of that policy is that **facilities be a LONG, LONG way from Sydney**.

Jerrara Power had a proposal for one of these facilities at Bungonia. However, Bungonia was apparently not sufficiently far from Sydney (~110 kms) and the proposal was abandoned in September 2021 when the NSW Government announced its policy limiting these facilities to Woodlawn (~150 kms from Sydney outskirts). and a few locations to the West (Parkes, ~250 kms), Lithgow West (~65 kms), and North (Richmond Valley, ~530 kms).

Note, the only location moderately close to Sydney in this policy is Lithgow West. It is no more than a fig leaf for the NSW Government policy. Given the attachment of Sydney to the Blue Mountains and the expansion of Western Sydney, any proposal for massive waste incineration at Lithgow will go the way of Eastern Creek. Bungonia is a real, live instance showing the Sydney-centric government's tolerance for the closeness of such facilities.

Toxins

The most recognized (but not the only) toxic emissions from waste incinerators are heavy metals and complex hydrocarbons called dioxins and furans. Dioxins and furans are not inherent to most waste but are created by the process of incineration. A research paper reports[4]:

> "Dioxins are known to be highly toxic to animals and humans, with various studies conducted on laboratory animals reporting teratogenic effects (malformations of the foetus), liver damage, decreased reproduction and growth rates, cancer promotion and behavioural changes.
>
> Even though dioxins can form through natural processes such as bush fires, the presence of the toxic congeners in the environment is predominantly anthropogenic. Dioxins have never been intentionally manufactured, but form as unwanted by-products in the manufacture of organochlorine chemicals (including herbicides and PVC), various combustion and metallurgical processes and chlorine bleaching of paper."

Dioxins decompose only slowly. For instance, the half-life[5] of some dioxins has been calculated as 9-15 years on surface soils and 25-100 years on sub-surface soils[6]. They also have a long half-life in people (7-12 years)[7] and animals.

So, with a facility pumping out these toxins day after day, the concentration in the affected area continuously increases for decades, then stabilizes at high levels. It is not simply the daily

[4] *Characterisation and Estimation of Dioxin and Furan Emissions from Waste Incineration Facilities*, Unilabs Environmental, p. 17.
[5] *Half-life*, the time for the existing concentration of a substance to halve.
[6] *Hazards of Dioxins*, Washington State Department of Ecology, Publication #01-04-010, p.3.
[7] *Ibid*, p.3.

output that creates the health hazard, but the accumulated concentration in the locality. If the facility stops, it then takes decades for most of the toxins to disappear.

And, likewise, the concentration in people and animals exposed in that area progressively increases for many years – so the health risks increase over time.

If Sydney's garbage is to be burned, it should be burned near Sydney. That is energy efficient and would produce the least net amount of greenhouse gases, by minimizing energy use for waste transport and transmission losses of electricity obtained from the project.

If that is not safe for Sydney, it is not safe for Tarago, not safe for Bungendore, not safe for Queanbeyan, not safe for Goulburn or Braidwood and all the properties around them.

The massive waste incinerator the NSW Department of Planning is aiming to approve at Woodlawn is 150 kms from Sydney's outskirts **BUT** 5 kms from Tarago (in GMC), about the same distance from the QPRC boundary and many rural properties, it is 25 kms from Bungendore and 40 kms from Queanbeyan and 45 kms from Braidwood. Incidentally, it is also 35 kms from Goulburn, 40 kms from Gungahlin, 50 kms from Canberra CBD and 65 kms from Yass.

None of those distances are judged safe for Sydney by a Sydney-centric government. They are not safe for us and the Veolia proposal is a huge health threat to residents of GMC and QPRC and the whole Capital Region and should be rejected.

Provision for reparations

This proposal should be rejected but, in the event the NSW Government decides to inflict massive health harm on the local community and broader National Capital Region, the proponent should be required to make a large-scale financial provision to meet subsequent legal judgements in favour of individuals harmed by its toxinator.

Specifically, it should be required to put in trust an amount equivalent to the capital investment of the project, to be used to pay reparations to anyone who gains a court judgement in their favour against the project for harm caused them. The trust should be in the control of a highly reputable Australian trustee organisation. The trust should be maintained until 50 years after the project eventually closes, at which time the residue of the trust should revert to the project owner.

Should the annual volume of waste burned by the toxinator increase beyond the amount currently proposed, the capital committed to the trust should be increased proportionately. In the event the trust is depleted by more than 25% through legal awards against it, or other factors, the project owner should be required to reimburse the trust with an amount equivalent to those reductions.

Multiple material breaches of legal requirements for EIS

Failure to provide proper analysis of feasible alternatives

The EIS does not comply with the NSW *Environmental Planning and Assessment Regulation 2000* in relation to the requirement to provide an analysis of feasible alternatives. In specifying the components of an EIS, the Regulation (Schedule 2 Section 3) requires:

> "An analysis of any feasible alternatives to the carrying out of the development or activity, having regard to its objectives, including the consequences of not carrying out the development or activity."

In relation to the proposal's stated objectives, there are at least 2 feasible alternatives not mentioned, let alone analysed. They are (a) the development of the project in the West Lithgow precinct, which is zoned for that purpose, and which is much closer to Sydney and thus needs less energy and GHG emissions to transport the waste from Sydney; and (b) continued use of the Woodlawn bioreactor as is, together with a solar farm, at some appropriate location, with a cost similar to the proposed ARC, which would almost certainly produce more electricity and far lower GHG emissions than the proposal and with none of the local air and water quality or noise pollution problems of the ARC.

The project purports to be primarily an energy-generator. There is good reason to suspect that solar will be a far more efficient means of energy generation, without the local pollution, and capable of producing more power for the same investment. Consequently, it is one of the feasible alternatives which must be evaluated.

Multiple breaches of prohibition on false or misleading statements

The NSW *Environmental Planning and Assessment Regulation 2000* prohibits proponents making submissions which are false or misleading, or which they should know are false or misleading, including by omission. The Veolia EIS is replete with them, a number of which are identified here.

The EIS has a lengthy statement about what Veolia is doing to achieve community engagement. It does not mention the important point that both the Goulburn Mulwaree Council and QPRC have explicitly opposed the proposal, which reflects the position of their constituents. This is important information and its absence from the EIS is a breach of the requirement to not provide false or misleading information.

The EIS provides scant information about its energy and GHG emissions calculations but appears to be less than comprehensive, omitting relevant aspects. For instance, the encapsulation of bottom ash from the incinerator requires mixing with cement. Cement is an energy-intensive product. From the EIS it does not appear that this has been included in the net energy and GHG calculations. What else is missing?

The EIS tells us (p. 144) "The SEARs for the project specifically request the modelling of 'worst case' emission scenarios associated with unexpected conditions such as a system trip or emergency shutdown." which the Department considers important information.

The EIS has to admit that there were 24 such events at Veolia's chosen reference site (Four Ashes in Staffordshire, UK) in 2017, but for various reasons 14 of those don't count because, for some reason or other, each of those 14 was "unavoidable".

The Department refers to these occasions as "other than normal operating conditions" (OTNOC), which have potentially seriously adverse impacts on emissions. Whether they are "unavoidable" (as Veolia claims) is totally irrelevant.

This is an example of data fudging, to the proponent's benefit. Regulatory authorities must assume this pattern of dishonesty is pervasive throughout the EIS.

There are multiple fraudulent and misleading assertions and omissions in relation to the health impact of the proposal. They are identified and discussed in detail in the section of this submission entitled *Misleading EIS statements relevant to adverse health impact*.

Demonstrated irresponsible behaviour by the proponent

The EIS says, as though it is a new discovery:

> "The SIA (Social Impact Statement) has identified a degree of concern amongst some community members, focused on the current operations at the Eco Precinct and their impacts, notably odour. Veolia has recognised these issues and has committed to further investigations into odour management at the Eco Precinct." [8]

Residents have been complaining about the stink from Veolia's plant for a decade or more and yet Veolia is still saying it will conduct further investigations. Exactly the same lethargic and disinterested response can be expected about the toxins and other air and water pollution which would emerge from the incinerator.

When an operator has more than a decade of failing to control problems from its existing operation and failing to respond to complaints from neighbours, it is insanity to grant that operator a licence to conduct operations which will produce even more hazardous emissions.

[8] *Woodlawn Advanced Energy Recovery Centre Environmental Impact Statement*, October 2022, p. 96..

Misleading EIS statements relevant to adverse health impact

The EIS is grossly misleading in multiple, highly important ways in relation to the all-important adverse health impacts of the proposal:

1. Fraudulent data and graphics are used to portray what is alleged to be the baseline air quality in the locality most directly affected;
2. The EIS admits that the incinerator will emit multiple toxins, including dioxins, heavy metals and fine particulates BUT it makes claims which:
    a. do NOT take proper account of the bioaccumulation and consequent progressively increasing toxic burden of a number of the emitted toxins;
    b. do NOT discuss the enhanced COMBINED impact of the emitted toxins nor make any assessment of the impact – and ***neither it nor the Department can do the latter since no detailed studies have yet been done despite medical research identifying the existence of enhanced effects of combined toxins and calling for the necessary studies***;
    c. do NOT take account of research evidence that public health standards have understated the toxic impact of individual toxins;
    d. ignore the long latency many toxins have in causing cancer and other diseases and the particular impacts on child-bearing, child development and transgenerational effects; and
    e. attempt to rely on the purportedly OK situation around overseas toxinators when there are no independent studies with both the participant scale and duration necessary to evaluate those impacts.

In summary, the EIS is an utter travesty of analysis of the adverse health impacts of the proposal. Any official relying on that analysis to approve the proposal will engage in a criminal act and wilfully risk harm and early death to multiple people in the locality.

The following section provides evidence for the charges made above.

Misleading air quality statements and graphs

In summary, *Section ES5.1 Air quality and odour* contains a grossly misleading graphic (Figure ES4) and related discussion.

They are grossly misleading in several ways. Specifically:

1. They exclude some of the principal forms of toxic emissions, particularly those which tend to accumulate in the environment and the human body.
2. For the emissions presented in the graph, they attempt to create a visual anchor related to 1 day in the 2019-20 bushfires that diminishes the apparent scale of the project emissions, which would occur every day of the life of the project, and ignoring the severe harm those bushfire emissions caused many people (and animals) living in the region.

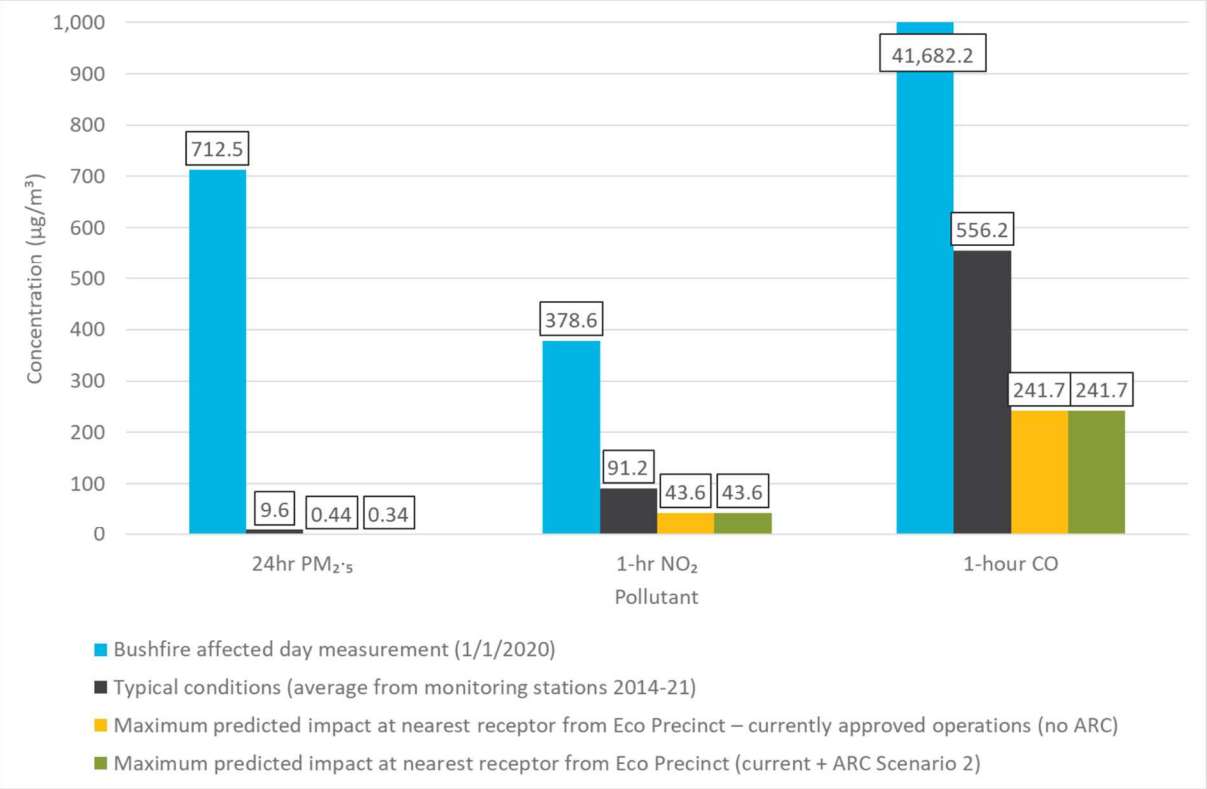
3. What they present as "typical conditions" presented as larger than the incremental emissions from the project, is:
    a. not for the locality directly affected by the project;
    b. uses partial data; and
    c. is materially elevated by the 2019-20 bushfires.

Misleading or even fraudulent graph of comparative air pollution

Prominent in the EIS Executive Summary is a graph which purports to show forecast emissions compared to prevailing and exceptional levels of those gas and particulate levels in the region around the project site.

The graph is meant to visually indicate that the incremental emissions will be relatively low – so don't worry about air quality effects. This graph is grossly misleading in multiple ways, and arguably deliberately fraudulent in its attempt to mislead residents and regulators.

The dishonest graph (Figure ES4)[9] , shown below, also appears as Figure ES1 in *Appendix O, Air quality impact assessment*.



Note: Y-axis is cropped at 1,000 µg/m3 for data visualisation purposes. The maximum 1 hour CO concentration from the dataset was 41,682.2 µg/m3.

Figure ES4 Comparison of regional ambient concentrations and predicted concentrations from the project

In relation to the graph, the EIS says[10]:

[9] *Woodlawn Advanced Energy Recovery Centre Environmental Impact Statement*, October 2022, p. ES.8.
[10] *Woodlawn Advanced Energy Recovery Centre Environmental Impact Statement*, October 2022, p. ES.7-ES.8.

> "To provide context to the modelling results, a comparison is presented in Figure ES4 below for three primary air pollutants. The comparison shows the concentrations for these pollutants:
> • on a day heavily impacted by bushfires (1 January 2020) as measured at regional air monitoring stations;
> • existing air quality in the region shown as an average over the period 2014–2021 as measured at regional air monitoring stations; and
> • the maximum emissions that will result from the ARC project under normal operations, at any sensitive receptor, such as a residence.
>
> The predicted concentrations from the project are well below typical ambient air pollutant concentrations for the region and are negligible relative to a bushfire affected day for these three pollutants."

The statement is explicit that the historical data is for "***the region***", which indicates the region around and reasonably close to the proposed project site.

Locals naturally wonder where the air quality measurement sites are located in "the region". While the executive summary does not tell us, Appendix O admits that "Analysis of background air quality is based on air quality monitoring stations at Goulburn, Canberra and Bargo." [11]

These are supposed to be measurements representative of the historical air quality around Tarago and yet all the measurement stations are tens or hundreds of kms from Tarago. The distances from Tarago are:

- Goulburn 36 km
- Canberra 54 km
- Bargo 122 km

The distances may be the least of the problem in terms of accurate representation. The three pollutants shown in the graph (particulates ($PM_{2.5}$), Nitrogen dioxide (NO_2), and Carbon monoxide (CO)) are commonly emitted by vehicles and industry. So how similar is the region around Tarago to the monitoring station locations used to source the historical data for "***the region***"?

First, consider the sites of the measurement stations:

- Goulburn is a city with a population over 23,000, in which motor vehicles/buses are the principal local means of transport, as well as having some local industry.
- Canberra has a population over 400,000 whose primary means of local transport is cars and buses.
- The Department describes its Bargo measurement station[12] as "The Bargo air quality monitoring station is located on residential property at Silica Road, Bargo. It is in a rural area on the far south-west edge of the Sydney basin." In fact, the site of the station (Latitude: 34° 18' 27"S, Longitude: 150° 34' 48"E) is about 2 km from the M31, which is busy 24/7 with heavy traffic pumping out pollutants, as well as receiving emissions spill-over from Sydney.

Tarago, by contrast, is a rural agriculture area, with a widely dispersed population. It probably does have an abnormal level of methane as a consequence of emissions from Veolia's failure to control its existing bioreactor, but we don't have actual data on that. No one, in good

[11] EIS Appendix O, Air quality impact assessment, p. ES.2.

[12] https://www.environment.nsw.gov.au/topics/air/monitoring-air-quality/sydney/monitoring-stations/bargo

conscience, could imagine that measurements from cities like Canberra and Goulburn, or from Bargo near the M31 and Sydney's southwest, are likely to be genuinely representative of a rural area such as that around Tarago.

The use of those measuring locations to represent "***the region***" is an intentional misrepresentation.

But the problems of misrepresentation don't end there. Review of relevant data from the respective sources (NSW EPA [13] and ACT Health [14]) lead to questions about the legitimacy of the historical data presented by Veolia, even for the locations nominated.

Deliberately misrepresented dataset

The graph ES4 has a visually very impressive Carbon monoxide bar for 1/1/20 which is "way off the scale". From where did the relevant data come? The Department of Planning and Environment tells us [15],[16] :

> The following air pollutants and meteorological variables are measured at Goulburn:
>
> - Fine particles as PM_{10}
> - Fine particles as $PM_{2.5}$
> - Ozone (O_3)
> - Oxides of nitrogen (NO, NO_2 and NO_x)
> - Visibility using nephelometry
> - Wind speed, wind direction and sigma theta
> - Ambient temperature
> - Relative humidity
> - Precipitation

and

> The following air pollutants and meteorological variables are currently measured at Bargo:
>
> - Ozone (O_3)
> - Oxides of nitrogen (NO, NO_2 and NO_x)
> - Sulfur dioxide (SO_2)
> - Visibility using nephelometry
> - Fine particles as PM_{10}
> - Fine particles as $PM_{2.5}$
> - Wind speed, wind direction and sigma theta
> - Ambient temperature
> - Relative humidity

NB, Carbon monoxide (CO) does not appear in the list for either Goulburn or Bargo. This is not simply a webpage error. Downloading all available air quality data from 1/1/2014 for

[13] https://www.dpie.nsw.gov.au/air-quality/air-quality-data-services/data-download-facility
[14] https://www.data.act.gov.au/Environment/Air-Quality-Monitoring-Data/94a5-zqnn
[15] https://www.environment.nsw.gov.au/topics/air/monitoring-air-quality/regional-and-rural-nsw/regional-monitoring-stations/goulburn
[16] https://www.environment.nsw.gov.au/topics/air/monitoring-air-quality/sydney/monitoring-stations/bargo

Goulburn and Bargo from the DPE website returns NO_2 and $PM_{2.5}$ data but no Carbon monoxide data. The ACT monitors air quality at three locations (Monash, Civic and Florey). It measures CO at two of them (Florey and Monash).

It therefore appears that the CO historical data which Veolia presents in its EIS as, for "***the region***", is solely from Canberra, despite its reference to sourcing data from Canberra, Goulburn and Bargo.

Then we run into another data integrity problem. Figure ES4 includes bars referred to as "Typical conditions (average from monitoring stations 2014-21)". Yet the downloadable data for the Goulburn air quality monitoring station actually commences on 7/11/2019 for any metric (remember it does not include CO at all). The Canberra records start before 2014, as do the Bargo records – except the Bargo $PM_{2.5}$ records only start on 2/12/2016.

So, while the EIS claims to present 2014-21 historical data for "the region" based on measuring stations at Canberra, Goulburn and Bargo, two of those stations do not record CO and what data is available for the station closest to Tarago, ie Goulburn, commences in November 2019, and the Bargo record is also incomplete.

Identifiable factors which make the dataset unrepresentative of the Tarago region

Are there other things in the dataset which lead to a misleading statement of historical information for the area around Tarago?

Analysis of variance of Canberra air quality records for 2014 – 2021 show a strong seasonality effect. CO emissions are highest in June (avg 0.423 ppm [17]) compared to 0.112 in December and 0.138 in January, excluding the December 2019 – January 2020 bushfire period[18]. If that extreme bushfire period is included in the data, the 8-year average is 0.186 for December and 0.301 for January, still materially less than June.

Canberra's $PM_{2.5}$ statistics show exactly the same seasonal pattern. Excluding the December 2019 – January 2020 bushfire period, the levels in $\mu g/m^3$ (micrograms / cubic metre) were a minimum in December (5.2) and January (5.8) and a maximum in June (9.9), with a progressive drop off in the months on either side of June. The relative scale of the 2019-20 bushfires can be seen in that, during the bushfire period the December average concentration was 75.4 and the January average 119.2 (i.e. more than 10 times higher than typical for those months). Note, also, the overall average of the Canberra $PM_{2.5}$ data for 2014 to 2021, inclusive, is 9.1 when the 2019-20 bushfire period is included and 6.9 with that period excluded.

A similar seasonal pattern is found in the Canberra data for NO_2. Excluding the 2019-20 bushfire period, the monthly average rises threefold from 0.0023 ppm in December and January to 0.0068 in June and in July, and then declines. The monthly figures were elevated for December 2019 (0.0037) and January 2020 (0.0064) but not by the relative magnitude seen for CO and $PM_{2.5}$, with the overall 8-year average of 0.0045 for NO_2 little affected by the bushfire period.

[17] ACT reports CO concentrations in ppm (parts per million), not in micrograms / cubic metre.

[18] There were also a number of bushfire days during November 2019, which affected results for that month, though not as strongly as for December and January.

The significance of the seasonality is that it is highly likely to reflect the use of wood and gas heating for Canberra winters and cold start/operating increases in vehicle exhaust Carbon monoxide, NO_2 and particulates and does not reflect the situation of the country surrounding Canberra.

While people in the Tarago vicinity also use wood and gas heating, and their vehicle emissions are also affected by cold, the housing and population density is minute compared to that of Canberra and thus the cold-weather increments in the Tarago region from these emissions will also be minute compared to that occurring in Canberra.

To the extent the warm weather levels of CO, NO_2 and $PM_{2.5}$ are also vehicle derived, they also will be much lower in the Tarago region than in Canberra.

So, the quantitative data which the EIS presents as being for "the region", implying the rural region around Tarago, are a total fraud. Consequently, the quantitative and visual comparison with the claimed future emissions from the incinerator are also a total fraud.

Toxic Bioaccumulation

Veolia's air quality statements are misleading in other critical aspects. This is done either deliberately or through incompetence. In either case, the government cannot accept any statement they make.

Like an illusionist, their graphs happen to exclude toxins which are known to bioaccumulate and whose level of harm consequently compound over time. That includes dioxins, furans and certain heavy metals.

Veolia's toxinator will give people an elevated, ongoing exposure to numerous toxins. People will experience the exposure day after day, week after week, month after month, and year after year. In addition, because people will be exposed to multiple toxins, each disposed to create harm, those effects will be multiplicative and cannot be individually determined or discounted.

For some toxins, such as Carbon monoxide, the concentration in a person's body will reach a plateau quite quickly and remain at that level as long as they continue to be exposed. If someone is exposed to constant CO emissions, the ongoing concentration in their body will be basically at the level reached by the end of the first day. That is because our bodies are pretty good at eliminating CO, which therefore has a short half-life in the body, measured in hours[19].

The person will still have an elevated level of CO in their body due to emissions from Veolia's toxinator, and will still suffer continuous toxic effects. However, after the first day it will be a fairly constant elevated level of that toxin in their body.

That is **NOT** the case for bioaccumulating toxins, such as dioxins and certain heavy metals[20]. Our bodies are poor at eliminating these toxins. Consequently, with continuous exposure, the

[19] CO "Elimination 1/2 life: 5-6 hours", https://pubchem.ncbi.nlm.nih.gov/compound/Carbon-monoxide#section=Biological-Half-Life, 10.6.

[20] For example, half-life in human body of Lead, 5 years (https://pubchem.ncbi.nlm.nih.gov/compound/5352425#section=Biological-Half-Life, 8.3); Cadmium > 15 years (https://pubchem.ncbi.nlm.nih.gov/compound/23973#section=Absorption-Distribution-and-Excretion).

concentration in the body increases day after day until it reaches a plateau after many years. Even though the concentration of these toxic emissions may be constant in the air in any locality in the region around the toxinator, the concentration in the body of people at that locality gets progressively higher and higher. Consequently, the exposure of cells and organs in the body gets continuously higher for years, until a high plateau is reached.

Dioxins have a half-life in people and animals of 7-12 years[21]. With a half-life of 10 years, the steady state plateau of bodily concentration of a substance is not reached for over forty (yes **40**) years, at which time it is more than **5,000** times higher than the bodily concentration after the first day of exposure. For a half-life of 10 years, the table below shows the relative bodily concentration compared to the end of the first day, for various time periods after constant exposure commences.

Bodily concentration relative to Day 1, with constant toxin exposure
For substance with a 10 year half-life in the human body

Period	Rel Conc
1 day	1
1 week	7
1 month	31
3 months	91
1 year	353
2 years	682
5 years	1,543
10 years	2,635
20 years	3,953
50 years	5,106
Plateau	5,273

Medical science has a subject area called *Pharmacokinetics*,[22] for calculating bodily concentrations of drugs or toxins under different dynamic situations. Appendix 1 provides the relevant equations and discussion underlying the effects summarised here.

There is another very important fact which *Pharmacokinetics* reveals about the time taken to eliminate medicines and toxic substances once exposure stops. If you have not yet reached the steady state point, then it takes as long to eliminate the substance from your body as the period during which you have been exposed. If you have reached steady state, then it takes as long to eliminate the substance as it took to first reach steady state.

This means that someone who is exposed to dioxins from Veolia's toxinator for 10 years, who then moves to a location without those toxins, will take another 10 years to get back to being free of the dioxins. If they have been exposed to Veolia's toxinator for 20 years, it will take them 20 years in a location without those dioxins to eliminate them completely. This applies to children as well as to adults.

[21] *Hazards of Dioxins*, Washington State Department of Ecology, Publication #01-04-010, p.3.
[22] See *Pharmacokinetics I* (https://med.libretexts.org/Bookshelves/Pharmacology_and_Neuroscience/Book%3A_Principles_of_Pharmacology_(Rosow_Standaert_and_Strichartz)/01%3A_Chapters/1.03%3A_Pharmacokinetics_I); and *Useful Pharmacokinetic Equations* (https://www.yumpu.com/en/document/view/18152816/useful-pharmacokinetic-equations)

Food and water

The discussion so far has dealt with inhaled toxins. That is not the only form of toxic exposure. Food and water are a substantial additional avenue for absorption of Veolia's toxins.

The population in the Tarago region generally use tank water for drinking and washing. Tank water will collect toxins deposited on roofs as well as washed out of the atmosphere when rain falls or fog precipitates. A large proportion of the population also eats at least some local produce, be it from a home garden, domestic chickens and eggs, local livestock or a combination of these. Veolia's toxins will be ingested and/or absorbed (while bathing) through these avenues.

I don't have the resources of Veolia or the Department to do a well-researched assessment of the magnitude of the amounts but it is easy to show it will be non-trivial.

For rainwater collection, we can get an indication by comparison with the amount of air people breathe each day. Children typically inhale 10,000 – 12,000 litres per day and adults inhale 12,000 – 15,000[23]. The latter is 12 – 15 m^3.

We can think of a "catchment" above a house's roof, defined by the area of the roof and a catchment distance above the roof from which toxins are deposited onto the roof. Obviously, the air above our roofs moves horizontally (and to a lesser degree vertically) so the deposits onto the roof are not from one static volume of air. Nonetheless, even though the air above is in motion, the amount of deposition out of it onto a roof is proportional to the catchment volume used.

Australian houses commonly have an area greater than 200 square metres. For simplicity in the table below, we use 200sqm and assume an average 4 person household, and an average daily breath volume of 12.5m^3.

Tank water catchment toxic equivalent relative to daily inhalation

Catchment Height (m)	Volume m^3	Avg Vol / person m^3	Day's breath equivalent / person
50	10,000	2,500	200
100	20,000	5,000	400
200	40,000	10,000	800

If only 1% of the toxins in the catchment volume each day makes it down to the roof and into the tank water, then with a catchment height of 50m, the toxic capture via tank water would be twice what each person inhales per day. If the catchment height is 200m, then the captured amount is 8 times what a person inhales each day.

A 1% deposition from gravity, rain and night time condensation is almost certainly a substantial underestimate. If, in fact, the deposition rate is 5%, then the amount captured per day would be between 10 and 40 times the daily inhalation.

Some of the water captured goes to washing the dishes, clothes and car, and some perhaps on the garden. Nonetheless, it is easy to see that the amount of toxins imposed and

[23] Smit, Nel; Todd, John., "Improving the Air We Breathe", *Green Teacher*, Toronto Iss 98, (Winter 2012), p. 23.

ingested/absorbed in this way is likely to be larger, and perhaps substantially larger, than the amount inhaled.

Aside from the deposition on roofs, there is all the deposition on gardens, yards and fields. Some of it on plants people eat and a substantial amount on pasture consumed by livestock, as well as making its way into grubs and insects foraged by chooks, and then into their flesh and eggs.

To get an idea of the amount of toxins (dioxins, heavy metals, etc) from Veolia's toxinator which livestock might ingest, assume a carrying capacity of 10 DSE[24] per hectare, which then equates to 1,000 sqm per DSE. So, the surface area being cropped by a single sheep is 5 times what we used for the water catchment for a household of 4, so effectively 20 times the catchment per sheep as applies to the roof catchment per person. If only 1% of the toxins in that catchment volume are ingested by a sheep, the daily equivalent is between 40 and 160 times the amount being inhaled by a person.

Because dioxins and heavy metals have a similar half-life in animals as in humans, any such toxins ingested by animals bioaccumulate so that meat from livestock can have substantial concentrations compared to what a person might breathe themselves.

Toxic character of emissions from the proposed project

The previous section has shown that the EIS misleadingly ignores bioaccumulation of many emissions. At which point the reader might accept that bioaccumulation occurs but ask what is the evidence of toxic effect. That is discussed below.

Dioxins

Veolia cannot hide the fact that its proposed toxinator will emit dioxins. The World Health Organization states[25]:

- Dioxins are a group of chemically-related compounds that are persistent environmental pollutants (POPs).
- Dioxins are found throughout the world in the environment and they accumulate in the food chain, mainly in the fatty tissue of animals.
- ***Dioxins are highly toxic and can cause reproductive and developmental problems, damage the immune system, interfere with hormones and also cause cancer.*** (*emphasis added*)

and, from another report:

> "Dioxins are known to be highly toxic to animals and humans, with various studies conducted on laboratory animals reporting teratogenic effects (malformations of the

[24] **DSE**: Dry sheep equivalent

[25] https://www.who.int/news-room/fact-sheets/detail/dioxins-and-their-effects-on-human-health

> foetus), liver damage, decreased reproduction and growth rates, cancer promotion and behavioural changes." [26]

A study of the Japanese general population, in which the authors were explicit that the subjects were not occupationally exposed to dioxins, found:

> "The odds ratios for hypertension, diabetes mellitus, hyperlipidemia, gout in men, and gynecologic diseases in women significantly increased with increasing toxic equivalents of PCDDs/PCDFs, DL-PCBs, and total dioxins in blood." [27]

A related paper reported:

> "body burden levels of dioxins and related compounds, particularly those of DL-PCBs, are associated with metabolic syndrome. Of the components, high blood pressure, elevated triglycerides, and glucose intolerance were most closely associated with these pollutants." [28]

So, the research evidence, and public health officials, are very clear that dioxins are toxic, increasing the incidence of multiple diseases, including hypertension, diabetes, cancer, and gynecologic diseases in women. The research is also clear that the higher the levels of dioxins in the body, the greater the incidence of disease.

Heavy Metals

From a medical review paper on heavy metals[29]:

> "The industrial activities of the last century have caused massive increases in human exposure to heavy metals. Mercury, lead, chromium, cadmium, and arsenic have been the most common heavy metals that induced human poisonings."[30]

NOTE. Arsenic, cadmium, chromium, lead and mercury are all part of the emissions from the proposed project.

> "Acute or chronic poisonings may occur following exposure through water, air, and food. Bioaccumulation of these heavy metals leads to a diversity of toxic effects on a variety of body tissues and organs. Heavy metals disrupt cellular events including growth, proliferation, differentiation, damage-repairing processes, and apoptosis."[31]

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[26] *Characterisation and Estimation of Dioxin and Furan Emissions from Waste Incineration Facilities*, Unilabs Environmental, p. 17.
[27] Mariko Nakamoto, et al, "Association between blood levels of PCDDs/PCDFs/dioxin-like PCBs and history of allergic and other diseases in the Japanese population", *Int Arch Occup Environ Health*, 2013 Nov;86(8), p. 849.
[28] Hirokazu Uemura, et al, "Prevalence of Metabolic Syndrome Associated with Body Burden Levels of Dioxin and Related Compounds among Japan's General Population", *Environmental Health Perspectives*, Vol 117, No 4, April 2009, p. 568.
[29] Mahdi Balali-Mood, et al, "Toxic Mechanisms of Five Heavy Metals: Mercury, Lead, Chromium, Cadmium, and Arsenic", *Frontiers in Pharmacology* | www.frontiersin.org, April 2021 | Volume 12 | Article 643972.
[30] *Ibid*, p. 1.
[31] *Ibid*, p. 1.

> "Some toxic metals including chromium, cadmium, and arsenic cause genomic instability." [32]

> "Several acute and chronic toxic effects of heavy metals affect different body organs. Gastrointestinal and kidney dysfunction, nervous system disorders, skin lesions, vascular damage, immune system dysfunction, birth defects, and cancer are examples of the complications of heavy metals toxic effects. Simultaneous exposure to two or more metals may have cumulative effects." [33]

> "low-dose exposure is a subtle and hidden threat, unless repeated regularly, which may then be diagnosed by its complications, e.g., neuropsychiatric disorders including fatigue, anxiety, and detrimental impacts on intelligence quotient (IQ) and intellectual function in children (Mazumdar et al., 2011). The fact that several metals have emerged as human carcinogens is another important aspect of the chronic exposure." [34]

> "The heavy metals enter the body from different ways including drinking water, air, food, or occasionally dermal exposure. Following absorption, heavy metals are retained, and they accumulate in the human body. Bioaccumulation of toxic metals leads to a diversity of toxic effects on a variety of body tissues and organs. Metal toxicity can have acute or chronic manifestations. Heavy metals disrupt cellular events including growth, proliferation, differentiation, damage-repairing processes, and apoptosis. Toxic metals can also promote epigenetic alterations which can influence gene expression." [35]

and, from another report:

> "Drinking water contaminated with heavy metals namely; arsenic, cadmium, nickel, mercury, chromium, zinc, and lead is becoming a major health concern for public and health care professionals." [36] and

> "the predominant source resulting in measurable human exposure to heavy metals is the consumption of contaminated drinking water and the resulting health issues may include cardiovascular disorders, neuronal damage, renal injuries, and risk of cancer and diabetes." [37]

Note, as discussed earlier, Veolia's proposed toxinator will add heavy metals to the drinking water of the surrounding population which is dependent on tank water, harvested from their roofs.

A study using data from the large-scale US NHANES longitudinal health research database found:

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[32] *Ibid*, p. 1.
[33] *Ibid*, p. 2.
[34] *Ibid*, p. 2.
[35] *Ibid*, p. 12-13.
[36] Kanwal Rehman, et al, "Prevalence of exposure of heavy metals and their impact on health consequences", *J Cell Biochem*, 2018 Jan;119(1), p. 157.
[37] Kanwal Rehman, et al, "Prevalence of exposure of heavy metals and their impact on health consequences", *J Cell Biochem*, 2018 Jan;119(1), p. 157.

> "Association analysis with health outcomes suggested that the high-exposure group according to either blood or urinary metal levels had significantly higher total mortality (1.63–1.64 times higher, $p < 0.0001$) . . . In addition, the high-exposure group based on blood levels was also significantly associated with SBP, death related to hypertension, heart disease and chronic lower respiratory disease, while the high-exposure group based on urinary concentrations had higher mortality related to nephritis." [38]

From another paper:

> "Certain five heavy metals viz. arsenic (As), cadmium (Cd), chromium (Cr)(VI), mercury (Hg), and lead (Pb) are non-threshold toxins and ***can exert toxic effects at very low concentrations*** (*emphasis added*) . . . . In recent years, high concentrations of heavy metals in different natural systems including atmosphere, pedosphere, hydrosphere, and biosphere have become a global issue. These THMs have severe deteriorating effects on various microorganisms, plants, and animals. Human exposure to the THMs may evoke serious health injuries and impairments in the body, and even certain extremities can cause death." [39]

and another paper:

> "Because of their high degree of toxicity, arsenic, cadmium, chromium, lead, and mercury rank among the priority metals that are of public health significance. These metallic elements are considered systemic toxicants that are known to induce multiple organ damage, ***even at lower levels of exposure*** (*emphasis added*). They are also classified as human carcinogens (known or probable) according to the U.S. Environmental Protection Agency, and the International Agency for Research on Cancer." [40]

Another review:

> "The main threats to human health from heavy metals are associated with exposure to lead, cadmium, mercury and arsenic. . . . Although several adverse health effects of heavy metals have been known for a long time, exposure to heavy metals continues, and is even increasing in some parts of the world, in particular in less developed countries." [41]

Note, from the previous quote, governments have been actively working to reduce human exposure to heavy metals, as the NSW Government did by rejecting the proposed Eastern Creek incinerator in Sydney, but Veolia proposes to increase the exposure to heavy metals of people (and animals) in the region around Tarago.

So, the toxic effect of heavy metals is beyond dispute, ***including that of low-dose, continuous exposure***.

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[38] Xu Yao, et al, "Stratification of population in NHANES 2009–2014 based on exposure pattern of lead, cadmium, mercury, and arsenic and their association with cardiovascular, renal and respiratory outcomes", *Environment International* 149 (2021) 106410, p. 1.

[39] Zeeshanur Rahman and Ved Pal Singh, "The relative impact of toxic heavy metals (THMs) (arsenic (As), cadmium (Cd), chromium (Cr)(VI), mercury (Hg), and lead (Pb)) on the total environment - an overview", *Environ Monit Assess*, 2019 Jun 8;191(7), p. 419

[40] Paul B Tchounwou, et al, "Heavy Metals Toxicity and the Environment", *EXS*. 2012; 101, p. 133.

[41] Lars Järup, "Hazards of heavy metal contamination", *Br Med Bull*, 2003;68, p. 167.

Adverse health effects have previously been underestimated

> "Recent data indicate that adverse health effects of cadmium exposure may occur at lower exposure levels than previously anticipated, primarily in the form of kidney damage but possibly also bone effects and fractures. Many individuals in Europe already exceed these exposure levels and the margin is very narrow for large groups." [42]

> "Children are particularly susceptible to lead exposure due to high gastrointestinal uptake and the permeable blood-brain barrier. Blood levels in children should be reduced below the levels so far considered acceptable, recent data indicating that there may be neurotoxic effects of lead at lower levels of exposure than previously anticipated." [43]

From another paper:

> "Recent increased knowledge of the greater sensitivity of the unborn baby, the infant and the child, has led to general recognition that a higher degree of precaution is now needed in regulating for multiple stressors on the young. The more liberal permissive approach proceeding from established effects of the individual exposures is becoming less acceptable now that we know that there is much we do not understand about chronic effects of stressors during the early development phases." [44]

As the above quotes state, relatively recent research has indicated that individual heavy metal levels in the body previously considered safe are, in fact, materially toxic and, by extension, that applies to air concentrations previously considered "acceptable" and emitted by operators such as Veolia.

Combined adverse impact of multiple toxins

Veolia does not dispute that its proposed industrial incinerator will emit a variety of toxins. It tries to claim that each one of them will be sufficiently low that it, individually, will not be harmful. As shown above, recent research indicates the adverse effects of low concentrations of toxic substances is greater than previously assessed.

Further, even were Veolia's assertion true, it ignores the combined effect of the toxins being emitted, not to mention the combined toxic impact of those together with medications being taken by some community members.

Consider the following statements from a review article with a ***research team of more than one hundred members***, published in the journal *Carcinogenesis*[45]:

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[42] Lars Järup, "Hazards of heavy metal contamination", *Br Med Bull*, 2003;68, p. 167.
[43] Lars Järup, "Hazards of heavy metal contamination", *Br Med Bull*, 2003;68, p. 167.
[44] Janna G Koppe, et al, "Exposure to multiple environmental agents and their effect", *Acta Paediatr Suppl*., 2006 Oct;95(453), p. 106.
[45] Goodson, et al, "Assessing the carcinogenic potential of low-dose exposures to chemical mixtures in the environment: the challenge ahead", *Carcinogenesis*. 2015 Jun; 36(Suppl 1): S284.

> "For several decades, there has been a concerted effort to identify individual chemicals and other agents that are carcinogenic. At the same time, however, little has been done to determine whether or not chronic lifetime exposures to mixtures of non-carcinogenic chemicals in the environment (at low-dose levels) have carcinogenic potential. Many chemicals are known to accumulate in bodily tissues over time, but little is known about their combined effects at a mechanistic level and their impact on cancer-related mechanisms and carcinogenesis. In this project, teams of cancer biologists worked with researchers in the field of environmental health for the very first time to explore this possibility." and
>
> "Our current understanding of the biology of cancer suggests that the cumulative effects of (non-carcinogenic) chemicals acting on different pathways that are relevant to cancer, and on a variety of cancer-relevant systems, organs, tissues and cells could conspire to produce carcinogenic synergies that will be overlooked using current risk assessment methods" and
>
> "Cumulative risk assessment methods that are based on 'common mechanisms of toxicity' or common 'modes of action' may therefore be underestimating cancer-related risks. In-utero and early life exposures, transgenerational effects and the interplay between the low-dose mechanistic effects of chemical mixtures in the environment and the vulnerabilities of subpopulations who are predisposed to cancer (i.e. via genetics or other influences) must also be considered. Current policies and practices do not adequately address these issues and should therefore be revisited if regulatory agencies hope to better understand and assess these risks." and
>
> "Finally, given the long latency period in most cancers, early detection to cancer is key so an improved understanding of the biology within originating tissues (during the latency period) would be very helpful."

Note, the above review paper focuses on combined effects of chronic, low-level toxin exposure producing cancer, even when the individual substances are not known as carcinogens. There are many other forms of tissue and organ damage than cancer. So, the observations developed by this 100+ team of researchers equally apply to the potential for chronic, low-dose, lifetime exposures to mixtures of chemicals to harm health in ways other than cancer.

From a review paper:

> "the literature is scarce regarding the combined toxicity of heavy metals. . . .
>
> A recent review of a number of individual studies that addressed metals interactions reported that co-exposure to metal/metalloid mixtures of arsenic, lead and cadmium produced more severe effects at both relatively high dose and low dose levels in a biomarker-specific manner [247]. These effects were found to be mediated by dose, duration of exposure and genetic factors. Also, human co-exposure to cadmium and inorganic arsenic resulted in a more pronounced renal damage than exposure to each of the elements alone [248]. In many areas of metal pollution, chronic low dose exposure to multiple elements is a major public health concern." [46]

[46] Paul B Tchounwou, et al, "Heavy Metals Toxicity and the Environment", *EXS*. 2012; 101: pp. 150-151.

From another review paper:

> "Simultaneous exposure to two or more metals may have cumulative effects." [47]

From Chinese research:

> "We identified the joint effect of multiple metals on hypertension and observed a significant interaction between cadmium and zinc. Further cohort studies are needed to clarify the health effects of multiple metals exposure in a larger population." [48]

From another research paper:

> "Although mixtures of compounds can have effects, it may not be possible to ascribe causation to a single compound. Furthermore, ***cumulative low-dose insult can, in some circumstances, be more toxic than a single high-dose exposure***, (*emphasis added*) e.g. endocrine disruptive effects of a combination of PCBs and dioxins which disrupt the thyroid hormone status; this tends to contradict elements of classical toxicology, . These cumulative insults may further combine with heavy metals and can disrupt the heme synthesis." [49]

In brief:

- There is good reason to believe chronic, low-dose, lifetime exposures to mixtures of chemicals which are **individually NON** carcinogenic actually result in cancer in some people;
- However, little has been done to measure the extent of these effects – *so there is no research base that Veolia or the Department can use to support a claim by Veolia that emissions from the toxinator will not collectively lead to cancers among some people exposed to them – even if all of those emissions were individually non-carcinogenic (and some, such as dioxins and some heavy metals, are known carcinogens);*
- Research in recent years has shown existing standards for toxins have underestimated the effect generally and, in particular, on the embryo/fetus, infants and children;
- Particular attention needs to be given to in-utero and early life exposures AND "transgenerational effects", ie from one generation to later generations; and
- There tends to be a long latency for cancers triggered by toxins; and transgenerational effects are also inherently very long term – *so any study Veolia might claim to prove no harm is caused, based on toxinators elsewhere, would have to be (a) a very, very long-term study; and (b) a genuinely large-scale study with many, many thousands of participants*[50].

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[47] Mahdi Balali-Mood, et al, "Toxic Mechanisms of Five Heavy Metals: Mercury, Lead, Chromium, Cadmium, and Arsenic", *Frontiers in Pharmacology* | www.frontiersin.org, April 2021 | Volume 12 | Article 643972, p. 2.

[48] Qi Zhong, et al, "Exposure to multiple metals and the risk of hypertension in adults: A prospective cohort study in a local area on the Yangtze River, China", *Environment International* 153 (2021) 106538, p. 1.

[49] Janna G Koppe, et al, "Exposure to multiple environmental agents and their effect", *Acta Paediatr Suppl*., 2006 Oct;95(453), p. 106.

[50] **NB**. Conducting or sponsoring studies with small sample sizes is a means used by parties with a vested interest in order to manufacture a "no relationship" result beneficial to their interests. Even if a genuinely strong relationship really exists between two factors, given the nature of statistical tests, a small enough sample can guarantee that no "statistically significant" relationship will be found. Since most of the population, media, government officials do not understand statistics and statistical tests, they are easily misled by this practice.

Implications

The extensive medical research cited here absolutely supports the IPC's statement in relation to the rejected Eastern Creek toxinator facility[51]:

> "The Commission finds that it is unable to determine the project's impacts on human health, which persuades the Commission to adopt a precautionary approach to the consideration and determination of the project's impacts on human health."

However, the research also indicates that whenever such industrial-scale waste incinerators are operated near people, some degree of harm ***will*** occur – the only uncertainty is the extent of that harm.

That same precautionary protection is due to people who live in the Tarago region and to the children who will be conceived and raised in the region.

[51] *Independent Planning Commission Statement of Reasons Eastern Creek Energy from Waste Facility (SSD 6236),* 19 July 2018, p. 28.

Summary

Veolia's industrial-scale waste incinerator **WILL** emit toxins, including dioxins, heavy metals and particulates, as long as it operates. There is a large volume of research identifying those substances as harmful, in numerous and major ways, to human (and animal) health.

Veolia's industrial incinerator **WILL**:

- harm the health and lifespan of people living in the region – the only uncertainty is how many and how badly.
- harm the development, and subsequent life, of children conceived, born and/or raised in the region – the only uncertainty is how many and how badly.
- impose a bioaccumulating burden of toxins on residents which will continuously increase for decades, exposing their cells and organs to permanently growing internal harm.
- mean that people who leave the region, after years of toxic exposure, will require a similar duration to eliminate the toxins from their systems.
- harm the health and viability of livestock in the region – the only uncertainty is how many and how badly.
- harm the health and viability of native fauna in the region – the only uncertainty is how many and how badly[52].

The EIS:

- uses fraudulent data and graphics to portray what is alleged to be the baseline air quality in the locality most directly affected;
- does NOT take proper account of the bioaccumulation and consequent progressively increasing toxic burden of a number of the emitted toxins;
- does NOT discuss the enhanced **COMBINED** impact of the emitted toxins nor make any assessment of the impact – and ***neither it nor the Department can do the latter since no detailed studies have yet been done despite medical research identifying the existence of enhanced effects of combined toxins and calling for the necessary studies***;
- does NOT take account of research evidence that public health standards have understated the toxic impact of individual toxins;
- ignores the long latency many toxins have in causing cancer and other diseases and the particular impacts on child-bearing, child development and transgenerational effects; and
- attempts to rely on the purportedly OK situation around overseas toxinators when there are no independent studies with both the participant scale and duration necessary to evaluate those impacts.

[52] While little discussed in the body of this paper, animals and birds are susceptible to the same toxic effects as humans from dioxins, heavy metals, particulates, etc. The only difference is that because of their shorter life spans, they quickly run through multiple generations, so adverse transgenerational impacts accumulate more quickly and the survival and development of young, and thus the local population, may be more readily threatened.

In addition, Veolia has breached its legal requirements under the NSW *Environmental Planning and Assessment Regulation 2000* in multiple instances, including:

- failure to provide proper analysis of feasible alternatives;
- making numerous false or misleading statements additional to those relating to health, including:
    - about local community opposition;
    - about the net energy position and GHG emissions of the project; and
    - in relation to modelling 'worst case' emission scenarios required by the Department

The proponent has a long history of irresponsible behaviour, harmful to the local community. Given Veolia's demonstrated character, approving its industrial-scale waste incinerator would be like giving the keys to a B-double to someone with a history of drunken, reckless car driving and a string of accidents injuring other people.

Only a few years ago, the IPC refused a similar project for Eastern Creek in Sydney because the IPC was "unable to determine the project's impacts on human health". Yet, now, Veolia claims it can determine the adverse impact and it is zero. Given the evidence presented in this paper, Veolia's statement is false.

The proposal should be absolutely rejected and the Department should take action against Veolia for its multiple, documented breaches of the Planning Regulation.

Should the proposal be somehow approved, the conditions should require:

- the proponent to establish a large-scale financial provision to meet subsequent legal judgements in favour of individuals harmed by its toxinator;
- with funds equivalent to the capital investment of the project;
- held in trust by a highly reputable Australian trustee organisation;
- with the trust to operate for 50 years after project closure.

Appendix 1: Pharmacokinetics Equations and Determining Bodily Toxic Concentrations over Time

Medical science has a subject area called *Pharmacokinetics*,[53] for calculating bodily concentrations of drugs or toxins under different dynamic situations. One well-established set of equations deal with concentration in the body when a person is subject to a continuous infusion. Those equations apply whether the infusion is via a catheter into a vein or breathing in a constant dose every minute of the day.

Those equations allow calculation of the ratio of the bodily concentration at any time relative to the bodily concentration after 1 day of exposure, irrespective of whatever is the concentration in the air and the absorption rate into the body. Obviously, the higher the air concentration (µg /m^3), the higher will be the bodily concentration in µg/Kg. However, with a constant air concentration, whatever that concentration may be, the ratio of bodily concentration at time t relative to day 1 will always be the same.

Pharmacokinetics commonly uses the symbol k_e to denote the "elimination rate constant", ie the proportion of existing concentration which is eliminated in one unit of time (eg day). A mathematically fixed relationship exists between k_e and the half-life (h), when each is expressed in the same time units (eg hours, or days). The relationship is:

$$k_e = \frac{0.693}{h}$$

There are two significant equations which follow.

$$C_{ss} / C_1 = 1 / k_e = h / 0.693$$

where C_1 is the concentration after 1 unit of time, and C_{ss} is the steady state concentration, ie the concentration reached when the amount of the substance being eliminated from the body in a unit of time is precisely the same as the amount being absorbed from the source; and

$$C_t / C_1 = (0.693/h) * (1 - e^{-1.443 * h * t})$$

where C_t is the concentration at time t, and 1.443 is simply the inverse of 0.693.

There is another very important fact which *Pharmacokinetics* reveals about the time taken to eliminate medicines and toxic substances once exposure stops. If you have not yet reached the steady state point, then it takes as long to eliminate the substance from your body as the period during which you have been exposed. If you have reached steady state, then it takes as long to eliminate the substance as it took to first reach steady state.

[53] See *Pharmacokinetics I* (https://med.libretexts.org/Bookshelves/Pharmacology_and_Neuroscience/Book%3A_Principles_of_Pharmacology_(Rosow_Standaert_and_Strichartz)/01%3A_Chapters/1.03%3A_Pharmacokinetics_I); and *Useful Pharmacokinetic Equations* (https://www.yumpu.com/en/document/view/18152816/useful-pharmacokinetic-equations)