Shoalhaven Starches Pty Ltd
C/- Cowman Stoddart Pty Ltd
29-31 Kinghorn Street
Nowra NSW 2541

Reference: 2103012e-l.docx

Attention:　　Mr Stephen Richardson
Telephone:　　02 4423 6198
Email:　　　　stephen@cowmanstoddart.com.au

20 January, 2022

Dear Stephen,

MODIFICATION 23 TO SHOALHAVEN STARCHES EXPANSION PROJECT 06_0228.

ADDITIONAL INFORMATION REQUEST – ENVIRONMENTAL NOISE ASSESSMENT

Shoalhaven Starches Pty Ltd has recently submitted a modification application to the NSW Department of Planning, Industry and Environment seeking approval for the construction of a new gas-fired co-generation plant at its exiting facility on Bolong Road, Bomaderry, NSW.

The Modification 23 application also seeks approval for the relocation of the previously approved Dried Distillers Grain dryer # 6 (DDG # 6) and associated cooling towers of which there will be six.

An initial Environmental Noise Assessment was prepared by Harwood Acoustics Pty. Ltd., reference 2103012E-R, dated 8 July 2021 (the July ENA) and was submitted with the initial application for the modification.

Subsequent to the submission of the application with the accompanying July NIA, in its letter reference DOC21/936070-6, dated 26/11/2021, the NSW EPA requested additional information and clarification in relation to the noise predictions therein.

I am pleased to advise that I have reviewed the request and have prepared a revised Environmental Noise Assessment, reference 2103012E-R, Revision A, dated 20/01/2022 (the Rev A ENA), which addresses the items raised by the EPA, so far as is reasonably practicable.

In addition to the Rev A ENA, we offer the following clarification comments.

Each bullet point below is a summary of the EPA request (in italics) and below that (Responses) is my response to indicate how each request has been addressed. A copy of the EPA's letter is appended to this response as well as the Rev A ENA for ease of reference for the reader.

1 (a) Inadequate assessment of operational noise impacts

Matters raised under this request for information require the following responses:-

    a. A more through and detailed assessment of the potential for annoying characteristics associated with the co-generation plant,

    b. A more detailed description of the acoustical modelling, building element transmission loss, internal reverberation times and noise levels and distance / attenuation loss to the receptors,

    c. One-third octave band spectral data for noise sources,

    d. 3D modelling, or example calculations to support the noise level predictions,

    e. A clear description of the operational scenarios considered in the noise modelling,

    f. An assessment of any additional noise sources to the cogeneration plant,

    g. An assessment of the cumulative affect of existing and approved sources to capture total premises noise emission.

Responses

    a. Section 5 of the revised assessment provides a more detailed review of the potential for annoying characteristics. This is based on one-third octave band data supplied by GE representatives following a visit to a university in Texas, USA where noise measurements were taken of an LM2500 gas turbine.

    Based on the data supplied, Section 5 concludes that the noise level from the turbines as received at distant receptors is unlikely to exhibit tonal characteristics after transmission losses attributed to the building elements (construction materials are detailed in Section 7).

    There has been data supplied on the HRSG systems, the design of which is to be outsourced by GE to John Cockerill. GE has confirmed that the supplier will meet (i.e will not exceed) a near field noise target of **85 dBA at 1 metre** at any point around the HRSG units.

    In the absence of any available noise data on the HRSG units, the same noise data supplied by GE for the LM2500 gas turbines was used in the noise model for the HRSG components. This noise data was supplied in terms of short term, energy average sound pressure level noise data in the free field (stated by GE as 1 metre from the LM2500). This data is provided in Table 3 of the Rev A ENA.

    For the purpose of determining the potential for tonality from the HRSG equipment, consideration was given to one-third octave band spectral measurements of existing boiler equipment at the Shoalhaven Starches facility. This is provided in Figures 13 and 14 in Section of the Rev A ENA. Existing boiler equipment, as measured, does not exhibit tonal characteristics.

    Further to this, GE has committed to ensure that there will not be any tonal components to the noise generated by the equipment to be installed.

    No modifying factor adjustment has been applied for tonality in the Rev A ENA for any noise sources associated with this Modification.

    To date there is insufficient data and information available from the manufacturer to undertake a detailed assessment of the potential for low frequency noise. The one-

third octave band data provided by GE from the Texas University measurements does not contain levels below 31.5 Hz.

As can be seen in Table 3 in the Rev A NA, there are significant amounts of sound energy at the octave band frequencies centred on 63 and 125 Hz for a number of components in the Turbine system. However, the spectral component of other noise sources such as the HRSG plant and its heat exhaust stack are unknown at this stage.

As a worst-case scenario, therefore, a 5 dB penalty is applied to the predicted noise levels for the turbine equipment in this assessment as shown in Table 5 of the Rev A ENA.

b.   In this assessment all noise predictions for the entire co-generation plant are based on the sound pressure levels supplied by GE for the LM2500 gas turbine unit and GE's confirmation that the same levels will be met for the HRSG units.

An schedule of overall 'A' frequency weighted and octave band centre frequency near field sound pressure levels are shown in Table 3 of the Rev A ENA in Section 4. A noise map prepared and provided by GE representing the near field sound pressure levels around the LM2500 is shown in Figure 7. The noise map shown in Figure 7 was reportedly produced by GE using *CadnaA* acoustical modelling software and a screen shot of that model is shown in Figure 8.

The noise data supplied to Harwood Acoustics Pty. Ltd. was used in acoustical modelling to predict the level of noise emission at each receptor location.

An example of a calculation is shown in Table 1 below and includes the calculated reverberant sound pressure level within the co-generation plant building, the transmission loss data for the relevant building element, the attenuation due to geometric divergence (distance loss) and the predicted noise level at that distance. Absorption coefficients for the building are also provided in the table, and the reverberation time within the building is derived from these coefficients using Sabine's formula and used in the calculation of the reverberant sound pressure level in the room / building.

Building 62 m x 45 m x 20 m, concrete walls, concrete roof, concrete floor

Table 1   Example calculation

Description	Overall dBA / R_w	Sound Pressure Levels (dB) / Transmission Loss / Absorption Coefficient at Octave Band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
Example 1 – One gas turbine / concrete wall									
Total L_w inside room	111	89	104	105	105	104	106	102	91
Absorption coefficients	-	0.02	0.02	0.02	0.03	0.03	0.04	0.07	0.14
Total L_p inside room (reverberant sound pressure level)	**91**	72	87	88	86	85	86	79	65
Transmission loss (170 mm concrete)	**55**	42	44	42	50	57	63	68	68
Distance loss (358 metres)		59	59	59	59	59	59	59	59
Predicted L_{eq} noise level	**-1.8**	-13.1	-1.4	3.9	-3.5	-12.7	-15.5	-29.7	-55.2
Example 2 – One gas turbine / roof									
Total L_w inside room	111	89	104	105	105	104	106	102	91
Absorption coefficients	-	0.02	0.02	0.02	0.03	0.03	0.04	0.07	0.14
Total L_p inside room (reverberant sound pressure level)	**91**	72	87	88	86	85	86	79	65
Transmission loss (75 mm concrete)	**44**	31	35	38	35	41	49	55	50
Distance loss (370 metres)		59	59	59	59	59	59	59	59
Predicted L_{eq} noise level*	**15**	3.3	12.9	12.8	16.2	7.8	3.3	-123	-33.4

- Includes + 3 dB safety factor to allow for *Insul* prediction of transmission loss data for 75 mm concrete

This calculation is done for each building element including the doors, acoustically louvred openings and for 2 x trubines and again for the HRSG equipment, which as mentioned above uses the same noise data provided for the LM2500 turbines in the absence of data from the supplier for the HRSG components. The predicted noise levels are then summed to determine the overall predicted noise level at each receptor based on the respective distances.

One-third octave band and octave bad transmission loss data for various building elements are derived from *Insul* and are Appended to the Rev A ENA. Acoustic louvre transmission loss data is supplied by the manufacturer and is provided in Table 10 in Section 7.1 of the Rev A ENA.

c. As mentioned in the response to point b above, one-third octave band data has been provided by GE from direct measurements undertaken in Texas for the purposes of the determining the potential for annoying characteristics, so far as is practicable.

d. See response to item b above for details of acoustical modelling as well Figures 7 and 8 in the Rev A for the noise data provided based on GE's noise model,

e. With respect to operational scenarios, the assessment considers the following:-

   ➢ Both LM2500 units and associated HRSG units operating simultaneously along with any two of the four exhaust stacks,

      ▪ Each of the HRSGs will have a heat exhaust stack and there is also a turbine bypass stack between each of the turbines and the generators. During typical operation the turbine bypass stacks will be closed and the heat from the turbines will exhaust via the HRSG stacks on the western side of the building (refer Figure 4 in the Rev A ENA). When the HRSGs are down for maintenance the heat created by the turbines will exhaust via the turbine bypass stacks which penetrate the roof in the centre of the building (refer Figure 4 in the Rev A ENA). We are therefore instructed that at no time can all four bypass stacks operate simultaneously and that there will be, and can only ever be, two stacks operating at once, being typically both HRSG stacks or on occasion, one HRSG stack and one gas turbine bypass stack. It is not envisaged that both turbine bypass stacks operate simultaneously, as this means both HRSGs are offline and therefore there would be insufficient steam to operate the facility.

   ➢ In addition to the LM2500 units, HRSG plant and stacks, consideration is given to cumulative noise levels from the facility in response

f. The Rev A ENA addresses the relocation of the previously approved DDG # 6 and six cooling towers,

g. Section 4.2.3 considers the cumulative impact of the overall site in conjunction with approved modifications, those under construction currently and those that are approved and yet to commence works.

Current overall noise levels from the operation of the facility have not been measured or assessed by Harwood Acoustics Pty. Ltd. However, Shoalhaven Starches is required to undertake annual noise compliance monitoring.

Noise compliance testing was carried out by the Acoustic Group Pty Ltd (TAG) in February 2021 and the results of the noise compliance testing have been supplied in report reference 51.3849.R89:MCC, dated 24 June 2021.

Therefore, for the purpose of considering cumulative noise impacts, the measured noise levels from the TAG February 2021 report were used as representing the existing level of noise emission from the overall facility at each of the respective receptor Locations. Table 7 in the Rev A ENA lists the various modifications and logarithmically adds the predicted noise levels from each Mod to the existing facility noise level obtained from the TAG report

h. Section 7.4 in the Rev A ENA addresses the potential for cumulative construction noise impacts and provides a schedule of current and future construction activities. Shoalhaven Starches will appropriately schedule construction works to ensure that noisy works do not coincide or overlap. As detailed in Section 7.4 There is no potential for piling works to occur simultaneously with other projects as these are all complete.

I trust this response along with the revised NIA addresses the queries raised by the EPA.

Please do not hesitate to contact the undersigned should you require any further information or clarification.

Yours faithfully

Matthew Harwood, MAAS
Principal Acoustical Consultant

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Parramatta NSW 2124

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Dear Ms Burn

Shoalhaven Starches – MP06_0228 Mod 23 – Gas Fired Co-generation Plant – EPA Comments

Thank you for the request for advice, requesting the review by the NSW Environment Protection Authority (EPA) of the Statement of Environmental Effects (SEE) for the proposed modification (MP06_0228-Mod-23) at 160 Bolong Road, Bomaderry.

The EPA has reviewed the following documents:

- *Statement of Environmental Effects – Proposed Modification to Approved Gas Fired Co-generation Plant* – Cowman Stoddart Pty Ltd – 2 September 2021

- *Environmental Noise Impact Assessment Shoalhaven Starches – Proposed Modification to Shoalhaven Starches Expansion Project 06_0228 – Proposed Modification to Approved Cogeneration Plant – Modification 23* – Harwood Acoustics Acoustical Consulting – 19 August 2021

- *Shoalhaven Starches Modification 23 – Air Quality Assessment* – GHD Pty Ltd – 1 September 2021

The EPA understands the proposal is for:

- Construction of a 60MW gas fired co-generation plant, to replace the approved but not yet constructed 40MW gas fired co-generation plant and 15MW coal fired co-generation plant;

- Construction of four water tanks at the southern end of the gas fired co-generation building;

- Construction of a gas compressor at the southern end of the gas fired co-generation building;

- Construction of a new electrical sub-station;

- Relocation of the approved but not yet constructed No. 6 DDG Dryer;

- Conversion of the existing coal fired boilers to gas powered.

The premises are subject to Environment Protection Licence No. 883 under section 43 of the *Protection of the Environment Operations Act 1997* (POEO Act) for Agricultural Processing, Chemical Production, and Chemical Storage under clauses 2, 8 and 9 respectively of Schedule 1 of the POEO Act.

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The EPA has reviewed the SEE, Noise Impact Assessment (NIA), and Air Quality Impact Assessment (AQIA) and notes that it does not provide the information required by the EPA. As such, the EPA requests additional information to be able to assess the proposal. The EPA's comments, recommendations, and requested information is detailed in Attachment A.

If you have any questions or wish to discuss, please contact Amanda Fletcher on (02) 6229 7002 or via email at info@epa.nsw.gov.au.

Yours sincerely

26/11/2021

JANINE GOODWIN
Unit Head
Regulatory Operations Regional

Noise

1. **Matters to be addressed prior to determination**

   a. **Inadequate assessment of operational noise impacts**

   In the EPA's experience, co-generation plants have demonstrated to be difficult to attenuate the annoying characteristics. These types of plants can generate significant low frequency noise and other characteristics such as tonality and intermittency. The NIA indicates from a basic assessment in Section 4.2.3 that there is potential for low frequency noise from the proposed Shoalhaven Starches co-generation plant and the potential for noise limits to be exceeded if the plant is approved and built.

   The EPA does not consider it appropriate to state that at this stage the proponent doesn't have the data to make a full and proper assessment in accordance with the *Noise Policy for Industry* (NPfI, EPA 2017). There is data and information available on co-generation plants; the onus is on the proponent to obtain that information and present a full and detailed worst-case assessment of the potential noise impact from the proposed modification, in accordance with the NPfI.

   With the limited information provided in the NIA, the EPA is unable to understand the potential impact from Mod 23. The EPA requests that a more detailed assessment of the proposal is prepared, and includes the following information:

   - To better understand the predicted noise levels at the receivers, the EPA would prefer that the NIA utilise noise modelling software, but as a minimum the EPA requires full and justified one-third octave spectral data for:
     - all sources proposed inside the buildings;
     - space averaged sound pressure levels including reverberation times;
     - the performance of the building fabric; and
     - the attenuation losses to the receivers
   which are then summed to provide an overall A weighted level.

   - The one-third octave data should also be used to determine any low frequency or tonal characteristics. The fans and steam generators have potential to generate tonality. Intermittency from auxiliary equipment should also be assessed, as well as a statement on the potential for emergency pressure releases or similar.

     The assessment of modifying factors should be conducted in accordance with Fact Sheet C of the NPfI. The assessment must be quantitative and any calculations relied on to determine the presence (or not) of modifying factors must be included in the report. An example method for determining low frequency noise was published in Acoustics Australia and can be found here: https://doi.org/10.1007/s40857-020-00199-x

   - The NIA should also clearly state what operating scenarios have been assumed – for example full working power or other modes. The EPA notes that the NIA states in Section 4.2.1 that 2 of the 4 exhaust stacks are assumed to be operating at any one time, the proponent needs to assess a worst-case operating scenario.

     The EPA also notes that Mod 23 includes the relocation of the No. 6 DDG dryer further to the south of the site. The noise impact from the new location of this noise source does not appear to have been assessed. The NIA for Mod 23 includes a number of noise sources that do not appear to have been assessed in the NIA. The

NIA needs to include all sources of noise proposed as part of the modification, not only the co-generation plant.

Where modelling software is used, the model should include the existing and approved sources at the premises to capture the total premises noise emission. The EPA requests the NIA include a noise contour map to clearly present the impacts at all surrounding receivers.

- The reduction of noise from another part of the site to accommodate the annoying characteristics of this proposed modification is not considered acceptable. The overall site noise reduction may serve to make the annoying characteristics more prominent.

  The EPA considers that further assessment of feasible and reasonable mitigation to reduce the annoying characteristics is required. The application of the low frequency noise penalty (or any other annoying characteristics) is only in the case where the annoying characteristics cannot be mitigated, as per Fact Sheet C of the NPfI.

b. Inadequate information on construction noise impacts

The NIA is lacking on the details in the construction noise assessment. The EPA is unable to sufficiently assess the potential noise impact from construction and requests further details including:

- The proposed duration of construction and the hours of construction. Any construction proposed outside standard hours will need to be sufficiently justified as per the guidance in the *Interim Construction Noise Guideline* (DECC 2009).

- A cumulative construction noise assessment from current construction works on the site in conjunction with the construction schedule for the proposed Mod 23. The EPA notes that the Shoalhaven Starches premises is undergoing numerous modifications which are either currently under construction or proposed to be under construction.

  The NIA should include a thorough and detailed assessment of the location, sources and noise level from existing construction works where they overlap with the proposed Mod 23 works. For transparency and clarity, the NIA should also include a detailed schedule of works to make it clear what activities will be occurring and when, for what modification and in what area of the site.

- The details of the likely duration of the predicted exceedance of the criteria and mitigation to manage those exceedances. The NIA defers assessment of feasible and reasonable mitigation to the preparation of a Construction Noise Management Plan, however it is not clear if and what mitigation can be implemented to reduce impact from highly noisy activities such as piling and what level of impact will remain after the implementation of those noise mitigation/management measures.

Air Quality

2. Matters to be addressed prior to determination

a. Supporting evidence on change in emissions from current approved operations not provided

Section 3.11.2 of the AQIA states that "*The proposal is expected to have a neutral impact on odour and a positive impact on combustion emission compared against the previous modification (Mod 21). The reduction in combustion emissions (compared with*

Mod 21) is attributed to conversion of boilers from coal to gas which typically has lower emissions". Whilst, the conversion of boilers from coal to gas could reduce particular air pollution emissions, the proposed modification seeks approval for an increase in power generating capacity from current approved operations. The modification seeks approval for a 60 MW cogeneration plant to replace existing approved power generation plant with a combined capacity of 55 MW.

The EPA recommends the proponent provide supporting evidence to support the claim that combustion emissions would decrease from current operations. In providing this information a comparison of particulate, oxides of nitrogen (NOx) and volatile organic compounds (VOC's) emissions for current and proposed operations should be provided. Emission estimates must be robustly justified for the comparison.

b. Assessment has not accounted for existing combustion sources

Section 8.1.1 of the AQIA states "*Use of boilers 1, 2, 3 and 8 are on standby duty as part of Mod 23 only boiler 5/6 would be active*". The dispersion modelling for the proposed modification has considered emissions from existing boiler 5/6. As such the EPA interprets that the other boilers not included in the impact assessment (1, 2, 3 and 8) would be decommissioned and no longer utilised at the premises.

However, no further description of the proposed operating regime has been provided to confirm if this interpretation is accurate. If existing boilers are to remain and utilised at the premises, the quantitative assessment must take these sources into consideration. Additionally, Section 3.11.2 of the AQIA states that existing coal fired boilers will be converted to gas, however it does not describe which coal fired boilers will be converted to gas.

The EPA recommends the proponent provide further information on:
  i. Which coal fired combustion units will be converted to gas, and clarify if all existing coal fired combustion units will be converted to gas
  ii. The proposed use of existing combustion units under the proposed modification
  iii. Where existing combustion units are proposed to remain and utilised at the premises, they must be accounted for in a revised Air Quality Impact Assessment.

c. Basis for the discharge parameters and emission estimates for the proposed gas fired cogeneration plant not provided, described or justified

Discharge parameters

Table 8.2 of the AQIA provides an emission inventory for combustion emissions and discharge parameters (stack height, velocity etc) for various sources. However, the AQIA does not describe or include supporting information on the basis for the discharge parameters adopted for the proposed gas fired cogeneration plant.

As per the *Approved Methods for Modelling and Assessment of Air Pollutants in NSW* (the Approved Methods), the EPA's preferred methods for assessing proposed sources is manufacture's design specifications. The AQIA does not include manufactures design specifications for the proposed gas fired cogeneration plant or describe the basis for the adopted discharge parameters for the gas fired cogeneration plant.

Emission estimates

Table 8.2 of the AQIA provides an emission inventory for combustion pollutants including emission estimates for the proposed gas fired cogeneration plant. However, the AQIA does not:
  i. Describe how emission estimates have been derived

    ii.   Include supporting calculations for derivation of any emission estimates

    iii. Justify the adopted emission rates, including demonstration that emission estimates represent reasonable worst-case emissions

As per the Approved Methods, the EPA's preferred methods for assessing proposed sources is manufacture's design specifications and/or emission guarantees.

The EPA recommends the proponent provide manufactures design specifications and/or emission guarantees for the proposed cogeneration plant and demonstrate that the AQIA is based on the proposed design.

d. Assessment of compliance with the prescribed concentrations contained in the Clean Air Regulation not provided

Table 8.2 of the AQIA presents an emission inventory for products of combustion. A NOx emission rate of 7.2 g/s is presented in Table 8.2 for each of the natural gas cogeneration units. An exhaust flow at actual conditions of 103 m^3/s is also presented.

Based on the discharge parameters (exhaust temperature, and exhaust flow) presented in Table 8.2 the EPA estimate an NOx discharge concentration of 96 mg/m^3. This estimate is significantly greater than the NOx discharge concentration of 39 mg/Nm^3 presented in Table 8. As such there appears to be potential errors in the emission estimate, and hence the EPA are not in a position to understand the quantum of emissions that have been accounted for in the dispersion modelling.

Additionally, the *Protection of the Environment Operations (Clean Air) Regulation 2021* (Clean Air Regulation) prescribes maximum allowable discharge concentrations for specific plant and activities. The Clean Air Regulation specifies a NOx discharge concentration of 70 mg/m^3 for any turbine operating on gas, being a turbine, used in connection with an electricity generating system with a capacity of 30 MW or more.

The AQIA does not include a demonstration that the prescribed concentrations contained in the Clean Air Regulation can be achieved. The estimated NOx discharge concentration of 96 mg/m^3, discussed above, is greater than the prescribed concentration of 70 mg/m^3 contained in the Clean Air Regulation.

The EPA recommends the proponent revise the AQIA to:
    i.   transparently describe and demonstrate that emission estimates are correct and representative of the proposal.
    ii. Demonstrate that compliance with the Clean Air Regulation will be achieved

e. Emission estimates for existing Coal fired boiler not described or justified

Air pollutant emissions for Boiler 5/6 have been included within the quantitative assessment, however the AQIA provides limited information on how emissions have been derived. Given the limited information, the AQIA does not justify that the quantitative assessment is representative of reasonable worst-case emission.

The EPA recommends the proponent provide further information on the derivation of emission estimates for Boiler 5/6 and justify that the quantitative assessment is representative of reasonable worst-case emissions.

f. Robust assessment of VOCs not included

The AQIA includes emission estimates for VOC's and a quantitative assessment of VOCs, however the AQIA does not:
    i.   Include an assessment of speciated VOC's

    ii. Reference the impact assessment criteria for speciated VOCs, for conducting the assessment of potential impacts

    iii. Include emission estimates of speciated VOCs for the proposed cogeneration plant. Table 8.2 of the AQIA implies there are no VOC emissions from the proposed cogeneration plant

The EPA recommends the proponent revise the AQIA to include a robust assessment of speciated VOCs.

g. Assessment of annual average particulates not included

The AQIA does not include an assessment of cumulative annual average impacts for TSP, PM_{10} and $PM_{2.5}$. Only incremental results at sensitive receptors are presented in Table 8.3.

The EPA recommends the proponent revise the AQIA to include cumulative assessment of annual average particulate matter impacts at sensitive receptors. If exceedances of annual average impact assessment criteria are predicted, the assessment must be revised to include additional mitigation measures

h. Assessment predicts exceedances of 24-hour PM_{10} and 24-hour $PM_{2.5}$

The AQIA predicts 3 additional exceedances of PM_{10} (24 hour) and $PM_{2.5}$ (24 hour) at commercial receptor C6. The AQIA does not provide further analysis on the predicted exceedances, including but not limited to source contribution analysis, and identification of additional mitigation measures.

The EPA recommends the proponent revise the AQIA to include additional analysis of the predicted exceedances and identification of additional mitigation measures.