This document has been prepared on behalf of **Shoalhaven Starches Pty Ltd** by:

Northstar Air Quality Pty Ltd,
Suite 1504, 275 Alfred Street, North Sydney, NSW 2060
Riverina Office: PO Box 483, Albury, NSW 2640

northstar-env.com | Tel: 1300 708 590

Shoalhaven Starches, Independent Odour Audit (2022-2023)

Addressee(s):	Shoalhaven Starches Pty Ltd
Report Reference:	24.1018.FR1V2
Date:	7 December 2023
Status:	Final

Quality Control

Study	Status	Prepared by:	Checked by:	Authorised by:
INTRODUCTION	Final	GCG	MD, GD, JS	GCG
ODOUR AUDIT REQUIREMENTS	Final	GCG	MD, GD, JS	GCG
ODOUR AUDIT EVIDENCE	Final	GCG	MD, GD, JS	GCG
ODOUR AUDIT FINDINGS	Final	GCG	MD, GD, JS	GCG
SUMMARY	Final	GCG	MD, GD, JS	GCG

Report Status

Northstar References		Report Status	Report Reference	Version
Year	Job Number	(Draft: Final)	(R*x*)	(V*x*)
24	1018	Final	R1	V2
Based upon the above, the specific reference for this version of the report is:				**24.1018.FR1V2**

Final Authority

This report must by regarded as draft until the above study components have been each marked as final, and the document has been signed and dated below.

G. Graham **7 December 2023**

Contents

Appendices

Tables

Figures

Units Used in the Report

All units presented in the report follow the International System of Units (SI) conventions, unless derived from references using non-SI units. In this report, units formed by the division of SI and non-SI units are expressed as a negative exponent, and do not use the solidus (/) symbol.

For example, 20 odour units cubic metres per second would be presented as 20 $OU \cdot m^3 \cdot s^{-1}$ and not 20 $OU \cdot m^3/s$.

1. INTRODUCTION

Shoalhaven Starches Pty Ltd (on behalf of the Manildra Group) has engaged Gary Graham (Director, of Northstar Air Quality Pty Ltd (Northstar)) to perform the independent odour audit (2022-2023) of the Shoalhaven Starches Facility (the facility) which operates at Bolong Road, Bomaderry, NSW.

As stipulated in the NSW Government (May 2020) *Independent Audit – Post Approval Requirements* (DPIE, 2020) I, Gary Graham, confirm that I am independent of Shoalhaven Starches as determined under Section 3.1.1 of the above guidance.

I have completed an Independent Audit Declaration Form, and this is attached in **Appendix A** of this report.

The requirement for an Independent Odour Audit is prescribed within Schedule 3 of the consolidated conditions of Project Approval 06_0228. For clarity, the consolidated conditions are reproduced in their entity in **Table 13** (**Section 3.8**), with a reference to the sections of the report that provide evidence and commentary on the compliance (or otherwise) with each condition related to odour.

1.1. Auditing Period

This odour audit covers the period from Q1 2022/23 to Q4 2022/23, aligned to the Environment Protection Licence (EPL) reporting period. With reference to the NSW Environment Protection Authority (EPA) website[1], it is noted that anniversary date for EPL 883 is stated as 30 April. Correspondingly, this report covers the period from 1 May 2022 to 30 April 2023.

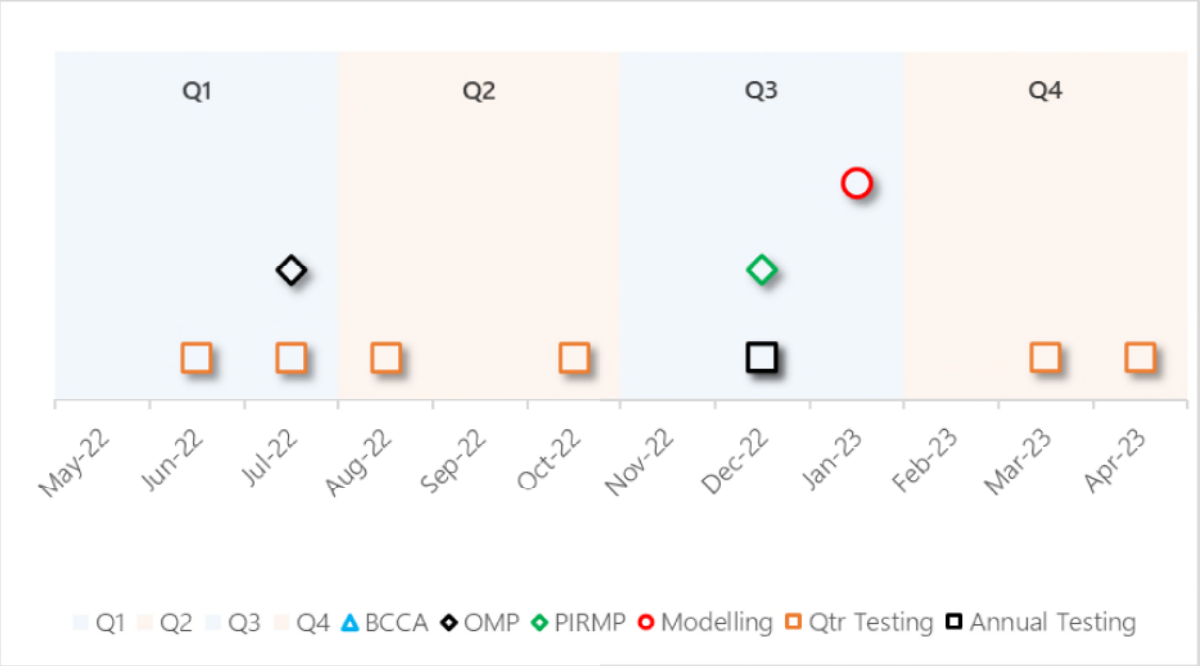
The quarters of the reporting year covered by this audit are therefore:

- Quarter 1 (Q1): May 2022 to July 2022;
- Quarter 2 (Q2): August 2022 to October 2022;
- Quarter 3 (Q3): November 2022 to January 2023; and
- Quarter 4 (Q4): February 2023 to April 2023.

The various reports relating to plant performance and odour emissions (including the quarterly and annual odour emissions test, biofilter capacity and condition assessments, management plans and modelling assessments) are discussed in the relevant sections of this audit report, and for ease of understanding how these data sources relate to the audit period, a summary has been provided in **Figure 1**.

[1] http://www.epa.nsw.gov.au/prpoeoapp/

Figure 1 Data sources audited in this audit period



Notes: BCCA – Biofilter Capacity and Condition report, Qtr Testing – Quarterly odour source monitoring, OMP – Odour Management Plan, Annual testing – Annual odour source monitoring, PIRMP – Pollution Incident and Response Management Plan, Modelling – Odour modelling

1.2. Consultation

As required under Condition 5, consultation with the relevant regulatory bodies (EPA and NSW Department of Planning and Environment [DPE]) was performed as part of this odour audit.

1.2.1. Environment Protection Authority (EPA)

The EPA was contacted by email on 13 October 2023 and an email response was provided on 27 October 2023 which is reproduced below:

> *"The EPA has the following comments for your consideration of the Independent Odour Audit.*
>
> *The odour PRP on the licence is still ongoing. I do note that there will be a Stage 3 of the odour PRP once the current Stage 2 is complete.*
>
> *The EPA has received a number of odour complaints between May 2022 and April 2023, regarding various odour types:*
>
> - *29 June 2022, complainant detected offensive odour relating to the WWTP, described as "rotten egg gas".*
> - *25 July 2022, complainant detected offensive odour relating to the WWTP, described as "rotten milk odour"*

- *2 August 2022, complainant detected offensive odour relating to the WWTP, described as "rotten eggs"*
- *5 August 2022, complainant detected offensive odour relating to the WWTP, same complainant and description as above.*
- *24 November 2022, complainant detected offensive odour relating to the WWTP, described as "decomposing vegetation".*
- *29 November 2022, complainant detected offensive "normal Manildra rotten" odour.*
- *5 December 2022, complainant detected offensive odour, described as "bad".*
- *16 January 2023, complainant detected offensive odour, described as "strong burning smell" around the WWTP area.*
- *18 February 2023, complainant detected offensive odour described as a "strong yeasty odour" in Nowra.*
- *13 March 2023, complainant detected offensive odour described as a "strong yeasty smell"*

Reference should be made to Section 3.2 that summarises the odour complaints as reported by Manildra over the audit period. It is noted that there is a discrepancy between the dates listed above and those recorded by Manildra due to the chain of communication and responses.

On 27 July 2022, (i.e. within this odour audit period), NSW EPA issued Notice 1619775 to vary EPL 883 to include Condition U2: Odour Pollution Reduction Study (Stage 1), the "PRP" discussed above by EPA (see Section 3.8).

1.2.2. Department of Planning and Environment (DPE)

DPE was contacted by email on 13 October 2023 and provided a response on 26 October 2023, including the following comment:

> *"No particular comments from DPE regarding odour management, just interest in the general compliance of the sites operations and any actions undertaken by Starches in the event of any exceedances."*

The odour performance of the site is determined by the results of the quarterly and annual odour emissions testing, which are discussed in **Section 3.6**. The variability of the odour emissions results is presented in **Section 3.6.4**.

The frequency and nature of odour complaints is also a key performance indicator for odour control from the site. Odour complaints are summarised and discussed in **Section 3.2**, which also outlines the response to odour complaints identified as originating from the Bulk Volume Fermenter (BVF). It was identified that at times high COD loading to the BVF was causing excessive biogas generation rates, and Shoalhaven Starches has implemented a range of actions to manage this risk including: an additional biogas blower; upgrade of the three existing biogas blowers; installation of a new biogas heat exchanger; and remedial works to the Sulphur Oxidation basin.

Reference should be made to **Table 2** and **Appendix E** for details of the actions implemented by Shoalhaven Starches.

1.3. Site Inspection

A site inspection was performed on 20 September 2023. The site inspection was facilitated by Gavin Dostal (Environment & Sustainability Leader, Manildra Group) and attended by Gary Graham (Northstar).

1.4. Field Ambient Odour Assessment

On 27 July 2022, NSW EPA issued Notice 1619775 to vary EPL 883 to include Condition U2: Odour Pollution Reduction Study (Stage 1).

Condition U2.2 required the following:

> *"The licensee must engage a suitably qualified independent person to undertake a minimum of (3) field odour surveys, at least one week apart. These must at a minimum:*
>
> *a) Characterise the frequency, intensity, duration, offensiveness, location and extent of any off-site odours.*
>
> *b) Be undertaken during hours when poor dispersion and/or peak odour emissions are expected.*
>
> *Findings and conclusions from the odour survey must be presented in the context of the activities being undertaken at the time the odour survey was conducted."*

Simultaneously with the performance of this annual odour audit, Northstar was commissioned to perform an independent field ambient odour survey in October 2023. This has been performed independently and in accordance with the requirements specified in EPL 883 Condition U2.2. This stand-alone component has been reported under separate cover to this audit report (Northstar, 2022) and (Northstar, 2023).

2. ODOUR AUDIT REQUIREMENTS

2.1. Audit Procedure

The procedure followed during the audit was derived from NSW Department of Planning and Environment (2020) Independent Audit – Post Approval Requirements (PAR) (DPIE, 2020). The requirements for an audit are prescribed in Appendix B of the PAR:

> *"The Audit Table must set out the following information for each requirement to be complied with (compliance requirement):*
>
> 1. *condition of consent number;*
> 2. *the exact wording of the compliance requirement;*
> 3. *a blank column to record the evidence used to assess and determine whether each requirement has been complied with;*
> 4. *a blank column for commentary on findings and recommendations;*
> 5. *a blank column for recording the status of compliance, and*
> 6. *a unique identification non compliance number."*

The methodology adopted in this audit has followed this guidance. An additional column 'recommendations / actions' has been included to discuss remedial actions and/or recommendations where necessary, as required under Section 4.2.4 of the guidance.

For each **non-compliance,** a unique identification number (UIN) has been assigned as required under the PAR (DPIE, 2020). As this odour audit is performed against the conditions presented in Schedule 3 of the Consolidated Conditions of Project Approval (MOD 21), each UIN has been labelled as **22/23-NC-n** where *n* is the Condition Number derived from MOD 21 and replicated in the first column of **Table 13**. Reference to UINs in previous odour audit reports will adopt the same nomenclature as previously reported (as sequential numbers rather than condition numbers) to avoid any confusion.

2.2. Audit Compliance Status Descriptors

As presented in NSW Government (DPIE, 2020) *Independent Audit – Post Approval Requirements*, the criteria outlined in **Table 1** have been adopted for the independent odour audit:

Table 1 Odour audit compliance criteria

Status	Description
Compliant	The auditor has collected sufficient verifiable evidence to demonstrate that all elements of the requirement have been complied with within the scope of the audit.
Non-compliant	The auditor has determined that one or more specific elements of the conditions or requirements have not been complied with within the scope of the audit.
Not triggered	A requirement has an activation or timing trigger that has not been met during the temporal scope of the audit being undertaken (may be a retrospective or future requirement), therefore an assessment of compliance is not relevant.

The following is also noted:

> *"The terms partial compliance, partial non-compliance, not verified or administrative non-compliance or other similar terms must not be used.*
>
> *As part of the Audit evaluation, the auditor may make observations, including identifying any opportunities for improvement in relation to any compliance requirement or any other aspect of the project. Any observations or notes are in addition to the compliance status descriptor assigned to each compliance requirement, limited to the descriptors listed in Table 2* (as reproduced in **Table 1**).

2.3. Audit Recommendations

Where recommendations are noted, these are expressed in **Section 3** and are not replicated in **Section 3.8** which relates to the compliance with the Consolidated Conditions of Project Approval only. These are designated UIN as **22/23-REC-n** (where n is a sequential letter designator) and do not carry the Condition reference to avoid compliance issues. Recommendations are provided for any observed opportunity for improved odour performance and are not solely related to compliance with the Consolidated Conditions of Project Approval.

2.4. Consolidated Odour Conditions and Summary of Compliance

Section 3.8 and **Table 13** presents a list of odour conditions, as prescribed in Schedule 3 of the Consolidated Conditions of Project Approval.

These conditions have been repeated *verbatim* and are accompanied with a summary of the sections of this report that provide additional evidence and commentary, and a summary of compliance (or otherwise) with that specific condition.

3. ODOUR AUDIT EVIDENCE

3.1. Review of Management Plans

As required to comply with Condition 5d of PA 06_0228, the following relevant management plans in place during the audit period have been reviewed:

- Shoalhaven Starches (2022) Shoalhaven Starches Ethanol Upgrade Odour Management Plan (ref: EN-P-247 1.0.H. July 2022) (TOU, July 2022); and
- Shoalhaven Starches (2020) Pollution Incident Response Management Plan (ref: EN-P-248 1.0.M. Dec 2022) (Manildra, 2022)

3.1.1. Odour Management Plan

The version of the Odour Management Plan (OMP) in force during the audit period was revision 1.0.H (July 2022 (TOU, July 2022)).

At the request of NSW EPA during the 2020/21 audit, the odour complaint procedure presented in the OMP has been reviewed, to facilitate a review of how the reported complaints have been recorded and responded to.

The procedure for responding to odour complaints is presented in section 4.3.1 of the OMP (ref: EN-P-247 1.0.H (TOU, July 2022) which is unchanged from previous iterations:

1. *The Environmental Complaints Handling procedure must reflect the requirements of Licence No. 883 set out in sections M5 of the licence.*
2. *The Environmental Manager and Site Manager have ownership of the system and have authority and responsibility to ensure that necessary corrective actions are taken.*
3. *Environmental complaints can be received through any of the following avenues:*
   a. *Environment Protection Authority (EPA)*
   b. *24 hour a day complaints hotline*
   c. *Ringing main office*
4. *The following procedure is followed when a complaint is received:*
   a. *All environmental complaints must be directed immediately to the Environmental Manager.*
   b. *If the Manager is not available, then directed to Farm Manager and then if not available to the Site Manager.*
   c. *The following details are recorded (where given by the complainant) in the Environmental Complaints Database*
      i. *Name of complainant and contact details (if they want to be identified). Details are required to enable Shoalhaven Starches to report back to the person once the complaint is investigated.*
      ii. *Nature of complaint – noise, dust/smoke, odour, spill, incident etc*
      iii. *Duration of the problem (dates and times)*
   d. *The Environmental Manager then investigates the complaint and if applicable initiates corrective action. This information is recorded in the Environmental Complaints Database.*
   e. *Once the investigation is complete, the details are give to the Quality Assurance department and the details entered into the Environmental Complaints section in the Fastrack Document Control system.*

f. A copy of the complaint is forwarded to the Site Manager and relevant Plant Manager as required.

5. *Details of complaints received direct from the EPA are sent to the Environmental Manager for investigation and dealt with as per the above procedure.*
6. *If the complaint is the same as one received directly by the company, then the EPA reference Number is added to the existing complaint (hence so doubling up does not occur).*
7. *Environmental Complaints are reviewed on an annual basis as part of the company's Annual Environmental Report. This annual review includes comparison with previous years.*

3.1.2. Pollution Incident Response Management Plan (Updated 2022)

The version of the PIRMP relevant to the audit period is revision 1.0.M (Dec 2022) which supersedes version 1.0.K which was audited during the previous independent odour audit. It is noted that the site is currently operating under version 1.0 N, which was issued outside of this audit period.

The document revision record on p2/48 of the PIRMP outlines the changes in the version in place during the audit period as:

"Update of site maps, dangerous goods register, contact details, incident response procedures."

The updates have been reviewed and are not considered to be significant in terms of the Odour Audit.

3.2. Odour Complaints

Odour complaints may be reported through two principal routes:

(i) directly as a telephone call to Shoalhaven Starches (via the 24-hr/day hotline or directly to the Environmental Manager); or

(ii) indirectly through the EPA.

Table 2 below presents a summary of the odour complaints received over the reporting period with some information relating to the complainant and/or location removed. Details of the complaints recorded from direct calls and response and follow-up are presented (in full) in **Appendix E**.

Table 2 Odour complaints

Date / Time	Route	Complaint Ref	Location	Description	Likely Cause	Action	Complaint Status
1 Jul 22	EPA	068	2-3 km east of WWTP	Caller affected by strong offensive odour on 29 Jun attributed to the WWTP… The odour is described as sulphuric, like sewerage/ sludge/ rotten egg gas. Odour seems to be more frequent lately, over the last 6 months, and has been getting worse, though it does vary based on the weather.	Likely biogas release from anaerobic BVF due to works on biogas recovery system	Unable to verify as the complaint was received on 30-06-22 (a day later). An inspection of the BVF cover… did not reveal any BVF cover issues however it was noted works to the Biogas recovery system occurred on the day on the complaint…	Closed
29 Jul 22	EPA	069	Bomaderry	…Odour from Manildra Farm. Described as a different odour to the typical Manildra odour from the factory	Investigation revealed odour likely to be caused by biogas from the BVF, caused by inflated BVF cover due to high food (COD loadings).	… The winds were noted to be light from the NW direction meaning any odour from the WWTP would travel away from the complainant's location. Investigation revealed odour likely to be caused by biogas odour from the BVF… High food spike passed through the system and the cover returned to normal operations.	Closed
1 Aug 22	EPA	070	Bomaderry	Offensive odour from the settling ponds believed to be coming from Manildra… The odour has been present on and off all day on	Unknown. Possibly caused by Council STP desludging the biosolids and applying on the land adjacent to the STP	The wind conditions on the day of the complaint (Monday 25th July) were from a W to NW direction from 0600 to midday at	

Date / Time	Route	Complaint Ref	Location	Description	Likely Cause	Action	Complaint Status
				25/7/22, wind from the NE, it's a rotten milk odour a very bad smell rated as 4/5 strength and keeps wafting into the house…		approximately 10-15 km/h. The wind then turned to an ENE to E direction from midday to approximately 5pm at ~10-15 km/h. As we did not receive the complaint until Tuesday 27th July and the exact location of the complainant is unknown, we are unable to advise if the odour… was attributed to Shoalhaven Starches.	
9 Aug 22	EPA	071	<1 km south	Dreadful odour like rotten eggs, started at approximately 3:45pm. Odour has usually occurred only occasionally, approx. once every two weeks. But over the last month the odour has been stronger and also more frequently, on average about three or four times a week. Odour is very strong, making caller feel sick and has already caused a headache. There is a northerly breeze, approx. 10 km/h. Caller lives less than 1 km from Manildra site in a southerly direction	The likely cause is excessive biogas production due to high 'food' (organic spikes from the factory operations). The BVF cover inflated resulting in biogas escaping from under the cover via the cover inspection / sample ports.	An inspection of the WWTP operations on the 5-8-22 at 3:00pm revealed a 'biogas' odour coming from the anaerobic bulk volume fermenter (BVF). The wind at the time of the inspection was moderate to strong, from the W to NW direction. The likely cause is excessive biogas production due to high 'food' (organic) spikes from the factory operations. As discussed, we are currently designing additional biogas recovery and biogas flare capacity which will address this issue. Once the high organic load passed through the system, the	Closed

Date / Time	Route	Complaint Ref	Location	Description	Likely Cause	Action	Complaint Status
						WWTP system returned to normal operation. Currently investigating and preliminary design underway to expand the wastewater treatment plant capacity which will resolve this issue. MOD 22 application being prepared which includes expansion to WWTP and biogas handling system.	
6 Dec 22	EPA	072	Bomaderry	… The complainant described the odour as "rank" and that the odour was of a biological nature, similar to manure or decomposing vegetation. There was no wind at the time.	Based on the weather data and the type of odour described by the complainant as 'biological nature similar to manure or decomposing vegetation' which is not consistent with the typical odour attributed to the Shoalhaven starches factory or WWTP, we do not believe that this complaint is attributed to Shoalhaven Starches on this occasion.	… based on the wind direction and the complainant's location the source of odour is unlikely to be emanating from the Shoalhaven starches factory… Potential sources may include the Council STP, surrounding rural properties and the Shoalhaven starches Environmental Farm and WWTP. A check of the factory odour recovery systems and Shoalhaven starches WWTP operations were noted to be operating as normal at the time of the complaint.	Closed

Date / Time	Route	Complaint Ref	Location	Description	Likely Cause	Action	Complaint Status
12 Jan 23	EPA	073	Bomaderry	Complainant described the odour as the "normal Manildra rotten smell", and that the odour has been an ongoing issue… Complainant also said that they can smell the odour even with their windows and doors shut.	Unknown. Unable to verify the odour source as the complainant details were received 2 days after the complaint was lodged.	… A check of the factory odour control systems and Shoalhaven starched WWTP operations were noted to be operating as normal at the time of the complaint…	Closed
24 Feb 23	Direct	074	Bomaderry	I would like to let you know that over the last 4 months… we have experienced unpleasant smells on most days from your facility. Some days are much worse than others… when we couldn't have the windows or doors open. This is becoming a significant issue… we need to close the house up. We find using the yard too unpleasant on days when the smell is stronger, and even on other days, the smell is not nice to be around… I understand that on occasion there might be an issue where there are smell emitted from the facility but almost daily is not reasonable. I have commenced an odour log today, which may assist	Unknown.	… An inspection around the complainant's location… was conducted when winds had turned to S/SE direction which is downwind of the factory. During the inspection no odours were detected near the complainant's location that may be attributed Shoalhaven Starches factory operations. A faint DDG type odour was detected… which dissipated west… away from the factory…	Closed

Date / Time	Route	Complaint Ref	Location	Description	Likely Cause	Action	Complaint Status
				with you understanding the issue in the next few months when I can collect more data.			
24 Feb 23	EPA	077	Bomaderry	'We've received an odour complaint that the complainant has attributed to Shoalhaven Starches, from around the WWTP area. The complainant described the odour as a burning smell, like "something is cooking".	Unknown. Potential cause is biogas odour from the anaerobic BVF, caused by inflated cover due to high food (COD) spike from the factory wastewater.	Investigation revealed WWTP encountered high organic loads causing excessive biogas production which may be the cause of the odour, however the complainant description of a burning smell, like something is cooking is not typical of biogas odour which is typically described as a pungent rotten-egg gas / sulfur smell. Once the high food spike passed, the WWTP returned to normal operation.	Closed
3 Mar 23	Direct	075	Bomaderry	Complainant advised of odour coming from Manildra farm described as an off-sulphur smell.	Likely cause is biogas odour from the anaerobic BVF, caused by an inflated cover due to high food (COD) spike from the factory wastewater.	A drive around the complainant's location immediately after the complaint was received revealed a faint sulphurous odour… An inspection of the anaerobic WWTP BVF pond revealed the BVF cover to be inflated with biogas odour detected… Once the BVF cover returned to normal, the odour quickly dissipated. Additional WWTP	Closed

Date / Time	Route	Complaint Ref	Location	Description	Likely Cause	Action	Complaint Status
						(BVF) capacity is required to cope with these peak COD loads. Diversion of wastewater flows to Pond 4 is undertaken to mitigate against this issue. Actions completed to reduce odour at the WWTP… as follows: - Installation of an additional 4th biogas blower – complete July 2022 - Upgrade of the existing 3 biogas blowers, which allow more biogas to be recovered from the… BVF for factory re-use (or to flare) – complete October 2022 - Installation of new biogas heat exchanger. The previous heat exchanger was restricting the biogas flow from the… BVF cover – complete August 2022 - Upgrade the capacity of the biogas flare – complete July 2022 We have also identified another potential cause of odour from the Sulphur Oxidisation (SO) basin	

Date / Time	Route	Complaint Ref	Location	Description	Likely Cause	Action	Complaint Status
						(which also received treated effluent from the BVF). The BVF effluent discharge pipe to the SO basin appears to have blocked… causing BVF effluent to discharge on top of the SO basin.	
14 Mar 23	Direct	076	Bomaderry	Complainant described the odour as burnt toast, chemical odour, which comes and goes.	Unable. Unable to confirm the cause of the odour as the complainant advised the odour was not present at the time of the time of the complaint.	Unable to confirm the cause of the odour as the complainant advised the odour was not present at the time of the time of the complaint.	Closed

Details of the complaints recorded from direct calls and response and follow-up are presented in **Appendix E**. These have been reviewed with regard to the complaint procedure discussed in **Section 3.1.1**, and no discrepancies have been identified.

Recommendation: 22/23-REC-A

Complaints logged as complaints, including 069, 071 and 075 are attributed to a biogas leakage from the BVF due to excessive COD loading in the incoming wastewater from the factory. The complaint records document various controls being implemented to manage this issue, including those included as MOD 22, including various additional capacity measures as described at complaint 075. It is therefore a recommendation of this independent odour audit that those measures are implemented as expediently as possible to resolve this identified capacity shortfall and identified source of uncontrolled odour discharge.

3.3. Review of Production Data

As required, a review of the facility's production data at the times of the odour monitoring (refer **Section 3.6**) has been performed.

The production data correspond to the periods of emission testing, as reported in:

- Manildra Ethanol Production Volumes (2022-2023)

Copies of the monitoring reports are presented in **Appendix D** of this report. The production volumes relevant to the odour monitoring events are presented in **Table 3**.

Table 3 Odour monitoring and production rates

Quarter	Date of Quarterly Odour Sampling	Daily Ethanol Production (L)	Annual Production Rate Equivalent ($ML \cdot yr^{-1}$)
1	21/06/2022	576 944	211
	22/06/2022	948 324	346
	23/06/2022	905 873	331
	26/06/2022	849 961	310
2	22/08/2022	727 204	265
	23/08/2022	787 686	288
	4/10/2022	766 576	280
3	15/12/2022	813 890	297
	19/12/2022	909 840	332
	21/12/2022	993 918	363
4	23/03/2023	578 386	211

Quarter	Date of Quarterly Odour Sampling	Daily Ethanol Production (L)	Annual Production Rate Equivalent ($ML \cdot yr^{-1}$)
	30/03/2023	562 482	205
	12/04/2023	722 378	264
	27/04/2023	734 083	268
Minimum		562 482	205
Maximum		993 918	363
Mean		776 968	284
Range (Max/Min)		1.77	1.77

For comparison purposes only, the production rates reported in the previous audit periods were:

- 2021-22: in the range of 461 $kL \cdot day^{-1}$ (168 $ML \cdot y^{-1}$) to 879 $kL \cdot day^{-1}$ (321 $ML \cdot y^{-1}$) with a mean of 696 $kL \cdot day^{-1}$ (254 $ML \cdot y^{-1}$).
- 2020-21: in the range of 396 $kL \cdot day^{-1}$ (145 $ML \cdot y^{-1}$) to 708 $kLday^{-1}$ (258 $ML \cdot y^{-1}$) with a mean of 582 $kL \cdot day^{-1}$ (212 $ML \cdot y^{-1}$).

The production rates during the 2022-23 audit period were higher than those in the previous year by a factor of around 11 %, determined through a comparison of the calculated mean values.

3.4. Independent Environmental Audit

Whilst some developments documented in the independent environmental audit report (Malo Sustainability Consulting (2019) *Independent Environmental Audit*) have a direct implication on the management of odour from the facility, most of the content in the audit report is outside of the scope of the Independent Odour Audit, and no comment is offered. It is understood that the most recent IEA is that completed in 2019.

3.5. Biofilter Capacity and Condition Assessments

It is noted that there was no DDG Biofilter Capacity and Condition Assessment (BCCA) report completed during the audit period. BCCA #25 was completed in April 2022 and was discussed in the 2021-22 independent odour audit report, and BCCA #26 was dated May 2023. This has been included within this audit report, although strictly it belongs to the 2023-24 audit period.

A copy of the DDG BCCA #26 performed by The Odour Unit is presented in **Appendix C**.

The report presented in **Appendix C** has not been replicated in the main body of this audit report but presented below is a summary of the key observations and measurements.

The design airflow of the installed biofilter system is stated as 15 000 $m^3 \cdot hr^{-1}$ per biofilter. The combined inlet flow (main duct + dryer 4 duct) is reported as 18 650 $m^3 \cdot hr^{-1}$ which is 124 % of the design airflow.

The operating conditions of the biofilters are summarised in **Table 4**, and the odour measurements are summarised in **Table 5**. Results that exceed the de facto emission concentration of 500 OU are highlighted.

Table 4 Biofilter capacity and condition report (#26) – operating parameters

Date	Position	Airflow ($m^3 \cdot hr^{-1}$)	RH (%)	Observation	Air Temp (°C)	Surface Temp (°C)	UB Pressure (Pa)
1-May-23 (#26)	Main duct	16 000	100 %	NR	51.0	NR	100
	DDG BF#2	9 060	100 %	saturated	48.8	NR	230
	Dryer 4 duct	2 650	100 %	NR	32.8	NR	475
	DDG BF#1	9 600	100 %	saturated	48.2	NR	100

Notes: bf – biofilter

NR – not reported

Table 5 Biofilter capacity and condition reports – odour measurements

Date	BCCA (#)	Inlet (OU)	DDG bf#1 (OU)		DDG bf#2 (OU)		Flow weighted (OU)	Efficiency (%)
			South cell	North cell	South cell	North cell		
12-Sep-17	20	23 200	395	332	59	64	273	98.8
10-Apr-18	21	98 300	2 050	512	197	2 900	1 360	98.6
11-Jun-19	22	173 000	776	891	74	588	683	99.6
9-Mar-20	23	10 770	675	388	588	675	582	94.6
2-Feb-21	24	35 700	2 900	1 720	4 870	4 100	3 160	91.2
6-Apr-22	25	8 930	5 790	6 890	1 330	4 470	8 930	56
1-May-23	26	7 510	7 510	7 510	8 190	4 870	6 890	8

With reference to **Table 5**, a flow weighted average odour concentration of 6 890 OU was measured which exceeds the *de facto* standard of 500 OU.

Recommendation: 22/23-REC-B

The biofilters are not achieving the *de facto* 500 OU standard and are not achieving a satisfactory degree of odour control (measured as 8 % efficiency). It is acknowledged that Shoalhaven Starches are currently constructing a duplicate set of biofilters to redistribute the flow to achieve the design capacity flow rate through all biofilters. The performance of the biofilters remains an unresolved issue and it is recommended that it is resolved at the earliest opportunity.

3.6. Odour Monitoring Results

The results of the monitoring programs performed over the audit period are presented in **Table 7**, **Table 8** and **Table 9**. Copies of the monitoring reports are presented in **Appendix D** of this report.

These data are taken from the following reports:

- Ektimo (2022) R012971 Odour Emission Testing Report Quarter 1 2022-2023 (measurements taken during June and July 2022) (Ektimo, Sep 2022)
- Ektimo (2022) R013525 Odour Emission Testing Report Quarter 2 2022-2023 (measurements taken during August 2022) (Ektimo, Nov 2022)
- Ektimo (2023) R14071 Odour Emission Testing Report Quarter 3 2022-2023 (measurements taken during December 2022) (Ektimo, Feb 2023)
- Ektimo (2022) R014499 Odour Emission Testing Report Quarter 4 2022-2023 (measurements taken during March and April 2023) (Ektimo, Apr 2023)

3.6.1. Process Conditions during the Monitoring

The Ektimo monitoring reports do not present any information regarding plant conditions during the monitoring campaigns. From the monitoring data summary (see Section 3.6.3), it is noted that the following EPL discharge points were not tested:

Table 6 Odour sources not tested during the audit period

EPA ID	Source	Reason (as stated in the test report)
Q1		
12	No 1 Starch Dryer	Not operational during sampling
42	Boiler 4	Not operational during sampling
Q2		
42	Boiler 4	Not operational during sampling
46	DDG Pellet Stack	Not sampled as there was no access for the required elevated work platform in that area
39A	Biofilter Inlet	Not sampled as there was no flow due to DDG Dryer No. 4 not operating
Q3		
8	No 1 Gluten Dryer Baghouse	Not sampled due to access limitations
46	DDG Pellet Stack	Not sampled as there was no access for the required elevated work platform in that area
20	Effluent Pond 2	The test report states: "*Insufficient water volume to sample and was deemed unsafe to access for odour sampling*", however Shoalhaven Starches have advised that the pond was not in use and was drained at the time of the testing.

EPA ID	Source	Reason (as stated in the test report)
21	Effluent Pond 3	The test report states: "*Insufficient water volume to sample and was deemed unsafe to access for odour sampling*", however Shoalhaven Starches have advised that the pond was not in use and was drained at the time of the testing.
22	Effluent Pond 4	The test report states: "*Covered and was not able to be sampled*". Shoalhaven Starches have advised that Pond 4 was covered for odour control purposes and was not available for testing.
Q4		
46	DDG Pellet Stack	Not sampled as there was no access for the required elevated work platform in the area

A check of the NSW EPA public register database[2] for EPL 883 notes that Notice 1622790, issued on 1 November 2022 varied the testing requirements on EPA ID 42 "Boiler No 4". As stated on page 2 of that Notice:

> *The following variations have been made to the licence:*
> *• Condition L2.4, M2.2 - The air monitoring limits for Discharge Point 42 have been removed, and the requirements and frequency have been amended.*

A cross check of Section M2.2 of EPL 883 shows that the requirement for odour testing has been removed.

Recommendation: 22/23-REC-C

It is recommended that the access limitations preventing EPA 46 (DDG Pellet Stack) are resolved to ensure that EPA 46 is available to be tested during the following testing periods.

[2] https://app.epa.nsw.gov.au/prpoeoapp/

3.6.2. Summary of Measurements – Annual Testing

Table 7 presents a summary of the annual odour tests over the reporting period, conducted on the effluent storage dams (EPA ID nos 19-24) and the sulphur oxidation pond (EPA ID 25).

Table 7 Summary of annual odour monitoring results

EPA Ref	Location	Frequency	Q3 and Annual (OU)
19	Effluent Storage Dam 1	Annual	89
20	Effluent Storage Dam 2	Annual	nd (see Table 6)
21	Effluent Storage Dam 3	Annual	nd (see Table 6)
22	Effluent Storage Dam 4	Annual	nd (see Table 6)
23	Effluent Storage Dam 5	Annual	96
24	Effluent Storage Dam 6	Annual	89
25	Sulphur Oxidation Pond	Annual	220

Note: nd no data. (Ektimo, Feb 2023)

3.6.3. Summary of Measurements – Quarterly Testing

Table 8 presents a summary of the quarterly monitoring results measured over the reporting period. The table has been presented by source (EPA source ref) and by testing quarter (Q1 to Q4, with the corresponding dates). The data is presented as odour concentrations (OU) and as mass odour emission rates (MOER) ($OU \cdot Nm^3 \cdot s^{-1}$).

Note: It is noted that the MOER stated in the quarterly monitoring reports are presented at standard temperature and pressure (STP) as stated in Appendix A of the test reports.

It is noted that biofilter odour concentration measurements taken during the Q1, Q2 and Q3 tests exceed the *de facto* emission standard of 500 OU. These data are highlighted in **Table 8**. Where the quarterly testing reports indicate no data ('nd'), these are similarly highlighted in **Table 8** for clarity.

Recommendation: 22/23-REC-D

With regard to flow measurements at EPA ID 8 the odour monitoring reports state: "*Sampling was undertaken at the exit of the stack as it was the only accessible area for the samples to be taken. No temperature or flow rate readings could be taken due to access issues.*" Shoalhaven Starches have advised that access is limited due to the addition of a silencer on this discharge point for noise control purposes. It is recommended that the access restrictions to EPA ID 8 are resolved to enable compliant odour monitoring to be performed.

Table 8 Summary of quarterly odour monitoring results

EPA Ref	Location	Frequency	Q1		Q2		Q3		Q4	
			OU	OU·Nm^3·s^{-1}	OU	OU·Nm^3·s^{-1}	OU	OU·Nm^3·s^{-1}	OU	OU·Nm^3·s^{-1}
8	No 1 Gluten Dryer	Quarterly	810	nd[(b)]	1 100	nd[(b)]	0	nd[(b)]	560	nd[(b)]
9	No 2 Gluten / Starch Dryer	Quarterly	1 000	14 000	480	7 200	470	8 930	280	5 040
10	No 3 Gluten Dryer	Quarterly	1 600	97 600	870	52 200	940	52 640	1 600	68 800
11	No 4 Gluten Dryer	Quarterly	1 000	28 000	1 600	48 000	940	25 380	560	15 680
12	No 1 Starch Dryer	Quarterly	nd[(a)]	nd[(a)]	570	11 970	470	9 400	510	10 200
13	No 3 Starch Dryer	Quarterly	120	2 040	340	6 800	1 300	24 700	430	6 880
14	No 4 Starch Dryer	Quarterly	570	10 830	880	17 600	470	8 460	470	7 520
16	CO_2 Scrubber Outlet	Quarterly	20 000	16 800	15 000	24 000	42 000	15 540	29 000	46 400
--	CO_2 Scrubber Inlet	Quarterly	30 000	25 200	14 000	23 800	35 000	12 950	35 000	56 000
35	Combined Stack Boilers No5&6	Quarterly	1 600	51 200	1 100	29 700	1 300	41 600	940	27 260
39	Inlet Pipe Biofilters A&B (DDG1-3)	Quarterly	3 000	8 700	6 400	19 840	6 400	19 200	22 000	77 000
39A	Inlet Pipe Biofilters A&B (DDG#4)	Quarterly	110 000	58 300	nd[(a)]	nd[(a)]	5 100	459	nd[(a)]	nd[(a)]
40	Outlet of Biofilter A (east)	Quarterly	14 000	nd[(b)]	6 000	nd[(b)]	5 200	nd[(b)]	9 700	nd[(b)]
	Outlet of Biofilter A (west)	Quarterly	8 100	nd[(b)]	6 000	nd[(b)]	3 700	nd[(b)]	4 200	nd[(b)]
41	Outlet of Biofilter B (east)	Quarterly	6 200	nd[(b)]	5 500	nd[(b)]	5 700	nd[(b)]	6 000	nd[(b)]
	Outlet of Biofilter B (west)	Quarterly	8 700	nd[(b)]	5 500	nd[(b)]	4 000	nd[(b)]	11 000	nd[(b)]
42	Boiler 4	Quarterly	nd[(a)]	nd[(a)]	nd[(a)]	nd[(a)]	nd[(a)]	nd[(a)]	nd[(a)]	nd[(a)]
44	Fermenters	Quarterly	68 000	17 000	8 600	2 322	8 500	1 190	32 000	16 000
45	Boiler No2 Outlet	Quarterly	880	3 960	1 100	5 170	nd[(a)]	nd[(a)]	nd[(a)]	nd[(a)]
46	DDG Pellet Plant Stack	Quarterly	1 700	28 900	nd[(a)]	nd[(a)]	nd[(a)]	nd[(a)]	nd[(a)]	nd[(a)]
47	No 5 Starch Dryer	Quarterly	620	28 520	570	25 650	130	6 240	2 300	108 100

Note: (a) nd = no data.

(b) No data relating to odour volumetric flow rate provided in the relevant reports.

3.6.4. Variability of Measurements

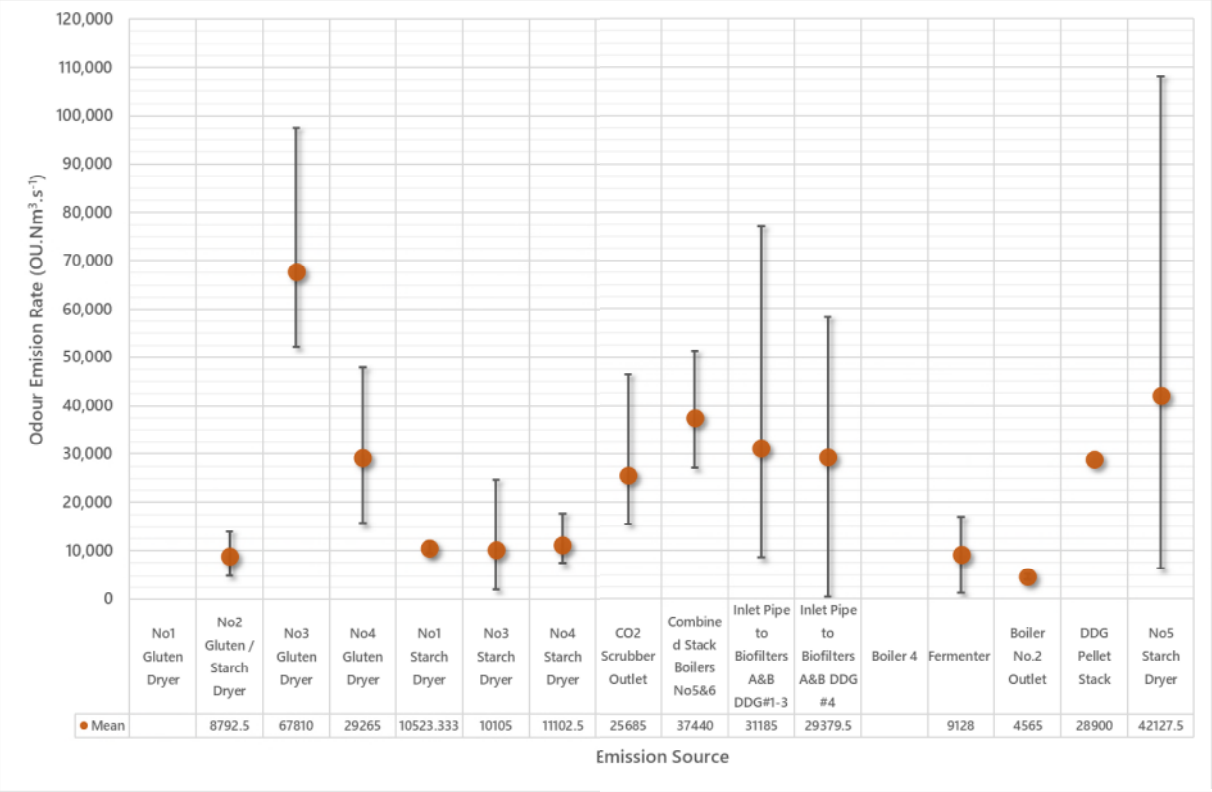
In terms of assessing the odour emission variability, the MOER (as $OU \cdot Nm^3 \cdot s^{-1}$) is the critical metric and is the product of the measured odour concentration (OU) and the measured volumetric discharge rate ($Nm^3 \cdot s^{-1}$). The variability in the MOER across the audit period is presented in **Table 9**. Any variability (max/min) greater than a factor of 10 is highlighted.

Table 9 Observed variability in the measured odour emission rate (by quarter)

EPA Ref	Location	MOER ($OU \cdot Nm^3 \cdot s^{-1}$)					
		Count	Min.	Max.	Mean	±STDev	Max/ Min
8	No 1 Gluten Dryer	0	nd	nd	nd	nd	nd
9	No 2 Gluten / Starch Dryer	4	5 040	14 000	8 793	3 819	2.8
10	No 3 Gluten Dryer	4	52 200	97 600	67 810	21 309	1.9
11	No 4 Gluten Dryer	4	15 680	48 000	29 265	13 568	3.1
12	No 1 Starch Dryer	3	9 400	11 970	10 523	1 315	1.3
13	No 3 Starch Dryer	4	2 040	24 700	10 105	9 990	12.1
14	No 4 Starch Dryer	4	7 520	17 600	11 103	4 550	2.3
16	CO_2 Scrubber Outlet	4	15 540	46 400	25 685	14 304	3.0
35	Combined Stack Boilers No5&6	4	27 260	51 200	37 440	11 108	1.9
39	Inlet Pipe to Biofilters A&B	4	8 700	77 000	31 185	30 967	8.9
39A	Inlet Pipe to Biofilters A&B (DDG4)	2	459	58 300	29 380	40 900	127
42	Boiler 4	0	nd	nd	nd	nd	nd
44	Fermenter	4	1 190	17 000	9 128	8 535	14.3
45	Boiler No2 Outlet	2	3 960	5 170	4 565	856	1.3
46	DDG Pellet Stack	1	28 900	28 900	28 900	n/a	1.0
47	No 5 Starch Dryer	4	6 240	108 100	42 128	45 081	17.3

The variation in odour emission rates, as range (represented by the observed minimum and maximum) and the arithmetic mean is illustrated in **Figure 2**.

Figure 2 Variation in measured emission rates (range and mean)



It is noted that for the following emission points there is a noted to be a significant (i.e. greater than a factor of 10) variability in the rate of odour emissions (estimated as a ratio of max/min), notably (in order of magnitude):

- EPA ID 39 Inlet Pipe to Biofilters A&B × 127
- EPA ID 47 No 5 Starch Dryer × 17.3
- EPA ID 44 Fermenter × 14.3
- EPA ID 10 No 3 Gluten Dryer × 12.1

Recommendation: 22/23-REC-E

It is recommended that the variability in the measured odour emission rates for EPA ID 10, 39, 44 and 47 is investigated.

As noted in the previous independent odour audit reports, the atypical odour emission profile highlights an inherent potential variability in the emission rate subject to process operations. It is further noted that the odour measurement uncertainty, as performed in accordance with AS4323.3 and AS4323.4 is (generally) within the range of $0.7OU < OU < 1.4OU$. The Ektimo test reports present upper and lower uncertainty limits for odour measurements which confirms this uncertainty (at the 95th percentile confidence limits).

The data comparing the mean measured odour concentration as compared to the previous three odour audit periods is presented in **Table 10** below:

Table 10 Observed variability in the measured mean odour emission rate (by audit year)

EPA Ref	Source	MOER ($OU \cdot Nm^3 \cdot s^{-1}$)			
		2022-23	2021-22	2020-21	2019-20
8	No1 Gluten Dryer	nd	nd	7 979	6 375
9	No2 Gluten / Starch Dryer	8 793	6 520	6 287	6 225
10	No3 Gluten Dryer	67 810	23 050	23 780	15 675
11	No4 Gluten Dryer	29 265	14 578	12 923	11 600
12	No1 Starch Dryer	10 523	5 683	4 353	3 130
13	No3 Starch Dryer	10 105	1 940	5 181	9 513
14	No4 Starch Dryer	11 103	2 989	3 549	6 285
16	CO_2 Scrubber Outlet	25 685	41 330	14 470	19 950
35	Combined Stack Boilers No5&6	37 440	17 315	55 982	52 750
39	Inlet Pipe to Biofilters A&B	31 185	22 165	46 149	56 900
39A	Inlet Pipe to Biofilters A&B DDG#4	29 380	23 260	15 307	8 500
42	Boiler 4	nd	13 273	19 796	23 633
44	Fermenter 15/16(A)	9 128	4 355	2 168	3 412
45	Boiler No.2 Outlet	4 565	4 223	6 068	7 167
46	DDG Pellet Plant Stack	28 900	27 653	66 514	40 167
47	No5 Starch Dryer	42 128	33 153	17 676	21 621
	aggregate ($OU \cdot Nm^3 \cdot s^{-1}$)	346 008	241 487	308 181	292 902
	mean ethanol production rate ($ML \cdot yr^{-1}$)	284	254	212	182
	odour emission intensity ($OU \cdot ML^{-1}$)	1 200	951	1 452	1 607

Note: (A) As compared to Fermenter 11 in 2017-18

The mean ethanol production rates (as $ML \cdot year^{-1}$) have been refenced from **Section 3.3**. It is noted that the production rates relate to the mean daily production rates averaged across all days during the Q1-Q4 testing periods, expressed as an annualised production volume only, and is not the total measured ethanol production rate. The aggregated MOER has been divided by the annual ethanol production rates to derive a "odour emission intensity" to provide a benchmark of emissions against the production rates. As may be observed, 2022-23 shows a marked increase in the estimated *pro-rata* odour emission intensity. It is noted that not all MOER are scalable by ethanol production rates, and this metric should be viewed acknowledging that uncertainty.

The MOER is the product of the measured odour concentration (OU) and the volumetric discharge rate ($Nm^3 \cdot s^{-1}$) expressed as $OU \cdot Nm^3 \cdot s^{-1}$. **Table 11** below presents a breakdown of the two component factors to the MOER, to add some light on whether the odour concentration and/or the volumetric discharge rate is overly influencing the variability in the MOER. All max/min ratios of >10 are highlighted.

Table 11 Observed variability in the measured odour concentration and volumetric discharge rate

EPA Ref	Location	Odour Concentration (OU)				Volumetric Discharge Rate ($Nm^3 \cdot s^{-1}$)			
		Max	Mean	Min	Max/ Min	Max	Mean	Min	Max/ Min
8	No1 Gluten Dryer	1 100	823	560	2.0	nd	nd	nd	nd
9	No2 Gluten / Starch Dryer	1 000	558	280	3.6	19.0	16.5	14.0	1.4
10	No3 Gluten Dryer	1 600	1 253	870	1.8	61.0	55.0	43.0	1.4
11	No4 Gluten Dryer	1 600	1 025	560	2.9	30.0	28.3	27.0	1.1
12	No1 Starch Dryer	570	517	470	1.2	21.0	20.3	20.0	1.1
13	No3 Starch Dryer	1 300	548	120	10.8	20.0	18.0	16.0	1.3
14	No4 Starch Dryer	880	598	470	1.9	20.0	18.3	16.0	1.3
16	CO2 Scrubber Outlet	42 000	26 500	15 000	2.8	1.6	1.1	0.4	4.3
35	Combined Stack Boilers No5&6	1 600	1 235	940	1.7	32.0	30.0	27.0	1.2
39	Inlet Pipe to Biofilters A&B	22 000	9 450	3 000	7.3	3.5	3.1	2.9	1.2
39A	Inlet Pipe to Biofilters A&B DDG #4	110 000	57 550	5 100	21.6	0.5	0.3	0.1	5.9
42	Boiler 4	nd	nd	nd	nd	nd	nd	nd	nd
44	Fermenter 15/16	68 000	29 275	8 500	8.0	0.5	0.3	0.1	3.6
45	Boiler No.2 Outlet	1 100	990	880	1.3	4.7	4.6	4.5	1.0
46	DDG Pellet Stack	1 700	1 700	1 700	1.0	17.0	17.0	17.0	1.0
47	No5 Starch Dryer	2 300	905	130	17.7	48.0	46.5	45.0	1.1

3.7. Odour Modelling

During the audit period, one modelling assessment has been performed as relates to MOD23 (gas-fired co-generation), which are reported in:

- GHD (Jan 2022) Shoalhaven Starches Modification 23 – Gas-fired Co-Generation, Air Quality Assessment (GHD, Jan 2022)

The modelling report has not been appended to this independent odour audit report.

Section 1.4 of (GHD, Jan 2022) provides the following description of the scope of the modelling assessment:

> *The proposed changes (Mod 23) requires an application to the EPA assessing the associated off-site odour and air quality impacts.*
>
> *In order to meet EPA NSW requirements, this report provides:*
>
> - *A revised emissions inventory for odorous and combustion sources on site. A comparative analysis of the emissions inventory has been undertaken with the last major air quality assessments for the site.*
> - *A level 2 air quality assessment of odour and air quality in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2016) (the Approved Methods). Dispersion modelling was undertaken using CALPUFF version 7.*
> - *A comparison of predicted odour and air quality results against the EPA criteria and against the previous modification results.*

The assumptions used in the modelling report are outlined in Section 1.5:

> *The major assumptions used in this assessment are as follows:*
>
> - *Stack emission testing reports from the past measurements are accurate and representative of normal operations, and do not vary significantly*
> - *The odour dispersion modelling using the NSW EPA and US EPA approved regulatory Gaussian puff dispersion model CALPUFF version 7, which was considered appropriate for the location. Limitations with the predicted odour are inherent within the model and in its ability to handle multiple buildings and stacks in a complex setup, with wake effects included. As such, the layout of the plant was simplified in order for the model to handle the setup*
> - *Odour emissions from the major sources of odour were modelled as both variable emission and fixed point, volume and area sources in CALPUFF with appropriate dispersion characteristics*
> - *The site representative meteorological data was obtained from previous assessments of the plant, which have been approved by EPA NSW in the past. The meteorological data is discussed in Section 5*
> - *Small silos in the Packing Plant are conservatively assumed to be filled 24 hours a day*
> - *Odour sources with horizontal releases have conservatively been modelled with vertical velocities of 0.1 m/s*
> - *The VOC concentration in the biofilter exhaust is not high enough to induce density flows of the exhaust plume in ambient air*
> - *The emissions inventory, and therefore the dispersion modelling results, is largely based on estimates and on data measured on site by Stephenson Environmental Management Australia (SEMA). Actual measurements are dependent on site conditions at the time of measurement and these conditions may change. GHD does not accept any responsibility for updating the measurements or estimates made by SEMA.*

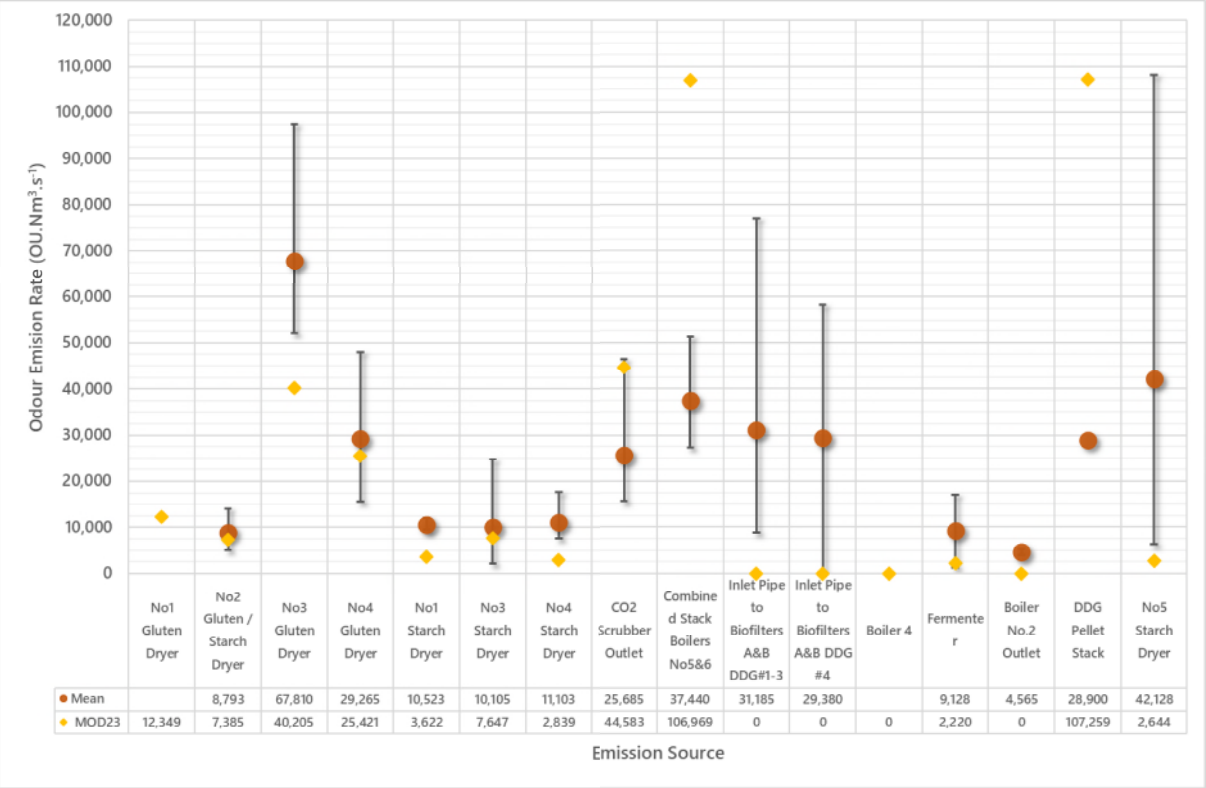
The odour emissions inventories for MOD23 presents assumptions for a range of sources not covered by this odour audit. It is noted that the odour emission rates are presented in the modelling report at discharge conditions ($OU \cdot m^3 \cdot s^{-1}$) and have been adjusted to reference gas temperature of 273 K ($OU \cdot Nm^{-3} \cdot s^{-1}$) for the purposes of comparison.

A simple comparison of the aggregated odour emission rates measured and modelled for sources (EPA ID, 8, 9, 10, 11, 12, 13, 14, 16, 35, 39, 39A, 40(E/W), 41(E/W), 42, 44, 45, 26, 47) shows the following:

- Measured: 346 008 $OU \cdot Nm^{-3} \cdot s^{-1}$
- Modelled (MOD23) 363 142 $OU \cdot Nm^{-3} \cdot s^{-1}$ (105 % of measured)

The distribution of the measured and modelled odour emission rates is presented in **Figure 3**.

Figure 3 Comparison of measured and modelled odour emission rates



The odour modelling results presented in (GHD, Jan 2022) are presented in table 7.2 on page 37 of that report. These data have been extracted are reproduced below in **Table 12**.

Table 12 Summary of odour modelling results (MOD 23) (99th percentile 1-second OU)

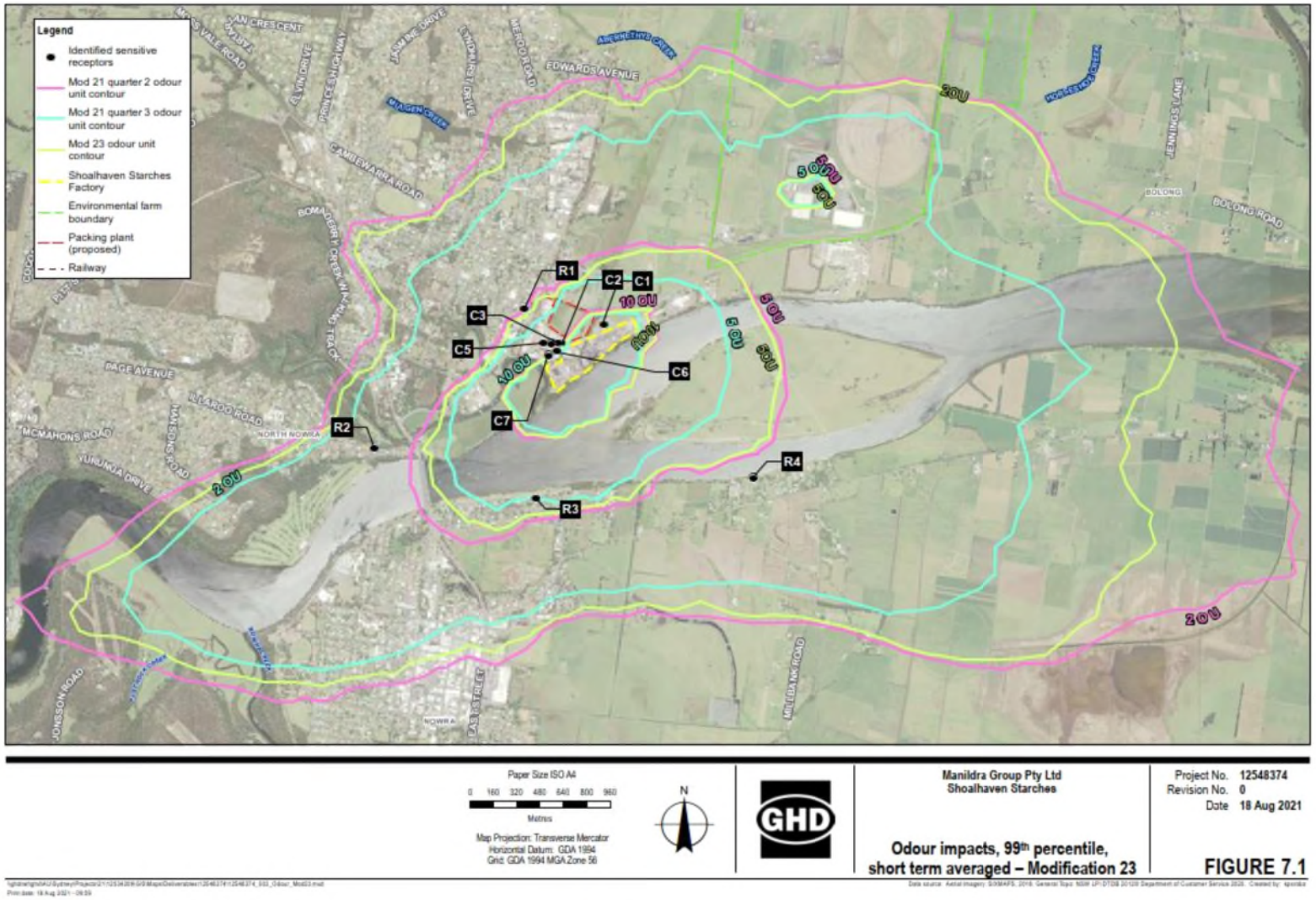
Receptor	Range (m)	Nearest odour	Dir.	Odour criterion	Odour impact, OU, 99th percentile, nose-response time						
					MOD 13	MOD 16	MOD 17	MOD 19	MOD 21 Q2	MOD 21 Q3	MOD 23
R1 Bomaderry	150	Packing plant	W	6	3.3	3.5	4	4	5	4	5
R2 North Nowra	1 300	Factory	SW	3	2.5	2.6	3	3	4	3	3
R3 Nowra	700	Factory	S	5	4	4.6	5	5	6	5	5
R4 Terara	1 300	Factory	SE	5	3.7	3.7	4	4	5	4	5
C1	45	Factory	N	n/a	n/a	10.3	12	12	14	12	12
C2	20	Factory	N	n/a	n/a	5.8	8	10	10	9	8
C3	30	Factory	N	n/a	n/a	5.3	7	9	9	8	8
C4	75	Factory	NW	n/a	n/a	4.4	6	7	8	7	7
C5	125	Factory	NW	n/a	n/a	6.1	7	7	8	7	7
C6	30	Factory	NW	n/a	n/a	5.4	7	10	10	9	9
C7	55	Factory	NW	n/a	n/a	4.8	7	8	10	9	8

Note: Predicted exceedances of the relevant criterion are highlighted

It may be noted that for MOD23 the modelling predicts no exceedances with stated odour impact assessment criteria. The isopleth plot for the predicted odour footprints is replicated in **Figure 4** (figure 7.2 (GHD, 2021)).

It is noted that the reported odour concentrations at receptors C1 and C7 within (GHD, Jan 2022) are different to those presented in (GHD, Nov 2021) (see **Table 12**).

Figure 4 Ground level odour predictions (MOD 23) (GHD, Jan 2022)



3.8. Pollution Reduction Program

On 27 July 2022, NSW EPA issued notice 1619775 (EF13/3577) to vary EPL 883 to include Condition U2 ('Odour Pollution Reduction Study (Stage 1)'). Condition U2 states:

> ***U2 Odour Pollution Reduction Study (Stage 1)***
>
> ***U2.1 Odour source identification***
>
> *The licensee must engage a suitably qualified person to undertake a site audit to identify all existing and approved sources that have the potential to generate odours. Consideration must be given to all onsite processes, existing and approved activities, and substances stored or used at the premises. Consideration must be given but not limited to the odour sources identified in Shoalhaven Starches, Report on ethanol upgrade, Air Quality Assessment, prepared by GHD Pty Ltd., dated July 2008. Specifically, the following must be provided for all existing, and, approved but not constructed, sources:*
>
> *a) Odour source name. Where applicable, the EPA monitoring identification number as per the Environment Protection Licence.*
>
> *b) If the source is existing, or, approved but not constructed.*
>
> *c) Odour emission control technology.*
>
> *d) Any manufacturers performance guarantee for the odour control technology.*
>
> *e) Measured efficiency for the odour control technology.*
>
> *f) Process unit/area of plant contributing to the odour from the source.*
>
> *g) If the process unit has been modified in the past 10 years, and if so, how the modification changed the odour emissions from the source.*
>
> *h) The status of the odour emission controls implemented at the premises (i.e. stage 1, stage 2, stage 3 or alternative odour controls). Where applicable, information must be provided to discuss why Stage 2 and/or Stage 3 controls have not been implemented at the premises.*
>
> ***U2.2 Field odour surveys***
>
> *The licensee must engage a suitably qualified independent person to undertake a minimum of (3) field odour surveys, at least one week apart. These must at a minimum:*
>
> *a) Characterise the frequency, intensity, duration, offensiveness, location and extent of any off-site odours.*
>
> *b) Be undertaken during hours when poor dispersion and/or peak odour emissions are expected.*
>
> *Findings and conclusions from the odour survey must be presented in the context of the activities being undertaken at the time the odour survey was conducted.*
>
> ***U2.3 Community engagement and investigations***
>
> *The licensee must provide:*

a) A summary of findings and conclusions from any community consultation/engagement investigations that may have been undertaken by the licensee in the last 10 years to understand potential odour impacts at community receptors and neighbouring industrial facilities.

b) The site-specific procedure to investigate odour complaints and determine whether the odour impacts are attributable to the on-site operations.

U2.4 By 30 September 2022, the licensee must provide the EPA the information required in Conditions U2.1, U2.2, and U2.3

On 1 November 2022, NSW EPA issued notice 1622790 to EPL 883 which stated:

Odour Pollution Reduction Study PRP

J. On 7 October 2022, the EPA received the report required under the Odour Pollution Reduction Study (Stage 1) PRP.

K. The EPA has reviewed the report and has determined that the licensee has completed their obligations under Stage 1, and that Stage 2 of the PRP be placed on the licence.

Correspondingly, Condition U2 of Notice 1619775 has been complied with.

On 28 February 2023, NSW EPA issued notice 1627077 to EPL 883 which includes Condition U3:

U3 Odour Pollution Reduction Study (Stage 2)

U3.1 Odour monitoring methodology

The licensee must provide detailed information regarding the procedures used to review and approve any odour testing and the independent odour audit reports. Consideration must be given but not necessarily be limited to:

1. A detailed description of the methodology to undertake odour emission monitoring. Detailed description of any deviation from the relevant test method(s), including the analysis of the likely effect of any deviation on the final test results.

2. A precise definition of 'normal' daily operating ranges.

3. A detailed list of process parameters which are monitored and recorded by the Licensee for the purposes of ensuring odour testing is undertaken at representative operating conditions and ranges.

4. The QA/QC measures implemented by the Licensee to verify test results provided by the contractor.

5. The criteria developed by the Licensee to review and approve the independent odour audit.

U3.2 Historical odour monitoring results

The licensee must provide:

1. A detailed summary of any odour monitoring results (i.e. measured concentrations) collected over the last ten years.

2. Figures showing the change in the emissions profile for each of the identified odour sources. Where significant differences in the emissions rates for individual sources is identified, an individual analysis of measured concentration and flow rates must be undertaken.

3. Figures comparing the measured odour concentrations against the process parameters (e.g. operating rates) during the period of time the odour emission monitoring was undertaken to demonstrate the plant was operating within normal daily ranges.

4. Based on the analysis undertaken in item 3a (i.e. historical odour monitoring results), a statement for each source regarding the recorded trend (e.g. increased, decreased) in emissions over the last ten years.

5. Where recent monitoring data is not available for a source, detailed discussion must be provided to robustly demonstrate that historical data is representative of the current emissions magnitude and operating variability.

6. A statement of compliance stating that the air emission testing was conducted as per the methodology described in Condition U3.1.

7. Comparison of the performance of the existing odour control equipment against the assumed efficiency in the initial odour assessment (upon which approval was granted). This is to include the identification of any reasons for existing odour control equipment not achieving the expected performance.

8. Use findings and conclusions from points 1-7 above to undertake a review and performance evaluation of the existing odour emission controls, including identification of odour control equipment for which performance can be improved.

U3.3 Odour emissions inventory

The licensee must prepare a consolidated summary table for all existing and approved sources that contains the following information:

1. Odour source name;

2. Odour source model reference ID;

3. Where applicable, the EPA monitoring identification number as per the Environment Protection Licence;

4. Part of the plant the source belongs to;

5. Type of source (i.e. point, area, volume);

6. Odour character and intensity (e.g. weak, distinct, strong, very strong, extremely strong) at the source;

7. Anticipated emission frequency (i.e. number of hours a day, number of days a week);

8. Whether or not the source is wake affected, and how that has been determined and assessed;

9. Odour concentration;

10. Odour emission rate;

11. Justification for assumed odour concentration and emission rate. This is to include detailed information regarding the assumptions made to estimate constant and variable emission rates (e.g. boilers, biofilters, effluent storage dams and membrane bio-reactor) and detailed analysis to support any assumptions made to scale odour emission rates;

12. Performance of odour control equipment.

U3.4 Biofilter performance review

The licensee must engage a suitably qualified person to undertake a review and provide recommendations regarding the performance of Biofilters A and B.

The review and recommendations must give consideration, but not necessarily be limited to:

1. The size and capacity of Biofilters A and B;

2. Ensuring that Biofilters A and B are operated in a proper and efficient manner to minimise odour emissions from the premises.

Based on the outcomes of the review, the licensee must nominate and commit to a specific timeframe to implement any identified changes resulting from the review.

U3.5 By 28 February 2023, the licensee must provide the information required in Conditions U3.1, U3.2, U3.3 and U3.4 to the EPA.

It is understood that the time allocation for completion of Condition U3 has been subsequently extended, and that work is currently in progress.

4. ODOUR AUDIT FINDINGS

The compiled audit table of the above information is presented in **Table 13**.

Table 13 Consolidated odour conditions and summary of compliance (MOD 21, Schedule 3)

Condition 22/23-NC-*n*	Requirement	Evidence	Independent Audit Findings and Recommendations	Compliance Status & UIN
Offensive Odour				
1	The Applicant shall not cause or permit the emission of offensive odours from the site, as defined under Section 129 of the POEO Act.	**Section 3.2** provides a summary of the odour complaints, and these are replicated (with redaction) in **Appendix E**. The number of odour complaints received in this period is 10 (see **Section 3.2**, which have been investigated and are closed.	NSW EPA has not issued any infringement notices against EPL 883 regarding offensive odour, as defined in Section 129 of the POEO Act.	Compliant
Implementation of Mandatory Odour Controls				
2	Prior to increasing ethanol production rates on site above 126 million litres a year or within 12 months of this approval, whichever is sooner, the Applicant shall implement all the mandatory odour controls listed in Appendix 3 and described in detail in the Odour Management Plan (see condition 4 below), to the satisfaction of the Secretary.	Controls implemented as evidenced in previous IOA.	None.	Compliant

Condition 22/23-NC-*n*	Requirement	Evidence	Independent Audit Findings and Recommendations	Compliance Status & UIN
3	The Applicant shall implement additional mandatory odour controls as may be directed by the Secretary, arising from the Department's assessment of any:	Controls implemented as evidenced in previous IOA.	None.	Not triggered
	a) Independent Odour Audit (see condition 5 below);	None.	None.	--
	b) Independent Environmental Audit (see condition 4 of schedule 4); or	None.	None.	--
	c) any monitoring results, incidents or complaints related to the project.	None.	None.	--
3A	Prior to commissioning the duct work that directs additional emissions from the evaporator plant area and load-out chute to the bio-filter (as identified in the amended modification proposal) the Applicant must demonstrate to the satisfaction of the Secretary and the EPA that the bio-filter can accommodate the additional load while maintaining acceptable treatment performance.	Controls implemented as evidenced in previous IOA.	Completed.	Compliant

Condition 22/23-NC-*n*	Requirement	Evidence	Independent Audit Findings and Recommendations	Compliance Status & UIN
3B	Should the Applicant opt to install a DDG pelletising plant as identified in the additional odour controls in Appendix 3 the plant must comply with all regulatory requirements including air and odour emissions standards that are in force at the time of installation. Compliance must be demonstrated to the satisfaction of the Secretary and EPA before installation work begins.	Controls implemented as evidenced in previous IOA.	Completed.	Compliant
3C	Deleted	None.	None	--
3D	Prior to construction of any part of MOD 11 and MOD 12 as described in Schedule 2, Condition 2, the Applicant shall implement odour mitigation controls on the gluten dryers 3 and 4. The controls shall include re-orienting the discharge vents and increasing the velocity of discharges to improve odour dispersion, as described in MOD 11 and MOD 12. The Applicant shall provide evidence to the satisfaction of the Secretary to demonstrate that the odour mitigation controls have been successfully implemented.	The plant modifications, including the re-orientation of the discharge vents have been implemented, although it is noted that neither of the modified discharges are vertical.	A letter from DPI&E (ref: 10/06422-11, dated 24/10/17) provides evidence of DPI&E satisfaction on the installation of the odour controls on gluten dryers 3 and 4.	Compliant

Condition 22/23-NC-*n*	Requirement	Evidence	Independent Audit Findings and Recommendations	Compliance Status & UIN
Odour Management Plan				
4	The Applicant shall prepare an Odour Management Plan for the project to the satisfaction of the Secretary. This plan must: a) be prepared in consultation with EPA by a suitably independent, qualified and experienced expert whose appointment has been endorsed by the Secretary, and submitted to the Secretary for approval within 3 months of the date of this approval;	The OMP is discussed in **Section 3.1.1**.	It has been completed by The Odour Unit, who are a suitably qualified and experienced expert in odour management. It is noted that the OMP has received DPE review.	Compliant
	b) describe in detail the measures that would be implemented on site to control the odour impacts of the project, and to ensure that these controls remain effective over time;	The OMP is discussed in **Section 3.1.1**.	Section 2 and 3 of the OMP adequately addresses odour control.	Compliant
	c) identify triggers for remedial action; and	The OMP is discussed in **Section 3.1.1**.	Section 3 of the OMP addresses upset conditions that would prompt remedial actions to assist reduce the resultant potential impacts.	Compliant
	d) include a program for monitoring the odour impacts of the project.	The OMP is discussed in **Section 3.1.1**.	Section 4 of the OMP presents details of the system monitoring program.	Compliant

Condition 22/23-NC-*n*	Requirement	Evidence	Independent Audit Findings and Recommendations	Compliance Status & UIN
4A	Prior to increasing ethanol production the Odour Management Plan for the project must be updated to the satisfaction of the Secretary to include the additional Appendix 3 mandatory odour controls specified in the modification approval MOD 1 – Deletion of DDG Pelletiser.	None.	Completed.	Compliant
Independent Odour Audit				
5	Within 3 months of the implementation of the mandatory odour controls (see Appendix 3), and annually thereafter unless the Secretary directs otherwise, the Applicant shall commission and pay the full cost of an Independent Odour Audit of the project. This audit must be conducted by a suitably qualified, experienced and independent expert whose appointment has been endorsed by the Secretary. During the audit, this expert must:	The Letter of Endorsement from the Director General is provided in **Appendix A**.	The Letter of Endorsement from the Director General is provided in **Appendix A**.	Compliant
	a) consult with the EPA and the Department	**Section 1.2** presents a summary of the consultation with the EPA and DPE.	Consultation performed and recommendations for the odour audit adopted	Compliant

Condition 22/23-NC-*n*	Requirement	Evidence	Independent Audit Findings and Recommendations	Compliance Status & UIN
	b) audit the effectiveness of the odour controls on site in regard to protecting receivers against offensive odour;	**Section 3** presents the collated information regarding odour control.	The information provided and reviews includes a wide range of ongoing compliance monitoring data to quantify and evaluate the odour control performance of the plant.	Compliant
	c) review the Applicant's production data (that are relevant to the odour audit) and complaint records;	**Section 3.3** presents a summary of the production data corresponding to the monitoring program dates. **Section 3.2** presents a summary of the odour complaints for the audit period.	The production data provided by Shoalhaven Starches has been reviewed and is tabulated in **Table 3**. The number of odour complaints received in this period is ten (10) (#068 to #077). It is noted that complaints #069, #071 and #075 have required additional storage pond capacity. All complaints are closed out i.e. adequately actioned.	Compliant
	d) review the Odour Management Plan for the project;	**Section 3.1.1** provides a summary of any relevant updates to the OMP.	During this audit period, there are no relevant updates relevant to this odour audit.	Compliant
	e) measure all key odour sources on site, and compare the results of these measurements against the predictions in the EA;	Audit of monitoring data presented in **Sections 3**. The comparison against modelling assessment provided in **Section 3.7**	The quarterly and annual emission testing has been completed over the auditing period.	Compliant

Condition 22/23-NC-*n*	Requirement	Evidence	Independent Audit Findings and Recommendations	Compliance Status & UIN
	f) determine whether the project is complying with the requirements in this approval; and	Reference should be made to the rest of the document.	Reference should be made to the rest of the document in which specific compliance (or otherwise) is documented.	--
	g) if necessary, recommend and prioritise measures to either improve the odour controls on site and/or the Odour Management Plan, such that receivers would be protected against offensive odour from the site.	**Section 5** provides a summary of this Independent Odour Audit. **Section 5.1** provides a summary of non-compliances and **Section 5.2** provides recommendations.	Recommendations as documented in **Section 5.2**.	Compliant
	Note: The Secretary may vary the frequency of the audit depending on the performance of the project.	None	None.	--
6	Within 6 weeks of the completion of this audit, the Applicant shall submit a copy of the audit report to both EPA and the Secretary with a response to any recommendations contained in the audit report.	Outside the scope of the Independent Odour Audit.	None	--

Condition 22/23-NC-*n*	Requirement	Evidence	Independent Audit Findings and Recommendations	Compliance Status & UIN
Odour verification (MP 06_0228 MOD 2)				
6A	The Applicant shall ensure that any Independent Odour Audit submitted to the Secretary in accordance with Condition 5 of this Schedule includes: a) 3 monthly (quarterly) odour monitoring with samples taken from the carbon dioxide/ethanol recovery scrubber inlet/s and outlet/s; and	The quarterly odour monitoring reports are discussed in **Section 3.6**, and attached as **Appendix D** to this audit report.	The quarterly and annual emission testing has been completed over the auditing period.	Compliant
	b) quarterly odour monitoring with samples taken of single vent stack (direct to atmosphere) emissions from a filling fermenter tank.	The quarterly odour monitoring reports are discussed in **Section 3.6**, and attached as **Appendix D** to this audit report.	The quarterly and annual emission testing has been completed over the auditing period.	Compliant
6B	Deleted	None required	The quarterly and annual emission testing has been completed over the auditing period.	--
6C	The Applicant shall conduct quarterly odour monitoring from the DDG exhaust stack and report the results in the independent odour audit required under Condition 5 of Schedule 3.	The quarterly odour monitoring reports are discussed in **Section 3.6**, and attached as **Appendix D** to this audit report.	The quarterly and annual emission testing is summarised in **Table 8**. It is observed that EPA ID 46 (DDG Pellet Plant Stack) was not tested during Q3 and Q4.	Not compliant

Condition 22/23-NC-*n*	Requirement	Evidence	Independent Audit Findings and Recommendations	Compliance Status & UIN
6D	The Applicant shall conduct odour monitoring on the relocated starch dryer described in MOD 7 in accordance with the requirements of the EPL and report the results in the independent odour audit required under Condition 5 of Schedule 3.	The quarterly odour monitoring reports are discussed in **Section 3.6**, and attached as **Appendix D** to this audit report.	MOD7 relates to the No5 Starch Dryer (as captured in the EPL variation dated June 2018).	Compliant
6E	If the results of odour monitoring show any odour impact greater than that predicted by the odour dispersion modelling in the EA and the modification proposals referred to in Condition 2 of Schedule 2, the Applicant shall investigate and implement further odour treatment options as directed by the Secretary or the EPA.	Section 3.7 presents a summary of the modelled odour emission rates as presented in the MOD21 and MOD 23 air quality assessment reports.	The sequential process modifications have been modelled and assessed, up to MOD23. A comparison presented in Section 3.7 shows modelled emissions were in the order of 105 % of the corresponding measured odour emission rates. It is noted that the MOD23 modelling includes a significant number of additional sources not included within the scope of this audit. Overall, it is considered that the modelling represents the site adequately.	Compliant

Condition 22/23-NC-*n*	Requirement	Evidence	Independent Audit Findings and Recommendations	Compliance Status & UIN
6F	The Applicant shall conduct odour validation monitoring on the gluten dryers 3 and 4, following implementation of the mitigation controls required by Condition 3D. Results of the odour validation monitoring shall be included in the independent odour audit required under Condition 5 of Schedule 3.	The quarterly odour monitoring reports are discussed in **Section 3.6**, and attached as **Appendix D** to this audit report.	The quarterly and annual emission testing has been completed over the auditing period.	Compliant

5. SUMMARY

Based upon the information reviewed the following recommendations are proposed.

5.1. Identified Non-Compliances

Table 14 below presents the observed non-compliances against the consolidated odour conditions (see **Table 13**).

Table 14 Independent odour audit non-compliances

UIN	Condition and Requirement	Evidence & Independent Audit Findings and Recommendations	Compliance Status
22/23-NC-6C	6C. The Applicant shall conduct quarterly odour monitoring from the DDG exhaust stack and report the results in the independent odour audit required under Condition 5 of Schedule 3.	The quarterly and annual emission testing is summarised in Table 8. It is observed that EPA ID 46 (DDG Pllet Plant Stack) was not tested during Q3 and Q4.	Non-compliant

5.2. Recommendations

Recommendations from this audit period (2022-2023) and any remaining unresolved recommendations from the previous audits are summarised in **Table 15**.

Table 15 Independent odour audit recommendations

Reference	Recommendation	Implementation
2022-23 Odour Audit Recommendations		
22/23-REC-A	Complaints logged, including 069, 071 and 075 are attributed to a biogas leakage from the BVF due to excessive COD loading in the incoming wastewater from the factory. The complaint records document various controls being implemented to manage this issue, including those included as MOD 22, including various additional capacity measures as described at complaint 075. It is therefore a recommendation of this independent odour audit that those measures are implemented as expediently as possible to resolve this identified capacity shortfall and identified source of uncontrolled odour discharge.	Identified in this report for consideration

Reference	Recommendation	Implementation
22/23-REC-B	The biofilters are not achieving the de facto 500 OU standard and are not achieving a satisfactory degree of odour control (measured as 8 % efficiency). It is acknowledged that Shoalhaven Starches are currently constructing a duplicate set of biofilters to redistribute the flow to achieve the design capacity flow rate through all biofilters. The performance of the biofilters remains an unresolved issue and it is recommended that it is resolved at the earliest opportunity.	Identified in this report for consideration
22/23-REC-C	It is recommended that the access limitations preventing EPA 46 (DDG Pellet Stack) are resolved to ensure that EPA 46 is available to be tested during the following testing periods.	Identified in this report for consideration
22/23-REC-D	With regard to flow measurements at EPA ID 8 the odour monitoring reports state: *"Sampling was undertaken at the exit of the stack as it was the only accessible area for the samples to be taken. No temperature or flow rate readings could be taken due to access issues."* Shoalhaven Starches have advised that access is limited due to the addition of a silencer on this discharge point for noise control purposes. It is recommended that the access restrictions to EPA ID 8 are resolved to enable compliant odour monitoring to be performed.	Identified in this report for consideration
22/23-REC-E	It is recommended that the variability in the measured odour emission rates for EPA ID 10, 39, 44 and 47 is investigated.	Identified in this report for consideration
2021-22 Odour Audit Recommendations		
21/22-REC-A	Whilst it is acknowledged that the biofilters are achieving a reasonable degree of odour control (56 % efficacy), the flow-weighted average odour concentration is not achieving the de-facto 500 OU standard. This matter remains an unresolved issue and it is recommended that it is resolved at the earliest opportunity.	Ongoing
21/22-REC-C	With regard to flow measurements at EPA ID 8 the odour monitoring reports state: "*Sampling was undertaken at the exit of the stack as it was the only accessible area for the samples to be taken. No temperature or flow rate readings could be taken due to access issues.*" It is recommended that the access restrictions to EPA ID 8 are resolved to enable compliant odour monitoring to be performed. It is understood that new sampling ports have been installed (Sep 2022) that would be in	Ongoing

Reference	Recommendation	Implementation
	compliance during the following odour audit period. (See also 22/23-REC-D).	
2020-21 Odour Audit Recommendations		
20/21-REC-A	Whilst it is acknowledged that the biofilters are achieving a high degree of odour control (i.e. >90 %), the flow-weighted average odour concentration is not achieving the de-facto 500 OU standard. This matter remains an unresolved issue and it is recommended that it is resolved.	Ongoing
2019-20 Odour Audit Recommendations		
2019-20-IOA-A	As identified at Section 3.1 and Section 3.5, and as stated in the Biofilter Capacity and Condition Assessment report #23, the biofilters are not achieving the *de facto* 500 OU standard. This should be flagged for ongoing observation and remedial action as required.	Ongoing
2018-19 Odour Audit Recommendations		
2018-19-IOA-B	As identified at Section 2.4, Section 2.9.3 (of the 2018-19 audit) and stated in the Biofilter Capacity and Condition Assessment report #22 (June 2019), the biofilters are not achieving the *de facto* 500 OU standard. This should be flagged for ongoing observation and remedial action as required.	Ongoing
2017-18 Odour Audit Recommendations		
2017-18-IOA-C	As identified at Section 2.3 (of the 2017-18 audit) and stated in the Biofilter Capacity and Condition Assessment report #21 (April 2018), the biofilters are not achieving the *de facto* 500 OU standard. This should be flagged for ongoing observation and remedial action as required.	Ongoing