ASSESSMENT REPORT

Shoalhaven Starches Expansion Project
Modification – Fermenter and Distillery Additions
(MP 06_0228 MOD 2)

1. BACKGROUND

Shoalhaven Starches Pty Ltd (Starches) operates a factory off Bolong Road at Bombaderry on the outskirts of Nowra in the Shoalhaven local government area (see Figure 1).

The factory began operating in 1979 to produce starch, gluten and glucose products from wheat and sorghum supplied by rail from central NSW. These products are used in the food, paper and brewing industries. Since 1992, the factory has also produced ethanol for use in the motor transport industry, and the by-product dried distillers grain (DDG) for use as feed for livestock. Wastewater from the factory is treated and irrigated on a nearby 'environmental farm' (see Figure 1).

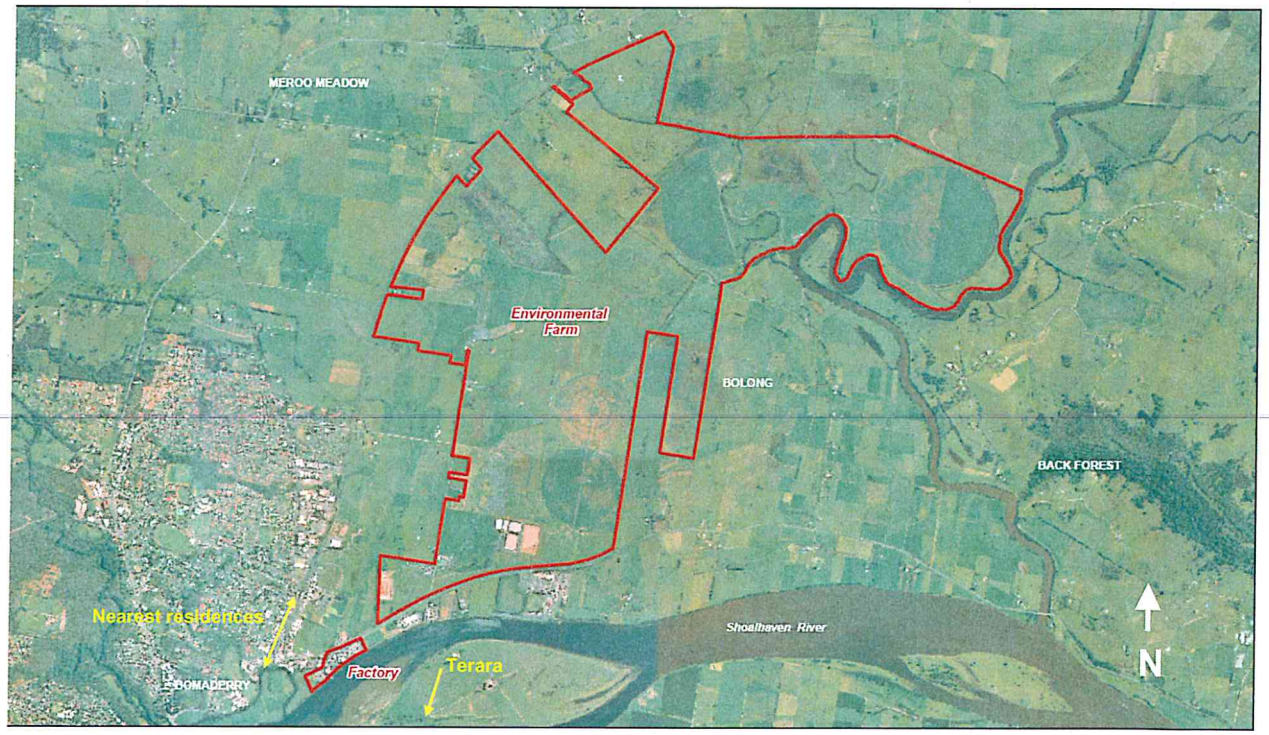

Figure 1 - Shoalhaven Starches' processing plant and environmental farm site context

The factory primarily operates under a planning approval issued by the then Minster in 2009 (see below). However, the Department was recently made aware that Shoalhaven City Council has also issued at least two consents (for an interim product packaging plant and road works) to Starches since 2009. The factory has also had a history of odour problems since it began operation.

The factory site is surrounded by a mix of industrial, commercial and residential premises with land also owned by Starches located to the north. The nearest residences are located between approximately 200 to 500 metres (m) north-west of the factory in Meroo Street, Bomaderry (see Figure 1).

In January 2009, following a review by the Planning Assessment Commission (PAC), the then Minister approved the Shoalhaven Starches Ethanol Expansion Project. This approval allowed Starches to increase ethanol production at the Bomaderry factory in a staged manner from 126 to 300 million litres a year, subject to strict conditions including many relating to odour performance (see Director-General's report and original conditions of approval in Appendix D).

In particular, as part of the approval to facilitate increased ethanol production at the factory, a number of equipment and infrastructure additions were necessary including (but not limited to):

- 3 additional fermenter tanks, each with a capacity of 3 megalitres (ML) at the eastern boundary of the site;
- additional molecular sieves and associated heat exchangers; and
- additional cooling towers.

All equipment and infrastructure additions approved as part of the ethanol expansion project are illustrated in Figure 2 below.

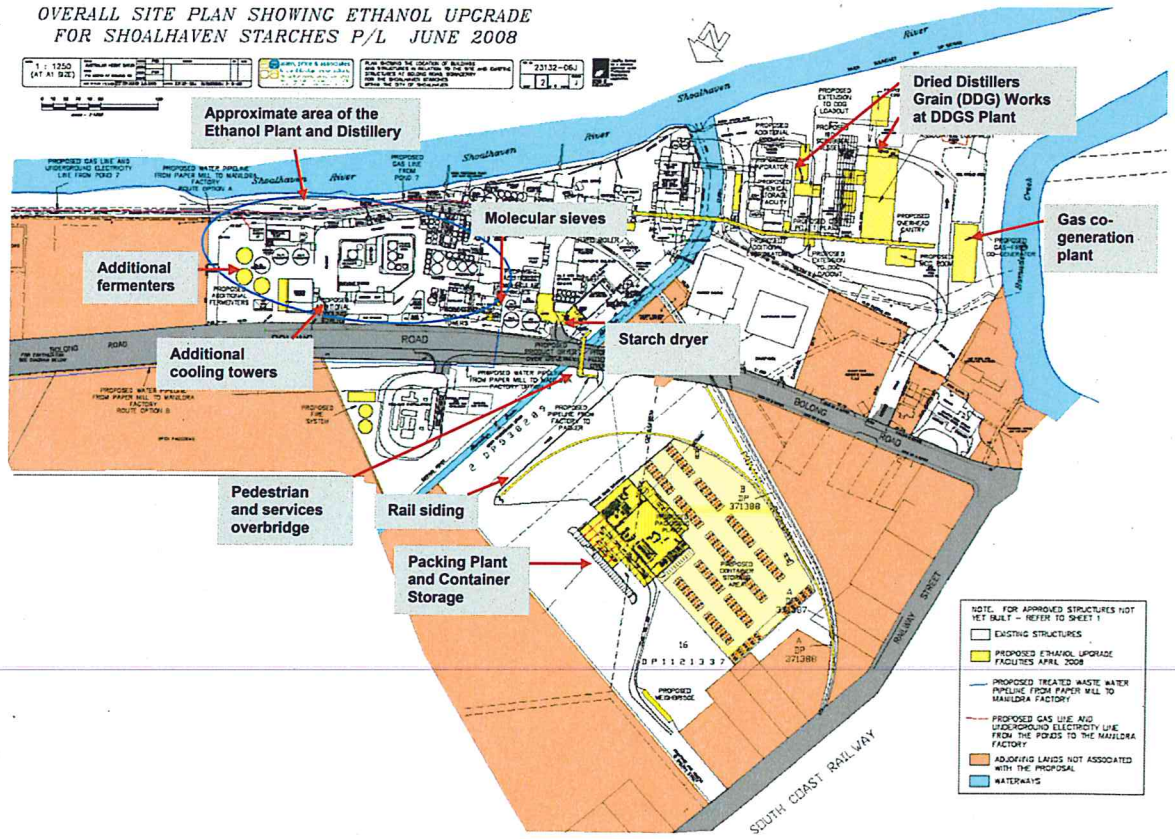

Figure 2 – Approved ethanol expansion equipment and infrastructure additions

On 4 June 2012, the Director-General granted final approval to Starches to increase ethanol production at the factory to a maximum of 300 ML a year, subject to the completion of construction and successful commissioning of a new biofilter at the site. In July 2012, PAEHolmes confirmed that the new biofilter had been completed and successfully commissioned.

Notwithstanding the odour performance measures that have been implemented since the 2009 approval was granted, Starches has also identified the need to undertake some operational and energy efficiency improvements at the site.

1.1. Operational Efficiency (Fermentation Process)

Ethanol Production

Ethanol is produced at the Distillery on-site by fermentation of starch, gluten and syrups.

The existing fermentation process is a 'continuous process' where feed from the starch plant continually flows through each of the fermenters before reaching the Distillery. The time taken for this process to occur is sufficient for the conversion of starch by yeast into alcohol.

However, when fermenters are taken out of service for cleaning on a continuous production system it is difficult to:

1. maintain the time required for conversion to alcohol; and
2. allow sufficient time for thorough cleaning of the fermenters.

Cleanliness is extremely critical in the fermentation process. If fermenters are not cleaned thoroughly bacteria competes against the yeast to consume part of the carbohydrate (starch) in the 'beer' thereby reducing the yield of ethanol. Consequently, 'beer' at the ethanol plant is becoming contaminated with bacteria and reducing the amount of industrial grade ethanol that is produced at the factory.

DDG Production

One of the by-products of ethanol production is DDG which is produced at the Dried Distillers Grain Syrup (DDGS) Plant (see Figure 2).

Similar to the above, when the DDGS Plant equipment is taken offline for cleaning, production in both the Distillery and the DDGS Plant is affected. At present, one of the existing fermenters has to be used as a buffer tank to even out flows between the Distillery and the DDGS Plant by filling in when sections of the DDGS Plant are offline for cleaning.

Once the DDGS equipment is cleaned, production in the Distillery has to be increased to meet normal operational requirements. This result in peaks and troughs in production at both the Distillery and the DDGS Plant.

1.2. Energy Efficiency

The Distillery uses two energy sources, electricity for motors and pumps and steam which is produced by natural and coal fired boilers on-site. Operational costs at the facility are estimated to cost Shoalhaven Starches over $10 million dollars a year. Consequently, Shoalhaven Starches has recently been exploring options to replace some of the older equipment on-site with alternative energy efficient options to reduce the cost associated with the supply of energy to the site.

2. PROPOSED MODIFICATION

On 19 January 2012, Shoalhaven Starches (Starches) lodged a modification application with the Department under section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to install some additional infrastructure necessary to facilitate improved operational and energy efficiency at the factory.

The proposed modifications to the site are summarised below and illustrated in Figures 3 to 6.

Starches proposes to:

Fermenters

- install 2 additional fermenters:
  - 1 to allow the conversion from 'continuous' to 'batch' fermentation to reduce the risk of ethanol contamination; and
  - 1 to maintain DDG and ethanol production capacity when equipment is taken offline for cleaning at the DDGS Plant.
- install a 20m X 20m concrete slab adjacent to the proposed additional fermenters to enable easy on-site fabrication of fermentation structures (e.g. for welding large tank walls together); and
- install a carbon dioxide/ethanol recovery scrubber as part of the new fermentation process.

Distillery

- install an additional more energy efficient evaporator unit (with 5 vessels), heat exchangers, pumps piping valves and electrical equipment adjacent to the existing Distillery;
- install an additional more energy efficient beer column, heat exchanger (H504), fan, platform, pumps, piping valves and electrical equipment within the Distillery;
- remove an old inefficient beer column (D10) in the Distillery and replace it with a new rectifier column and side stripper vessel to improve ethanol yield;
- remove the existing fire wall in the Distillery and modify the fire system;
- expand electricity substation no. 7 to house additional motor control equipment for the new infrastructure; and
- install additional compressors housed in a new compressor room to provide additional compressed air to piping valves.

No change is proposed to the ethanol, grain or DDG production capacity at the factory or the volume of wastewater generated. The proposed fermenters would be identical in height (ie. 21m) and capacity to the existing ones on-site (see Figures 3 & 5).

The proposed modification is described in full in the modification application and accompanying Environmental Assessment (EA) in Appendix B of this report.

Early Works

During the course of this assessment, the Department became aware that Starches had unlawfully commenced construction of one of the new fermenters which is the subject of this modification. This was confirmed by the Department following a site inspection.

In terms of this breach, the Department is currently investigating the matter with the view to taking appropriate enforcement action.

With regards to the unlawful structures, the Department considers that in the case where a construction certificate has not been issued for an 'unapproved' structure or building, a building certificate (under Section 149A and 149B of the EP&A Act) should be obtained from Shoalhaven Council to cover all aspects of construction and occupation.

This would ensure that the early works are structurally sound, comply with the Building Code of Australia and/or other relevant building standards. As such, a condition has been included in the modification instrument which requires Starches to obtain and provide copies of all necessary building certificates from Council for these early works, prior to the commencement of operations of the modification.

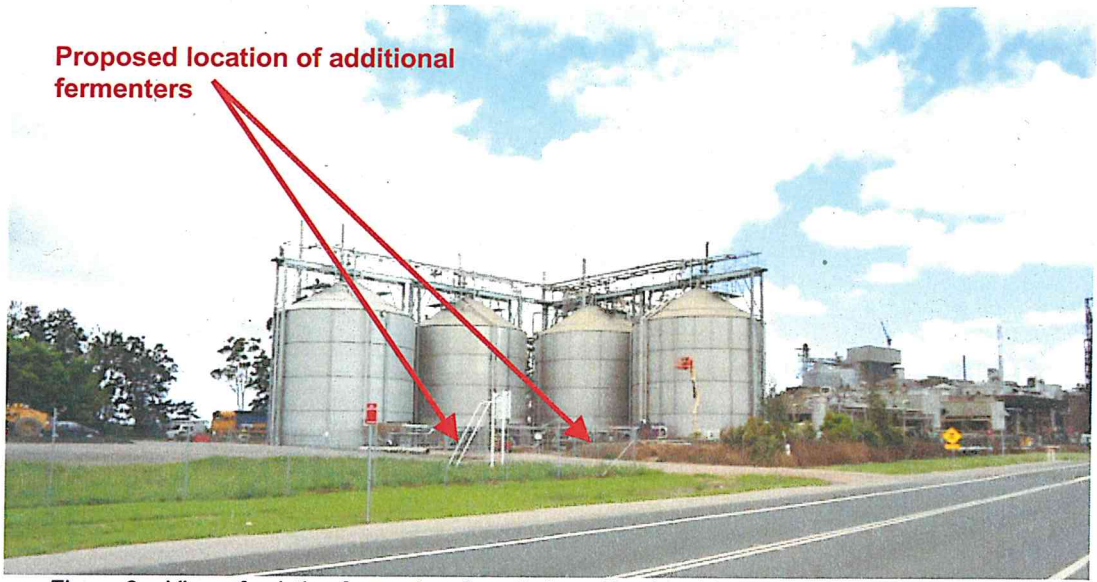

Figure 3 – View of existing fermenters from Bolong Road and location of proposed fermenters

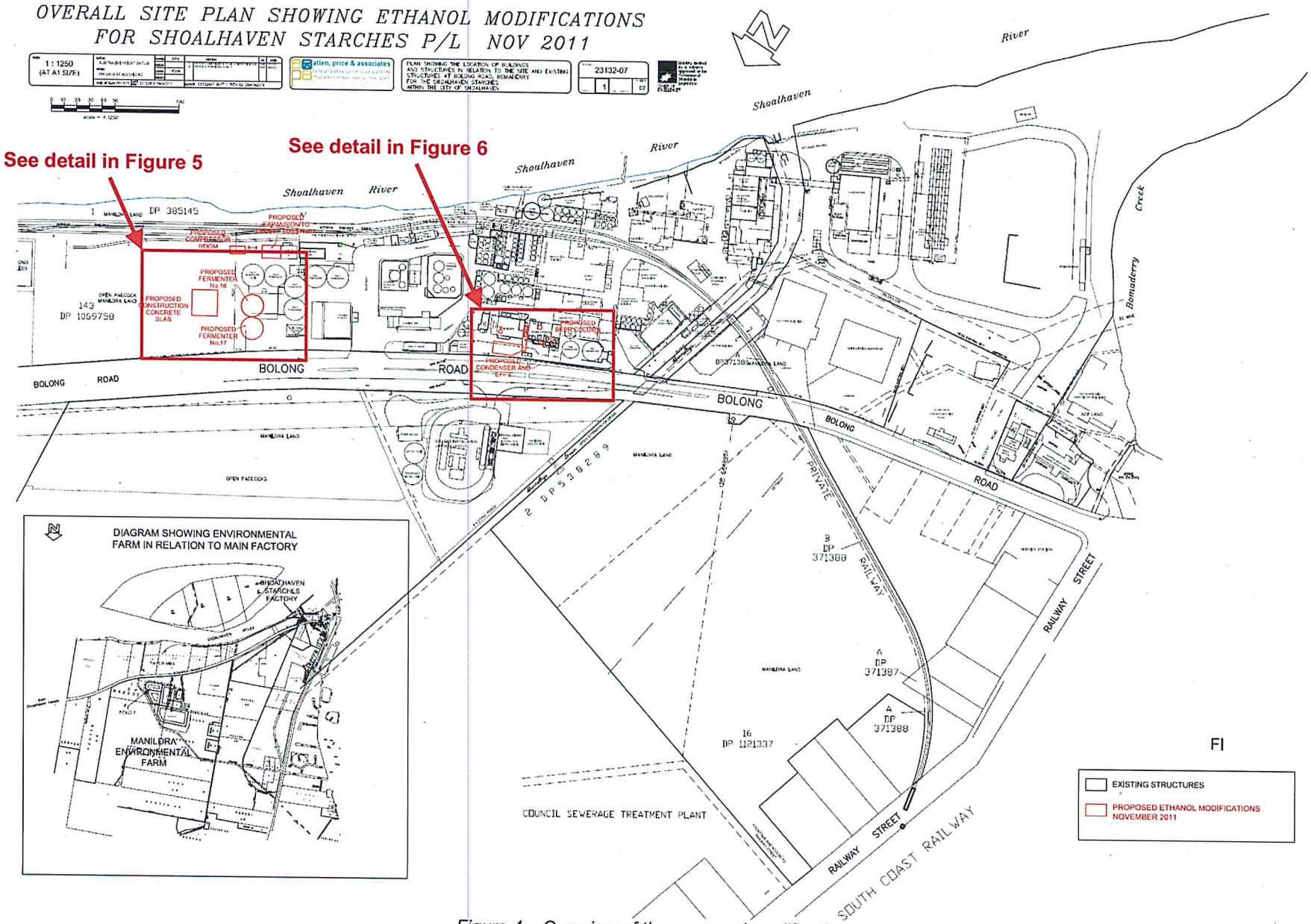

Figure 4 – Overview of the proposed modifications

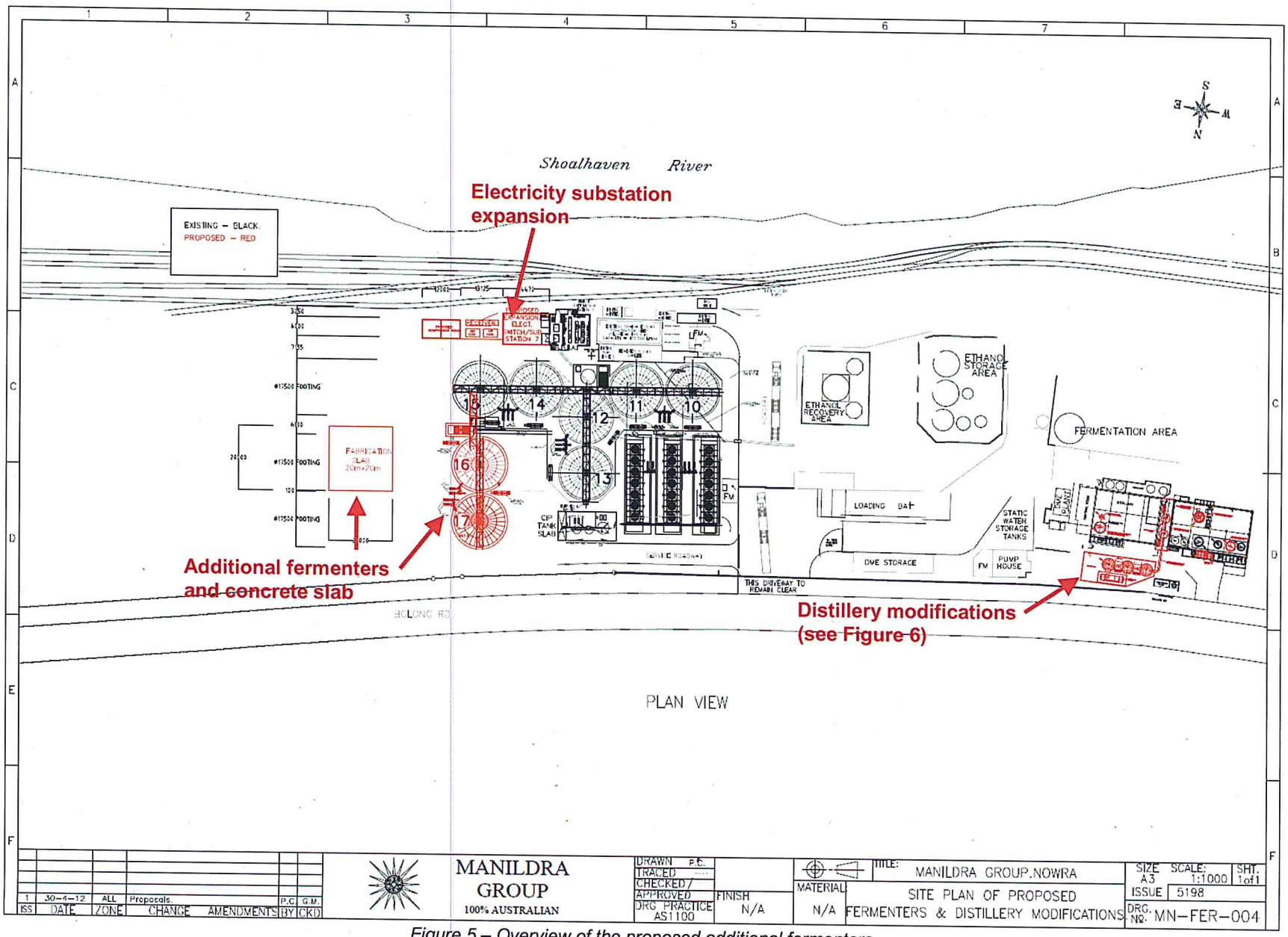

Figure 5 – Overview of the proposed additional fermenters

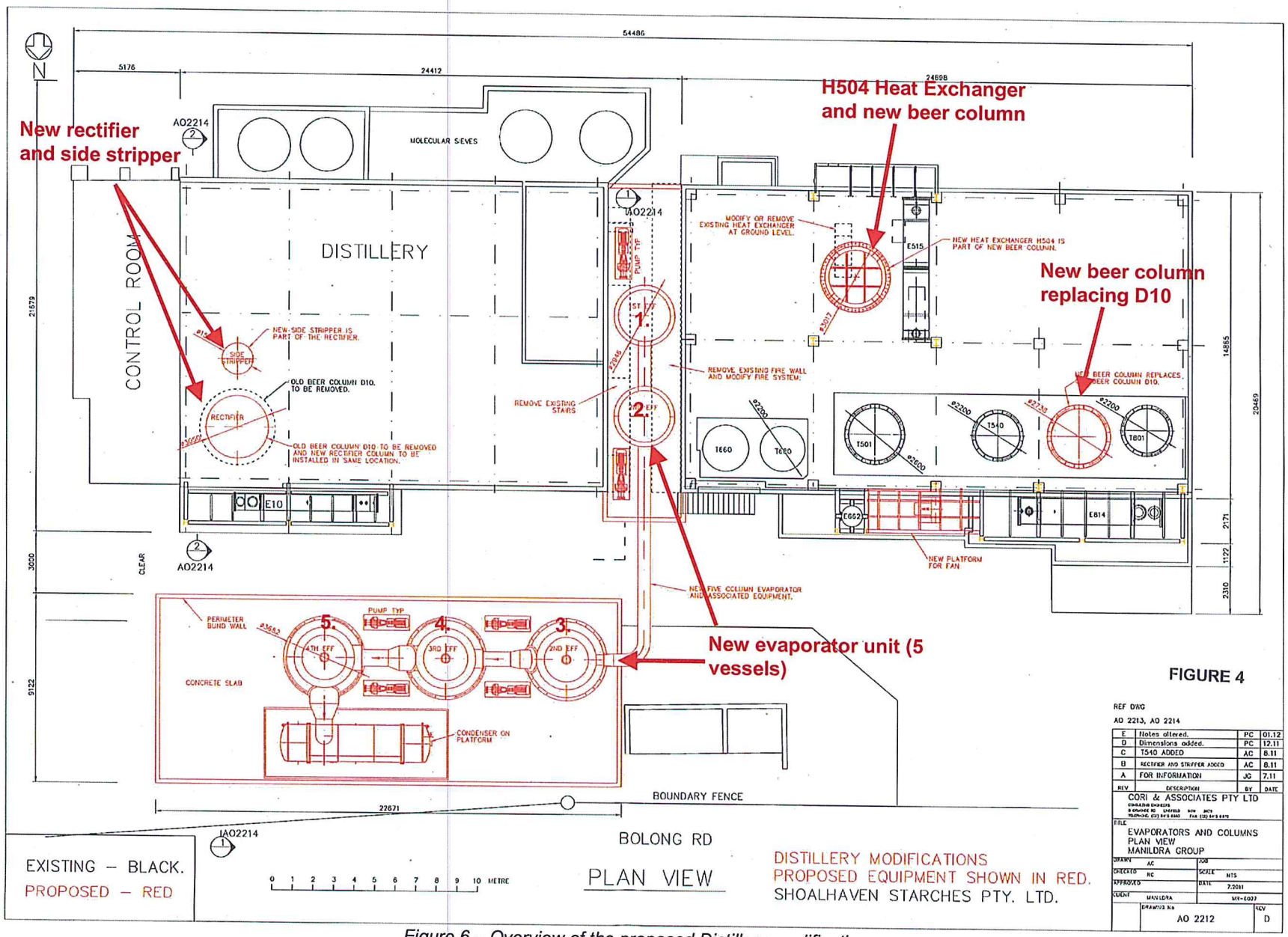

Figure 6 – Overview of the proposed Distillery modifications

3. STATUTORY CONTEXT

Approval Authority
The Minister was the approval authority for the original project application, and is consequently the approval authority for this application.

However, as reportable political donations were made by Shoalhaven Starches in respect of the modification application, the application will be determined by the Planning Assessment Commission in accordance with the Minister's Instrument of Delegation, dated 14 September 2011.

Section 75W
Under Section 75W of the EP&A Act, the Minister is obliged to be satisfied that what is proposed is indeed a modification of the original project, rather than being a new project in its own right.

The development footprint of the approved facility would not significantly change as a result of the proposal and no change is proposed to the approved production levels. In addition, the proposed modification is not expected to result in an unacceptable increase in environmental impacts relative to the approved facility. Therefore, it is considered that the proposed modification is within the scope of section 75W of the EP&A Act.

Consequently, the Department considers that the application should be assessed and determined under Section 75W of the EP&A Act rather than requiring a new development or project application to be lodged.

4. CONSULTATION

Under Section 75W of the EP&A Act, the Minister is required to make the application publicly available on the Department's website. Upon receipt, the application was placed on the Department's website and following a review of the application, the Department did not believe formal public notification of the application was necessary. Notwithstanding, the Department sought comments from Shoalhaven City Council (Council) and the Environment Protection Authority (EPA).

Consultation with other neighbouring sites was considered unnecessary, as the environmental impacts of the proposal would essentially remain unchanged from the approved project.

Council raised concern that the proposed modification would result in increased visual impacts on the township of Bomaderry (if unmitigated) and requested that Starches provide an assessment of the impact of additional structures on flooding and emergency evacuation. Council also raised some minor issues in relation to compliance with the original project approval.

The **EPA** raised concern that the air assessment in the EA was not adequate in that it did not address the change to batch fermentation. The EPA suggested the change may increase odour emissions and requested that Starches undertake an air quality impact assessment (AQIA) in accordance with EPA guidelines.

Starches provided an AQIA in the response to submissions report (RTS) for the modification on 4 May 2012 (see Appendix D). However, following a review of the AQIA, the EPA requested that Starches undertake a further odour assessment including a comparative analysis between the air/odour emissions of the current operations or the proposed batch fermentation process. This additional odour assessment is provided in Appendix E of this report on 30 July 2012.

Copies of all submissions received from both Council and the EPA are contained in Appendix C of this report.

5. CONSIDERATION

The Department has assessed the merits of the proposed modification. During this assessment, the Department has considered:

- all issues raised in submissions (see Appendix B);
- all documentation supporting the proposed modification (see Appendices C, D & E);
- the environmental assessment for the original project;
- the Director-General's assessment report and conditionals of approval for the original project application (see Appendix F);
- the findings of the latest Independent Odour Audit of the factory site;
- all relevant environmental planning instruments, policies and guidelines; and
- the requirements of the EP&A Act, including the objects of the Act.

The Department considers air quality and visual amenity to be the key environmental issues associated with the modification. The Department's assessment of all other issues is outlined in Table 1.

5.1 Air Quality (including odour)

Issue

The proposed modification has the potential to increase or alter the air quality impacts of the project, particularly in relation to odour and dust.

Consideration

Odour

The factory has a history of odour problems. In 2006, Starches was prosecuted in the Land and Environment Court. The company was fined and required to undertake a comprehensive audit of all odour sources at the premises to identify options to prevent or treat odours.

This odour audit (conducted in 2007) found that emissions from the factory and Environmental Farm substantially exceeded relevant odour criteria at rural residences near the Environmental Farm and at residences in Bomaderry and the northern fringes of Nowra.

The audit recommended that odour could be minimised through a number of measures. These measures, together with a proposed expansion in ethanol production, formed the basis for the Ethanol Expansion Project (MP 06_0228), which (as above) was approved by the then Minster for Planning in 2009.

Under the terms of the 2009 approval, Starches could only increase ethanol production in a staged manner from 126 to 300 million litres a year, subject to satisfying a number of odour related conditions.

In June 2012, the Department granted final approval for Starches to increase ethanol production at the factory up to a maximum of 300 ML a year.

In its submission, the EPA noted that an air quality impact assessment (AQIA) for the proposed modification in accordance with the relevant EPA guidelines had not been included in the EA. The EPA raised concern that the proposed changes to the fermentation process could add to or alter odour emissions from the factory. Subsequently, the EPA requested that Starches undertake an AQIA to allow the EPA to be able to fully assess the impact of the proposal on air quality.

On 4 May 2012, Starches provided an AQIA in the response to submissions report (RTS) for the modification.

The EPA reviewed the AQIA and requested that Starches undertake a further odour assessment including a comparative analysis between the odour emissions of the current operations (i.e. continuous fermentation and distillery setup) and the proposed batch fermentation with a modified distillery setup.

On 30 July 2012, Starches provided the additional odour assessment (see Appendix E). This assessment concluded that at maximum production capacity (ie. 300ML of ethanol per annum), there would be a reduction in odour emissions by moving from a continuous to a batch fermentation process. While the introduction of batch fermentation would result in an additional source of odour emission, the installation of a carbon dioxide/ethanol recovery scrubber (as required by the EPA) at the facility would offset any increase from this source.

The EPA has reviewed the additional assessment and is now satisfied that the proposed modification would not increase odorous air emissions at the site. Notwithstanding, the EPA requested that conditions be imposed which would require Starches to undertake the following as part on-going Independent Odour Audits of the factory site:

- quarterly odour monitoring of emissions from the carbon dioxide/ethanol recovery scrubber associated with the new batch fermentation process; and
- annual odour monitoring of single vent stack (direct to atmosphere) emissions from a filling fermenter tank.

The Department has incorporated the EPA's request into the recommended conditions of approval.

Other emissions

During construction, the proposed modification would generate minor particulate (dust) emissions. However, the Department is satisfied that the implementation of reasonable and feasible measures to minimise dust generated by the project, as required under the existing conditions of approval, would ensure that dust impacts on nearby sensitive receivers (located approximately 200m - 500m away in Meroo Street, see Figure 1) are suitably managed.

During operation, the AQIA concluded that the proposed modification would not increase other emissions such as nitrogen oxides, volatile organics compounds or particulates from the gas fired boilers. As such, the Department and EPA are satisfied that these emissions would be negligible.

Conclusion

The Department and the EPA are satisfied that the air quality impacts of the proposed modification would be negligible. In particular, the additional odour assessment undertaken by Starches has confirmed that the modification would not increase odorous emissions from the factory site.

Finally, recommended conditions of approval for odour monitoring would ensure that the predictions of the modification EA and accompanying documents are verified and that odour performance continues to be closely monitored throughout the life of the project. Notwithstanding this, there are a number of existing conditions of approval in place to ensure the air quality impacts of the project are effectively managed including (but not limited to) the requirement for Starches to:

- not cause or permit the emission of offensive odours from the site, as defined under Section 129 of the POEO Act;
- implement the approved Air Quality Monitoring Program for the project;
- implement the approved Odour Management Plan for the project;

- undertake annual Independent Odour Audits for the project;
- undertake tri-annual Independent Environmental Audits of the project; and
- implement additional mandatory odour controls at the site as directed by the Director-General as a result of any audit findings, monitoring, incidents or complaints.

5.2 Visual Amenity

Issue

The proposed modification could increase the visual impact of the project.

Consideration

The Starches factory complex began operation in Bomaderry in 1979 and is characterised by typical industrial column like structures. The bulk and scale of the factory complex, despite being partially screened by vegetation along Bolong Road, the Shoalhaven River and Abernethy's Creek, visually dominates the locality.

The view of the factory site from Bolong Road is typified by internal structures including recovery and storage tanks, fermentation tanks and the Ethanol and Distillery Plants (see Figure 7).

The factory is exposed to intermittent viewing from persons in vehicles and pedestrians travelling along Bolong Road (see Figure 7), surrounding industrial sites (many of them owned by Starches) and rural farmland adjacent to the site of the proposed fermenters.

Figure 7 – Collage of key viewing points of the Shoalhaven Starches factory site from Bolong Road

The site is also partially visible from:

- the nearest residences in Meroo Street - approximately 200m to 500m to the north-east bordering the Bomaderry Industrial Precinct (see Figure 1); and
- the village of Terara - approximately 1.5 kilometres (km) to the south on the southern bank of the Shoalhaven River (see Figure 1).

As part of the Environmental Assessment for the modification, Starches engaged Cowman Stoddart Pty Ltd to undertake a Visual Impact Assessment (VIA).

Of the proposed modifications to the site, the new fermenters (see Figure 5) and evaporator unit (see Figure 6) are likely to have the greatest impact on visual amenity.

Fermenters

The new fermenters would be identical to the existing tanks (ie. large metal cylindrical tanks 16m in diameter by 21m in height, with supporting gantries increasing to an overall height of 28m) and located on the northern side of the Starches site.

The VIA suggested that the new fermenters would be unlikely to be visible from the nearest residences given the location of existing mature vegetation located between the Starches site and these properties. In addition, as the new fermenters would be located on the northern boundary of the Starches site, the VIA concluded that they would not be visible from the village of Terara, which is located on the southern side of Shoalhaven River. As such, the Department considers that the vistas from the nearest residences are unlikely to be significantly altered. Further, as the new fermenters are identical to the existing tanks, they would be generally consistent with the bulk, scale and industrial character of the site and its surrounds.

Evaporator Unit

The new evaporator unit would consist of a series of 5 column like structures with a height ranging from 18.3m to 28.05m situated within and adjacent to the existing Distillery (see Figure 6).

Whilst the new beer column and two of the evaporator columns will be sited within and between the framework of the existing Distillery, the other three evaporator columns and associated equipment will be situated upon a platform that would be located between the Distillery and Bolong Road (see Figure 6). These three columns are likely to have the greatest potential visual impact.

Despite this, it is considered that the evaporator columns are likely to be largely indistinguishable from the existing plant, would be similar in height to components of the existing distillery (ie. around 28m), and would be sited within proximity of surrounding industrial sites.

Where possible, new equipment would be constructed using similar materials and colours to existing structures at the site.

In its submission, Council requested clarification from Starches on its compliance with Condition 43 of the project approval in relation to the implementation of an approved Landscaping and Vegetation Management Plan (LVMP) for the project. Council also requested the Department consider an alternate location for new structures to reduce the visual impact of the proposal on existing and future development of the township of Bomaderry.

In the RTS, Starches clarified that it had complied with Condition 43 and attached a Landscape Plan (LP) proposing the installation of a number of additional planting beds (3m x 10m) for native plants, trees and shrubs on the site's frontage to Bolong Road to assist in mitigating the visual impacts of the new structures.

On review of the RTS, Council requested that a timeline for the installation of the planting beds proposed in the LP should be established and raised no further issues. The Department has incorporated Council's request, along with a number of additional requirements into the recommended conditions of approval (see below).

Conclusion

The Department is satisfied that the visual impacts of the proposed modification would be minimal given the scale of the existing industrial development on the site and since the additional structures would generally be of a similar appearance, height and bulk to the existing structures on the site. Notwithstanding, the Department has recommended some conditions which require Starches to undertake some additional landscaping works to improve the current visual appearance of the factory site. This includes the requirement for Starches to ensure:

- all landscaping proposed in the LP as part of the modification is completed within 6 months of determination in consultation with Council;
- the LP is incorporated into the approved LVMP for the project; and
- suitable measures are in place and detailed in the LVMP to maintain vegetation at the site for the life of the project.

With these conditions in place, the Department is satisfied that the visual amenity of the factory site would improve, particularly once those plant species used as visual screenings begin to mature.

5.3 Other Issues

Table 1: Assessment of other issues

Issue	Assessment	Recommendation
Hazards and Risk	• Starches undertook a Preliminary Hazards Analysis (PHA) for the modification which estimated the risks associated with the new processes, equipment and fire wall demolition. • The PHA concluded that the overall risks from the facility would be substantially reduced, primarily due to the proposed upgrading of the deluge system. The effectiveness of this equipment would be critical for ensuring that risks are kept at low levels. • The Department's Major Hazards Unit has reviewed the PHA and confirmed the findings of the PHA. • Based on the information provided in the EA and assuming that all safeguards and controls are installed and maintained, the Department is satisfied that the proposed modification will not increase hazards or risk to unacceptable levels. • However to ensure safety at the site, the Department has recommended a number of new conditions and amended some existing hazards and risk conditions (see recommendation).	• Prepare and implement a Construction Safety Study for the modification to the satisfaction of the Director-General; • Update the Fire Safety Study and Emergency Plan for the modified project; • Prepare and implement a Hazard and Operability Study and Final Hazards Analysis for the modification, to the satisfaction of the Director-General; and • Undertake on-going Hazard Audits of the modified project.
Noise	• The proposed modification has the potential to increase noise emissions from the site during construction and operation. • The nearest residences to the site are located approximately 200m - 500m away in Meroo Street (see Figure 1). • Construction and installation of additional equipment at the site would be short-term (approximately 9 months) during standard construction hours. • Construction works would consist of assembling/erecting prefabricated sections of the new structures and some sporadic piling during the last 2 weeks of construction to establish concrete slabs on top of which the new fermentation tanks would sit. • Construction noise emissions are predicted to comply with the *EPA's* Interim *Construction Noise Guideline (2009)* noise management level at all nearby residences. • Operational noise emissions from the modified project are also predicted to comply with the noise limits in the development approval and the Environmental Protection License. • The EPA did not raise any issues in relation to noise. • Finally, there are a number of existing conditions in place to ensure that the construction and operational noise impacts of the project are minimised (see recommendation). • The Department is therefore satisfied that the noise impacts of the proposed modification would be negligible.	• Manage through existing conditions of approval including the requirement for Starches to: - implement all reasonable and feasible measures to minimise the construction noise impacts of the project; - comply with the operational noise limits for the site; - only construct during standard construction hours; and - implement the approved Noise Management Plan for the project.
Soil and Water (including flooding)	• All new structures proposed as part of the modification would be constructed on hardstand areas or compacted gravel within the existing factory site. • The construction of the new fermenters, concrete slab, electricity substation and compressor room would involve shallow excavations (approximately 1m deep) which would be managed via the implementation of standard erosion and sediment controls. • As the site is located on a floodplain, Starches undertook a hydraulic assessment of the incremental impact of additional	• Manage through existing conditions of approval including the requirement for Starches to: - comply with Section 120 of the POEO Act; - ensure all chemicals, fuels and oils used on site in appropriately bunded areas;

Issue	Assessment	Recommendation
	structures on flooding behaviour. • The results of this assessment indicated a negligible change in flood level (0.01m) and flooding behaviour. • Council requested that Starches undertake an assessment to confirm that the additional structures do not impede the ability of staff to evacuate the site in flood emergencies or adversely impact on existing residential structures on the flood plain. • In its RTS, Starches confirmed the proposed modification is unlikely to inhibit emergency evacuation during flooding and would not adversely affect residential structures on the floodplain. • Council raised no further issues in relation to emergency evacuation or flooding. • The proposal would not result in any change to the amount of wastewater treated or disposed of at the site. • There are a number of existing conditions in place to ensure that the soil and water impacts of the project are minimised (see recommendation). • The Department is satisfied that with the existing conditions in place, the soil and water impacts of the proposed modification would be negligible.	- implement approved Flood Mitigation and Management Plan for the project; and - implement approved Erosion and Sediment Control Plan for the modified project during construction.
Greenhouse Gas (GHG)	• While not quantified in the EA, Starches AQIA concluded that the modification is expected to result in an overall reduction of GHG emissions at the site by reducing steam and electrical energy consumption via the replacement of old, inefficient equipment and machinery with new equipment that is more energy efficient. • In addition, the Commonwealth's Clean Energy Legislative Package and carbon pricing mechanism commenced on 1 July 2012. • The legislation aims to provide a coordinated nationwide response to greenhouse gas management, reduce Australia's carbon pollution and provide incentives for industry to move to using clean energy. • The Department is therefore satisfied that GHG emissions at the Starches factory are likely to reduce as a result of the modification and the new Commonwealth legislation.	• N/A
Biodiversity and Heritage	• All building works would be carried out on disturbed land and as such, there would be no impacts on biodiversity or heritage.	• N/A

6. CONCLUSION

The Department has assessed the proposed modification in accordance with the requirements of clause 8B of the Regulations. This assessment has found that the proposed modification would:

- have minimal impact beyond the approved project;
- not increase odour emissions from the site;
- not have an adverse impact on visual amenity;
- improve the operational and energy efficiency of the Starches factory; and
- reduce greenhouse gas emissions from the Starches factory.

The Department has recommended modified conditions to monitor odour and mitigate any visual impacts of the modification.

Starches, the EPA and Council have reviewed and accepted the draft conditions.

Consequently, the Department is satisfied that the modification should be approved.

7. RECOMMENDATION

It is RECOMMENDED that the Planning Assessment Commission:

- **approve** the proposed modification under Section 75W of the EP&A Act; and
- **sign** the attached notice of modification (in Appendix A).

Chris Ritchie
Manager, Industry

10.9.12

Chris Wilson
Executive Director
Major Projects Assessment

13/9/12

Richard Pearson
Deputy Director-General
Development Assessment & Systems Performance

APPENDIX A – NOTICE OF MODIFICATION

APPENDIX B – MODIFICATION APPLICATION AND ENVIRONMENTAL ASSESSMENT

APPENDIX C – SUBMISSIONS

APPENDIX D – RESPONSE TO SUBMISSIONS

APPENDIX E – ADDITIONAL ODOUR ASSESSMENT

APPENDIX F – DIRECTOR-GENERAL'S REPORT AND CONDITIONS OF APPROVAL FOR THE ORIGINAL PROJECT APPLICATION