Dear Minister

MINISTERIAL STATEMENT 870 – TECHNICAL AMMONIUM NITRATE PRODUCTION FACILITY, BURRUP PENINSULA

In a meeting in November 2017 with Hon Robin Chapple MLC, Dr John Black, Professor Jo MacDonald and Judith Hugo, you requested the Department of Water and Environmental Regulation (DWER) to review Yara Pilbara Nitrates Pty Ltd’s Ministerial Statement 870 (MS 870), with reference to potential changes to Condition 5-1: Air Quality.

Condition 5-1 requires the adoption and implementation of best practice pollution control technology to minimise all relevant emissions from the ammonium nitrate prilling plant, within the Technical Ammonium Nitrate Production Facility (TANPF).

The purpose of the review was to determine whether contemporary best practice pollution control technology was being implemented. Details of the process and outcomes of the desktop review and site visit are contained in the attached.

Background – Environmental Impact Assessment (2009 to 2011)

The Environmental Protection Authority’s (EPA) impact assessment of the TANPF commenced in April 2009 and concluded with the release of Report 1379 in January 2011.

The EPA listed the key environmental factors requiring detailed assessment as: (a) Air quality; (b) Biodiversity; (c) Surface water and groundwater; and (d) Liquid waste disposal. This review is concerned only with the EPA’s assessment of air quality.

Air Quality

The EPA considered the main sources of atmospheric emissions from the TANPF would be the nitric acid plant and the ammonium nitrate prilling plant. The nitric acid plant would emit oxides of nitrogen, nitrous oxide, ammonia, carbon monoxide, and methane, and the ammonium nitrate prilling plant “common stack” would emit ammonia and ammonium nitrate dust.
In 2011, the EPA conducted a comprehensive air quality assessment and concluded that under normal operating conditions the TANPF is not expected to be a major source of emissions in the region.

The cumulative 1-hour average nitrogen dioxide ground level concentrations at Hearson Cove, Deep Gorge, Dampier, and Karratha were predicted to be below the relevant National Environment Protection Measure criteria.

The EPA noted that 1-hour average ammonia ground level concentrations were predicted to be below applicable criteria at Hearson Cove, Deep Gorge, Dampier, and Karratha when the TANPF was considered in isolation and is operating under normal or non-routine (upset) conditions.

Importantly, the EPA concluded the TANPF would not be achieving best practice emission control performance for ammonia and ammonium nitrate dust stack emission concentrations from the ammonium nitrate prilling plant “common stack”, because the emission levels were predicted to be above those listed in the:

- European Fertilizer Manufacturers Association (EFMA) Best Available Techniques for Pollution Prevention and Control in the European Fertilizer Industry Booklet No. 6: Production of Ammonium Nitrate and Calcium Ammonium Nitrate; and

In view of the above, the EPA considered in 2011 that Condition 5-1 should be imposed on the proponent to adopt and implement best practice pollution control technology to minimise emissions from the TANPF ammonium nitrate prilling plant “common stack”.

The EPA also considered that stack and plant emissions from the TANPF could be adequately regulated through Part V (Environmental Regulation) of the Environmental Protection Act 1986 (EP Act).

The EPA expected that stack emission concentration figures commensurate with the use of best practice pollution control technology would be incorporated in the Works Approval and Licence.

Petroglyphs (rock art)

In addition to considering the impacts to human health, the EPA also assessed the impact of air emissions on the petroglyphs.

This impact assessment was based on the best available information at the time, including the CSIRO study on the impact of industrial air emissions on rock art located on the Burrup Peninsula (CSIRO, 2007), and the Burrup Peninsula Air Pollution Study: Report for 2004/2005 and 2007/2008 (CSIRO, 2008).

Based on these earlier studies, the EPA considered it was unlikely the predicted quantities of nitrogen dioxide and ammonia that would be emitted from the TANPF would have a significant impact on rock art in the surrounding areas.

As a result of this conclusion, the EPA and subsequently the then Minister for Environment did not include a specific condition on protecting rock art in MS870, but rather relied on Condition 5 to broadly regulate emissions from the TANPF.
Technical Desktop Review – Findings and Recommendations

Air Quality
The technical desktop review involved the evaluation of documentation submitted to date by Yara Pilbara Nitrates Pty Ltd against the requirements for adoption and implementation for best practice pollution control technology under Condition 5-1 Air Quality in MS870 (Attachment 1).

A site visit was also conducted by DWER officers in March 2018 to view the pollution control equipment.

The key documents considered in the review were:
• the proponent’s approved Air Quality Management Plan;
• the proponent’s Commissioning Report for the TANPF which was submitted to the DWER in September 2017 in accordance with the requirements of Works Approval No. W4701/2010/1;
• the European Commission Reference Document on Best Available Techniques for the Manufacture of Large Volume Inorganic Chemicals – Ammonia, Acids and Fertilisers (European Commission, 2007);
• the European Fertilizer Manufacturers Association (EFMA) Best Available Techniques for Pollution Prevention and Control in the European Fertilizer Industry Booklet No. 2: Production of Nitric Acid (EFMA Booklet No. 2); and
• the EFMA Best Available Techniques for Pollution Prevention and Control in the European Fertilizer Industry Booklet No. 6: Production of Ammonium Nitrate and Calcium Ammonium Nitrate (EFMA Booklet No. 6).

It is important to note the Reference Document (European Commission, 2007) and EFMA Booklets No. 2 and No. 6 which were referenced in EPA Report 1379 (2011) are still current and, therefore, have been used to ascertain whether the performance of the pollution control technology incorporated into the TANPF and the resulting stack emission concentrations are commensurate with best practice and best available technology.

The overall finding of the desktop review is that contemporary best practice pollution control technology has been incorporated into the TANPF and that towards the end of the commissioning period the plant was substantially achieving best practice stack emission concentrations under normal operating conditions.

During the commissioning of the TANPF, however, there were frequent periods when the plant was not operating under normal conditions (for example, start-ups, shut-downs and upset conditions), which resulted in elevated emissions. The DWER formally investigated a number of these events under the Environmental Protection Act 1986 and found that there was no breach of the conditions of the Works Approval.

Although the EPA’s original assessment of the proposal determined that relevant ambient air quality standards [for example, the National Environmental Protection (Ambient Air Quality) Measure] for human health would be met, the DWER acknowledges on-going community concern over whether the level of emissions from the routine and non-routine operation of the TANPF are sufficiently low to continuously and reliably protect human health in surrounding areas.

I am committed to addressing these specific concerns in the current licensing process for the TANPF, by commissioning an independent Health Risk Assessment by an air quality specialist. I envisage this process would involve: analysing the TANPF emission data in the proponent’s Commissioning Report; understanding and addressing the community’s concerns; and confirming relevant local emission limits for the protection of human health in the surrounding area.
Yara Pilbara Nitrates Pty Ltd, and the local community would be consulted during the licensing process.

Petroglyphs (rock art)
As previously stated, MS 870 does not contain conditions that specifically limit the impacts of air emissions on the rock art, based on the premise at the time the emissions would not have a significant impact on rock art.

Since the EPA's assessment in 2011, a number of shortcomings in the design, data collection and analysis elements of the rock art monitoring program were raised and subsequent independent reviews have confirmed that considerable improvements could be made to the existing monitoring design and analysis. In addition, one of the three main instruments used for monitoring was considered to be unreliable for drawing any conclusions on colour change in the rock art.

In response, the DWER is currently finalising the Burrup Rock Art Strategy, which is a framework for the monitoring and protecting Aboriginal rock art on the Burrup Peninsula. In the long-term this strategy will deliver a scientifically rigorous approach to monitoring and managing the potential impacts of emissions on the rock art.

In the meantime, I recommend that you take a cautious approach to this matter by requesting the EPA, under section 46 of the EP Act, to inquire into changing Condition 5-1: Air Quality in MS 870 to protect rock art.

As part of its inquiry, the EPA would need consult with Yara Pilbara Nitrates Pty Ltd as well as the Burrup Rock Art Stakeholder Reference Group, with a view to reporting within twelve to eighteen months based on the best available science. The EPA Chairman, Dr Tom Hatton, is supportive of this approach.

This inquiry also provides the opportunity to address many of the recommendations contained in the recent Senate committee report, "Protection of Aboriginal rock art of the Burrup Peninsula".

I am available to discuss the review findings and recommendations if you require further information or clarification.

Yours sincerely

Mike Rowe
DIRECTOR GENERAL

29 March 2018

Att.
1. Background

1.1 EPA Assessment

The proposal for the Burrup Nitrates Pty Ltd (now Yara Pilbara Nitrates Pty Ltd) Technical Ammonium Nitrate Production Facility (TANPF) was referred to the EPA on 11 November 2008. The level of assessment was set at Public Environmental Review (PER) on 15 April 2009.

The EPA considered that the key environmental factors for the proposal were Air Quality, Biodiversity, Surface Water and Groundwater, and Liquid Waste Disposal.

The EPA released its assessment report on the TANPF (EPA Report 1379) on 10 January 2011. Ministerial Statement 870 for the TANPF was published on 11 July 2011.

In EPA Report 1379, the EPA noted that the expected oxides of nitrogen (NOx) stack emission concentration from the TANPF nitric acid plant stack was consistent with the best practice emission concentrations listed in the:

• European Fertilizer Manufacturers Association (EFMA) Best Available Techniques for Pollution Prevention and Control in the European Fertilizer Industry Booklet No. 2: Production of Nitric Acid (EFMA Booklet No. 2); and


However, the EPA also noted that the expected ammonia (NH3) and PM10 particulates stack emission concentrations from the TANPF ammonium nitrate prilling plant common stack would be above the best practice emission concentrations listed in the:

• EFMA Best Available Techniques for Pollution Prevention and Control in the European Fertilizer Industry Booklet No. 6: Production of Ammonium Nitrate and Calcium Ammonium Nitrate (EFMA Booklet No. 6); and

• (European Commission, 2007) reference document.
As a result, the EPA recommended that Condition 5-1 in EPA Report 1379 be imposed on the proponent as follows:

5-1 The proponent shall adopt and implement best practice pollution control technology as determined by the Chief Executive Officer of the Department of Environment and Conservation on advice of the Chief Executive Officer of the Office of the Environmental Protection Authority to minimise ammonia (NH₃) and particulate [as total suspended particulates (TSP)] emissions from the TANPF ammonium nitrate prilling plant “common stack”.

However, the EPA's recommended condition was subsequently amended on appeal to expand the scope to all relevant emissions. The amended condition reads as follows:

5-1 The proponent shall adopt and implement best practice pollution control technology as determined by the Chief Executive Officer of the Department of Environment and Conservation (DEC) on advice of the CEO to minimise all relevant emissions from the TANPF ammonium nitrate prilling plant.

2. Implementation of best practice pollution control technology within the TANPF

2.1 Current guidance on best practice / best available technology applicable to the TANPF

The (European Commission, 2007) reference document and EFMA Booklets No. 2 and No. 6 which were referenced in EPA Report 1379 are still current, and therefore, have been used to ascertain whether the performance of the pollution control technology incorporated into the TANPF and the resulting stack emission concentrations are commensurate with best practice and best available technology.

2.2 Air Quality Management Plan

Following the release of EPA Report 1379, Yara Pilbara Nitrates Pty Ltd prepared an Air Quality Management Plan for the TANPF (Yara Pilbara Nitrates Pty Ltd, 2013) which:

- indicates that a De-NOₓ reactor NOₓ reduction unit equipped with a catalyst and utilising best available technology would be incorporated into the TANPF nitric acid plant; and

- includes a commitment to achieving NH₃ and ammonium nitrate PM₁₀ particulates stack emission concentrations from the TANPF ammonium nitrate prilling plant common stack that would be consistent with the best practice emission concentrations listed in EFMA Booklet No. 6.

Table 3.4 in the above-mentioned Air Quality Management Plan also lists the plant equipment manufacturer’s guarantees provided to the proponent for stack emission concentrations for the TANPF nitric acid plant stack and ammonium nitrate prilling plant common stack. It is noted that the plant equipment manufacturer’s guaranteed:
• NO\textsubscript{x} stack emission concentration for the TANPF nitric acid plant stack is consistent with the best practice emission concentrations listed in EFMA Booklet No. 2 and the (European Commission, 2007) reference document; and

• NH\textsubscript{3} and ammonium nitrate PM\textsubscript{10} particulates stack emission concentrations for the TANPF ammonium nitrate prilling plant common stack are consistent with the best practice emission concentrations listed in the EFMA Booklet No. 6.

### 2.3 Works Approval No. W4701/2010/1

Works Approval No. W4701/2010/1 for the TANPF was issued on 25 July 2013. Table 2.1.1 in the Works Approval lists the nitric acid plant stack and the ammonium nitrate prilling plant common stack as the two permitted point sources for air emissions from the TANPF.

Table 2.1.2 in the Works Approval lists targets for NO\textsubscript{x} and NH\textsubscript{3} stack emission concentrations for the nitric acid plant stack and NH\textsubscript{3} and ammonium nitrate PM\textsubscript{10} particulates stack emission concentrations for the ammonium nitrate prilling plant common stack. The above targets are identical to the plant equipment manufacturer’s guarantees provided to the proponent for stack emission concentrations for the nitric acid plant stack and ammonium nitrate prilling plant common stack in Table 3.4 in the proponent’s Air Quality Management Plan.

However, Table 2.1.2 also includes a stack emission concentration target for nitrous oxide (N\textsubscript{2}O) from the TANPF nitric acid plant stack. Although a guaranteed N\textsubscript{2}O stack emission concentration for the nitric acid plant stack does not appear to have been provided by the plant equipment manufacturer for inclusion in Table 3.4 in the Air Quality Management Plan, it is noted that the target in Table 2.1.2 is consistent with the best practice emission concentration listed in the (European Commission, 2007) reference document.

### 2.4 Commissioning Report

On 29 September 2017, the proponent submitted a Commissioning Report for the TANPF to the DWER Regulatory Services (Environment) Division in accordance with the requirements of Works Approval No. W4701/2010/1.

Section 5.3.1 in the Commissioning Report indicates that the TANPF utilises wet scrubbers to control NH\textsubscript{3} and ammonium nitrate PM\textsubscript{10} particulate emissions from the ammonium nitrate prilling plant common stack. A three-stage scrubbing system is used in the TANPF. In this system, prilling air from each prill tower is directed through its own independent scrubber. Approximately 80-90% of the air from these scrubbers is recycled back through the prill towers. The bleed air from each prill tower scrubber is then sent to a pair of rotary brush scrubbers (4 in total). The air streams from the rotary brush scrubbers are subsequently combined and directed into the final scrubber to remove moisture in the air before being sent to the common stack.
Section 5.3.5 in the Commissioning Report indicates that stack emissions monitoring for the ammonium nitrate prilling plant common stack was undertaken on 28 April 2017, 18 May 2017, 30 June 2017, and 31 August 2017. On these dates, the TANPF was operating at approximately 84%, 81%, 81%, and 90% of nominal capacity (i.e. maximum production rate / throughput), respectively.

Monitoring results presented in Table 8 in the Commissioning Report indicate that during normal operating conditions the measured average NH3 and ammonium nitrate PM10 particulates stack emission concentrations were well below the relevant targets in Table 2.1.2 in the Works Approval which are duplicated in Table 6 in the Commissioning Report. For example, the highest measured average NH3 and ammonium nitrate PM10 particulates stack emission concentrations were equivalent to 36% and 24.7% of the respective target values.

Section 5.4.1 in the Commissioning Report indicates that catalytic abatement systems which include the De-N2O platinum catalyst and the De-NOx catalytic abatement gauzes have been installed in the TANPF to control N2O and NOx emissions from the nitric acid plant stack.

Section 5.4.6 in the Commissioning Report indicates that stack emissions monitoring for the nitric acid plant stack was undertaken on 27 April 2017, 18 May 2017, 30 June 2017, and 31 August 2017. On these dates, the TANPF was operating at approximately 84%, 81%, 81%, and 90% of nominal capacity, respectively.

Monitoring results presented in Table 12 in the Commissioning Report indicate that during normal operating conditions the measured average NOx, NH3, and N2O stack emission concentrations were all below the relevant targets in Table 2.1.2 in the Works Approval which are duplicated in Table 10 in the Commissioning Report. For example, the highest measured average NOx, NH3, and N2O stack emission concentrations were equivalent to 89.7%, 90.7%, and 25% of the respective target values. However, NOx stack emission concentrations above the nominated target were recorded following all start-up events, typically within the first hour of operation.

The Commissioning Report indicates that exceedances of the nominated NOx stack emission concentration target occurred within a timespan which represents approximately 2.4% of plant operating time during commissioning. The Commissioning Report also indicates that as commissioning progressed, exceedances of the nominated NOx stack emission concentration target occurred on fewer occasions and over shorter timeframes.

Section 5.4.7.3 in the Commissioning Report indicates that exceedances of the nominated NH3 stack emission concentration target for the nitric acid plant stack occurred over a timespan which represents approximately 10% of plant operating time during commissioning. The Commissioning Report indicates that exceedances of the NH3 stack emission concentration target occurred more frequently than exceedances of the NOx target due to the use of NH3 to control NOx emissions.
Section 5.4.7.4 in the Commissioning Report indicates that exceedances of the nominated $N_2O$ stack emission concentration target for the nitric acid plant stack occurred over a very small timespan representing only 0.065% of plant operating time during commissioning.

Section 5.4.8 in the Commissioning Report indicates that NO$_x$, NH$_3$, and $N_2O$ emissions from the nitric acid plant stack were reduced during commissioning through process improvements and optimisation. These improvements included the use of demineralised water within the nitric acid absorber to decrease the initial acid load in the system which reduced NO$_x$ emissions during start-up, and optimisation of the De-NO$_x$ reactor NO$_x$ reduction unit during start-up and operation of the TANPF.

Section 5.4.8 in the Commissioning Report concludes that the TANPF is:

- largely producing stack emission concentrations below the relevant targets in Works Approval No. W4701/2010/1;
- functioning in accordance with design specifications; and
- expected to perform similarly during full operational phases.

2.5 Comparison of TANPF pollution control technology and stack emission concentrations against applicable best practice criteria

The proponent has advised EPA Services of the DWER that the plant equipment manufacturer’s guaranteed stack emission concentrations for the ammonium nitrate prilling plant common stack and the nitric acid plant stack are average concentrations rather than maximum values. Hence, the potential exists for stack emission concentrations to exceed the target values during normal operations.

As the TANPF was not operating at full capacity when the stack emissions monitoring was undertaken, the proponent was asked to clarify what impact plant capacity / production rate has on stack emission concentrations, and to provide estimated average stack emission concentrations with the TANPF operating at full capacity. The proponent has advised that all average stack emission concentrations for the ammonium nitrate prilling plant common stack and the nitric acid plant stack will be within the relevant targets when the TANPF is operating at maximum production rate / capacity under normal operating conditions.

Ammonium nitrate prilling plant common stack

EFMA Booklet No. 6 indicates that scrubbers are routinely used to control NH$_3$ and ammonium nitrate PM$_{10}$ particulate emissions from prilling plants. Therefore, the configuration of scrubbers used in the TANPF to control emissions from the ammonium nitrate prilling plant common stack accords with “best available techniques” and best practice pollution control technology.

The highest measured average NH$_3$ and ammonium nitrate PM$_{10}$ particulates stack emission concentrations from the ammonium nitrate prilling plant common stack during commissioning were equivalent to 36% and 24.7% of the respective target
values with the TANPF operating at about 90% and 81% of nominal capacity, respectively, when the measurements were taken. Therefore, these measured stack emission concentrations are consistent with applicable best practice criteria.

The proponent has advised that the average NH$_3$ and ammonium nitrate PM$_{10}$ particulates stack emission concentrations for the ammonium nitrate prilling plant common stack with the TANPF operating at full capacity are not expected to exceed the respective target values. As these targets are identical to the best practice stack emission concentrations listed in EFMA Booklet No. 6, operation of the TANPF at full capacity is expected to be consistent with best practice under normal operating conditions.

*Nitric acid plant stack*

The (European Commission, 2007) reference document indicates that the use of catalytic abatement systems to control of N$_2$O and NO$_x$ emissions from the nitric acid plant represents the application of "best available techniques" to the production of nitric acid.

The highest measured average NO$_x$, NH$_3$, and N$_2$O stack emission concentrations from the nitric acid plant stack during commissioning were equivalent to 89.7%, 90.7%, and 25% of the respective target values with the TANPF operating at 84%, 81%, and 90% of nominal capacity, respectively when the measurements were taken. Therefore, these measured stack emission concentrations are consistent with applicable best practice criteria.

The proponent has advised that the average NO$_x$, NH$_3$, and N$_2$O stack emission concentrations for the nitric acid plant stack with the TANPF operating at full capacity are not expected to exceed the relevant target values. Operation of the TANPF at full capacity is expected to be consistent with best practice under normal operating conditions given that the:

- NO$_x$ target is equivalent to 66.6% of the maximum best practice stack emission concentration listed in the (European Commission, 2007) reference document and 50% of the best practice stack emission concentration listed in EFMA Booklet No. 2; and

- N$_2$O target is equal to the best practice stack emission concentration listed in the (European Commission, 2007) reference document.

**2.6 DWER site visit to the TANPF**

A site visit to the TANPF was undertaken by DWER staff members on 20 March 2018 to confirm that the installation of best practice pollution control technology was in accordance with Condition 5-1 in Ministerial Statement 870 and the information provided in the proponent's Commissioning Report for the TANPF.

DWER staff members were escorted through relevant sections of the TANPF and shown the location of the catalytic abatement systems to control of N$_2$O and NO$_x$ emissions from the nitric acid plant and the various scrubbers employed to control NH$_3$
and ammonium nitrate PM_{10} particulate emissions from the ammonium nitrate prilling plant common stack. The location of stack emission monitoring points and systems were also shown to the DWER staff members.

DWER staff have confirmed that best practice pollution control technology has been installed in the TANPF in accordance with Condition 5-1 in Ministerial Statement 870 and the information provided in the proponent’s Commissioning Report.

3. Conclusion

The review found that contemporary best practice pollution control technology has been incorporated into the TANPF and that towards the end of the commissioning period the plant was substantially achieving best practice stack emission concentrations under normal operating conditions.

However, during the commissioning of the TANPF, there were frequent periods when the plant was not operating under normal conditions (for example, start-ups, shut-downs and upset conditions), which resulted in elevated emissions.

It should be noted that the DWER formally investigated a number of these events under the Environmental Protection Act 1986 and found that there was no breach of the conditions of the Works Approval.