Attachment 8 – Application to Amend W6332/2019/1 Additional Information

Woodside Burrup Pty Ltd

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Rev 0

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1. INTRODUCTION AND CONTEXT

To support the expansion of the Pluto Liquefied Natural Gas (LNG) Facility, Woodside Burrup Pty Ltd (Woodside) was granted Works Approval W6332/2019/1 on 28 May 2021 to construct and commission a second LNG Train (Pluto Train 2) and Domestic Gas export facilities.

Several clerical errors have since been identified that are inconsistent with monitoring currently undertaken by Woodside and are misaligned with latest National Environment Protection Measure (NEPM) guidance. Woodside is seeking to amend via an Amendment Application for W6332/2019/1, supported by additional detail in this document. As set out in Section 6.1 of the Amendment Application Form, DWER has previously advised that an amendment assessment in relation to these errors could be straightforward and timely (i.e. prior to Environment Commissioning activities planned to commence in July 2025) provided a well-reasoned application was provided.

2. AMENDMENT SCOPE – PROPOSED MODIFICATIONS 1

2.1 PROPOSED ADMINISTRATIVE AMENDMENT 1

W6332/2019/1 Condition 9, Table 5 and Condition 26, Table 11 are formatted in a way that all three ambient air monitoring stations have been consolidated into a single row with all parameters listed against this group of stations, rather than distinguishing specific parameters monitored at each station as per Woodside's existing monitoring program (refer Appendix A). This aspect of the conditions as currently written is inconsistent with the monitoring that is currently undertaken. In addition to being inconsistent with Woodside's existing monitoring program, W6332/2019/1 Condition 9, Table 5 and Condition 26, Table 11 are currently formatted in such a way so as to be incommensurate with the risk, which has not increased since the current Pluto LNG Air Quality Management Plan (required under Ministerial Statement 757) was approved. Woodside considers this discrepancy to be an unintentional clerical error and administrative oversight with rationale outlined in Section 3.

The following changes to Tables 5 and 11 are proposed to align with existing Burrup Ambient Air Monitoring Program (BAAMP) and current NEPM guidance.

Table 1. Proposed Amendments to W6332/2019/1 Tables 5 & 11 (changes highlighted)

Monitoring location (Schedule 1: Ambient monitoring locations)	Parameter	Unit	Frequency	Averaging Period	Method
Dampier and Karratha Ambient Monitoring Stations [Change (a)]	O_3 [Change (a)]	ppb	Continuous	8-hour (rolling) [Change (b)]	AS3580.6.1
	NO, NO_2, NO_x			1-hour	AS3580.5.1
Burrup Ambient Monitoring Station [Change (a)]	BTEX [Change (a)]	ppm		1-hour	Gas chromatography Synspec GC955 series manual [Change (c)]
	NO, NO_2, NO_x	ppb		1-hour	AS3580.5.1

a) *Update Tables 5 and 11 to reflect specific parameters monitored at specific stations as per Woodside's existing BAAMP, and aligned with Table 13 of the current approved publicly available Part IV Pluto LNG Air Quality Management Plan.*

b) *Update Ozone averaging period from 1-hour and 4-hour averaging period to rolling 8-hour averaging period, per the 2021 update to the Ambient Air Quality NEPM (NEPC, 2021), and reflected in the current BAAMP.*

c) *Update BTEX monitoring method to the 'Gas Chromatography Synspec GC955 Series Manual', replacing AS 3580.11.1. The method specified in AS 3580.11.1 can only measure total non-methane organics and not individual components. The GC955 series manual provides a specific method for measuring BTEX, complying with European Standard CSN EN 14662-3 and considered as an acceptable alternative method per Air Toxics NEPM (NEPC 2014) requirements. This method is currently utilised in the BAAMP.*

2.2 PROPOSED ADMINISTRATIVE AMENDMENT 2

There are several clerical errors throughout W6332/2019/1:

a) References to "Conditions 8, 0, and 0" throughout the works approval conditions listed below:

- Condition 11
- Condition 18(c)
- Condition 20(b)
- Condition 40(c)

Woodside requests these are amended to reference the correct conditions to avoid ambiguity, assumed to be "Conditions 8, 9 and 10."

b) Condition 32(d)-(f) to be corrected to 32(a)-(c).

3. AIR QUALITY MONITORING RATIONALE

3.1 W6332/2019/1 APPLICATION & DECISION REPORT

Woodside's original Works Approval Application Supporting Document (submitted October 2019) refers to continuation of the existing BAAMP:

- "*The currently implemented Pluto LNG ambient air quality monitoring program will continue throughout the commissioning phase of Pluto Train 2. Woodside has in early 2019 voluntarily recommenced ambient air monitoring to further baseline understanding of ambient air quality in the region. Ambient air quality monitoring is further described in Pluto LNG Project Air Quality Management Plan*." – W6332/2019/1 Application Supporting Document, Section 6.1.2.3 (emphasis added)
- "*It is Woodside's intention to continue the in-place ambient air monitoring program until its absorption or replacement with the coordinated approach established under the WA State Murujuga Rock Art Strategy*." – W6332/2019/1 Application Supporting Document, Section 6.1.3 (emphasis added)

Following the assessment and approval of W6332/2019/1, the associated Decision Report made reference to the existing BAAMP and commitments under the Part IV Air Quality Management Plan (AQMP) to continue the existing BAAMP:

- "*The Applicant has an ambient air monitoring program in place…" and "In accordance with MS 757, the Applicant has committed to continuing its ambient air monitoring program until a coordinated approach under the State Murujuga Rock Art Strategy is established*." – W6332/2019/1 Decision Report, Section 5.5 (emphasis added)
- "*The applicant has committed to continuation of existing monitoring regimes which will incorporate operations from Pluto Train 2*." – W6332/2019/1 Decision Report, Section 5.6 Delegated Officer key findings (emphasis added)

Further to this, the Decision Report also provided commentary on predictive air quality modelling included in the Air Quality Management Plan, and acknowledged "*there is unlikely to be exceedance of the NEPM (Ambient Air Quality) criteria during operation of Pluto Train 2 under normal operating conditions as well as during short term upset conditions"*.

- "*In support of the Pluto Train 2 design and construction activities, a revised Air Quality Management Plan (AQMP) and Air Quality Impact Assessment (AQIA) was prepared by the Applicant. The AQMP provides a framework for management of emissions to air that have the potential to impact human health as a result of operation of the Pluto LNG Project and Pluto Train 2*." – W6332/2019/1 Decision Report, Section 5.1

- "*Predictive modelling of cumulative ambient air emissions within the Burrup, Dampier and Karratha airsheds indicate there is unlikely to be exceedance of the NEPM (Ambient Air Quality) criteria during operation of Pluto Train 2 under normal operating conditions as well as during short term upset conditions*." – W6332/2019/1 Decision Report, Section 5.6 Delegated Officer Key Findings

There was no commentary or recommendations made in the W6332/2019/1 Application or Decision Report to suggest that changes to the existing BAAMP were required. This reinforces that the intent of W6332/2019/1 Condition 9, Table 5 and Condition 26, Table 11 was to capture the existing BAAMP as a requirement for Train 2 Environment Commissioning and Time Limited Operations. As such, Woodside considers the formatting of Tables 5 and 11 to be an unintentional clerical error.

3.2 AMBIENT MONITORING LOCATIONS & PARAMETERS

The BAAMP includes three ambient air quality monitoring stations: Burrup Road (closest to the Pluto LNG Facility), Karratha and Dampier (Refer Appendix B). Specific parameters are monitored at each station, reflected in the table below and aligned with Table 13 of the current approved and publicly available Part IV Pluto LNG Air Quality Management Plan (AQMP):

Table 2. Ambient Air Monitoring Station Locations & Parameters

Parameter	Ambient Air Monitoring Station Location		
	Karratha	Dampier	Burrup Road
Oxides of Nitrogen	✓	✓	✓
Ozone	✓	✓	-
BTEX	-	-	✓

3.2.1 Oxides of Nitrogen & Ozone

Oxides of Nitrogen (NO_x) and ozone are both key pollutants associated with Pluto LNG Facility. Although NOx is emitted from the facility, Ozone is considered as a secondary pollutant, and involves a more complex process. In general, the production of ozone occurs from emissions of NO_x and other emissions such volatile organic compounds and carbon monoxide in the presence of UV light (Seinfield and Pandis, 2016). Ozone is not localised to the Pluto LNG Facility, and can be produced as a result of both anthropogenic and natural causes e.g. bushfires (Department of Environment, 2004).

Oxides of Nitrogen (NO_x) is currently monitored at all three stations, however ozone (O_3) is currently monitored at the Karratha and Dampier stations only. This is because ozone is expected in greater concentrations in Karratha and Dampier locations compared to Burrup Road, supported by historical BAAMP data and understanding of photochemical reactions.

The following excerpt from Section 2.1.2 of the Pluto LNG AQMP (2019) provides further explanation:

"The BAAMP results confirmed what was found in previous reviews; that NO_2 is typically observed well below the relevant NEPM (Ambient Air Quality) standard for NO_2 [3]. There is no ambient air quality standard for NO.

The monitoring results showed higher O_3 concentrations in Dampier and Karratha in comparison with NO_2. The opposite was the case for monitoring located closer to the sources on the Burrup Peninsula. An interpretation is NO_X, from industrial sources, was dispersed to lower concentrations by the time it reached the townships of Dampier and Karratha. Therefore, there was less NO_X in the townships to destroy the O_3 that built up to higher concentrations there. Elevated ozone levels identified as short period anomalies in the Karratha 2012 were analysed as likely due to external sources, and not resulting from Pluto LNG emissions [16]."

In addition, Woodside notes that the BAAMP averaging period for ozone criteria has since changed from 1-hour and 4-hour to an 8-hour rolling average. This is to ensure consistency with the latest Ambient Air Quality NEPM (NEPC, 2021), which establishes an ozone standard with an 8-hour averaging period that reflects latest scientific evidence about health impacts and its use internationally.

3.2.2 BTEX

BTEX (Benzene, Toluene, Ethylbenzene, and Xylene) is considered as a localised emission from the Pluto LNG Facility and is currently monitored at the Burrup Road Station. Ethylbenzene monitoring has

been included in the program since 2020 and, although no NEPM standard for Ethylbenzene exists to date, additional investigation trigger values from EPA NSW have been adopted to assist in assessing the short-term hourly monitoring data.

Associated BTEX concentrations are expected to be greatest at the Burrup Road station (closest to the LNG facility). Initial monitoring of BTX (Benzene, Toluene, and Xylene) was undertaken at all three monitoring stations from 2008 – 2010 as part of the original BAAMP. This program found insignificant air quality impacts with BTX levels much lower at the remote locations (Dampier and Karratha). As such, monitoring was discontinued from the Dampier and Karratha stations. Continued BTX monitoring at the Burrup Road Station, under the continued BAAMP Pluto Ambient Air Monitoring Program, also demonstrated BTX concentrations remained consistent with previously observed background levels following the startup of the Pluto LNG facility. Normally BTEX are measured in small quantities (less than one part per billion by volume). The following excerpt from Section 2.1.3 of the Pluto LNG AQMP (2019) provides further explanation:

"Maximum hourly average concentrations of benzene measured at Dampier and Karratha over 2008-2010 never exceeded 3 ppb. The measured 90th percentile hourly average benzene concentrations at both locations was 0.1 ppb only.

The NEPM (Air Toxics) Monitoring Investigation Level (MIL) for benzene is 3 ppb as an annual average [4]. The ambient monitoring results reported the annual average concentration of benzene is typically less than 0.1 ppb.

From a review of all ambient air quality monitoring results over 2008-2015 for all monitoring locations, toluene and isomers of xylene were found to be lower levels than benzene [18].

Levels of benzene, toluene and isomers of xylene (BTX) during the monitoring program were typical of background levels."

Given the low concentrations of BTEX consistently measured at the Burrup Road Station, it is not considered credible that greater concentrations associated with Pluto LNG emissions would be observed at the Dampier and Karratha locations.

4. REFERENCES

1. Works Approval W6332/2019/1 – Pluto Train 2. Accessed at www.der.wa.gov.au
2. Decision Report for W6332/2019/1 – Pluto Train 2. Accessed at www.der.wa.gov.au
3. Woodside, 2019. *Pluto Train 2 Construction – Works Approval Application Supporting Document*, October 2019.
4. Woodside, 2019. *Pluto LNG Project Air Quality Management Plan*. Controlled Ref No. X0000AH0002, June 2019.
5. National Environment Protection Council (NEPC), 2013. *National Environment Protection (Ambient Air Quality) Measure*, May 2021.
6. NEPC, 2011. *National Environment Protection (Air Toxics) Measure*, October 2011.
7. NSW Environment Protection Authority (2022), *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*, August 2022.
8. Synspec, 2011. *Gas Chromatography Synspec GC955 Series Manual,* February 2011. Accessed at Manual operator Syntech Spectras GC955 600-800.pdf - Synspec bv
9. Seinfeld, J and Pandis, 2016. *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change.* 3rd Edition, J. Wiley and Sons, April 2016.
10. Department of Environment, *Pilbara Air Quality Study Summary Report*, August 2004.

APPENDIX A – COMPARISON OF EXISTING AND PROPOSED REQUIREMENTS

W6332/2019/1 Table 5 & 11 Requirements: Monitoring of ambient concentrations during environmental commissioning / time limited operations

Monitoring location (Schedule 1: Ambient monitoring locations)	Parameter	Unit	Frequency	Averaging Period	Method
Burrup, Dampier and Karratha Ambient Monitoring Station	O_3	ppb	Continuous	1-hour	AS3580.6.1
				4-hour	
	NO, NO_2, NO_x			1-hour	AS3580.5.1
	BTEX	ppm		1-hour	AS3580.11.1

Proposed Amendments to W6332/2019/1 Tables 5 & 11 (changes highlighted, refer to Section 2.1):

Monitoring location (Schedule 1: Ambient monitoring locations)	Parameter	Unit	Frequency	Averaging Period	Method
Dampier and Karratha Ambient Monitoring Stations [Change (a)]	O_3 [Change (a)]	ppb	Continuous	8-hour (rolling) [Change (b)]	AS3580.6.1
	NO, NO_2, NO_x			1-hour	AS3580.5.1
Burrup Ambient Monitoring Station [Change (a)]	BTEX [Change (a)]	ppm		1-hour	Gas chromatography Synspec GC955 series manual [Change (c)]
	NO, NO_2, NO_x	ppb		1-hour	AS3580.5.1

APPENDIX B – AMBIENT MONITORING LOCATIONS

As per W6332/2019/1 – Schedule 1 Figure 4