

# NARRABRI GAS PROJECT

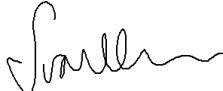

## Dust Suppression Protocol

### PHASE 1

0041-150-PLA-0022

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## Acronyms and abbreviations

Acronym	Description
µg/L	micrograms per litre
µS/cm	microSiemens per centimetre
ANZECC	The Australia and New Zealand Environment and Conservation Council
ARMCANZ	The Agriculture and Resources Management Council of Australia and New Zealand
cm	centimetre
CoC	Conditions of consent for the NGP SSD 6456
CSG	coal seam gas
D&C	drilling and completions
DPE	NSW Department of Planning and Environment
DPE Water	The Water Group within DPE
DPIE	The former NSW Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EMP	environmental management plan
EMS	Environmental Management Strategy
EP&A Act	<i>Environmental Planning and Assessment Act 1979 (NSW)</i>
EP&A Regulation	Environmental Planning and Assessment Regulation 2021
EPA	NSW Environment Protection Authority
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cth)</i>
EPL	environment protection licence under the POEO Act
EQulS	Environmental Quality Information System
IEA	Independent Environmental Audit
ha	hectare
L	litre
LNG	liquefied natural gas
LOR	limit of reporting
m	metre
ML	megalitre
ML/day	megalitre per day
ML/y	megalitre per year
mm	millimetre
MNES	Matters of National Environmental Significance
NGP	Narrabri Gas Project
NOW	The former NSW Office of Water, as part of the Department of Primary Industries
NRAR	Natural Resources Access Regulator
NSW	The State of New South Wales
PAL	petroleum assessment lease under the PO Act

Acronym	Description
PEL	petroleum exploration licence under the PO Act
PO Act	<i>Petroleum (Onshore) Act 1991</i> (NSW)
POEO Act	<i>Protection of the Environment Operations Act 1997</i> (NSW)
POEO Regulation	Protection of the Environment Operations (General) Regulation 2022
POP	Petroleum Operations Plan
PPL	petroleum production lease under the PO Act
PPLA	petroleum production lease application under the PO Act
PWMP	Produced Water Management Plan
QA	quality assurance
QC	quality control
RO	reverse osmosis
ROP	reverse osmosis plant
RREO	Resource Recovery Exemption and Order
SMS	Santos Management System
SSD	State significant development
TDS	total dissolved solids
TARP	trigger action response plan
WAL	water access licence
WBTP	water and brine treatment plant
WMP	Water Management Plan
WTAG	Water Technical Advisory Group

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## 1. Introduction

### 1.1 Narrabri Gas Project

#### 1.1.1 Background

Resource exploration has been occurring in the north-western area of NSW since the 1960s; initially for oil, but more recently for coal and gas. Santos NSW Pty Ltd began exploring for natural gas from coal seams in north-western NSW in 2008 and is currently conducting coal seam gas (**CSG**) exploration and appraisal activities within Petroleum Exploration Licence (**PEL**) 238, Petroleum Assessment Lease (**PAL**) 2 and Petroleum Production Lease (**PPL**) 3, located in the Gunnedah Basin about 20 kilometres (**km**) south-west of the town of Narrabri. Activities in PAL 2 have focussed on the Bibblewindi and Bohena CSG pilots, whilst recent activities in PEL 238 have focussed on the Dewhurst and Tintsville CSG pilots.

The Narrabri Coal Seam Gas Utilisation Project (Wilga Park Power Station and associated infrastructure) operates under an existing Part 3A approval under the *Environmental Planning and Assessment Act 1979* (NSW) (**EP&A Act**). It was originally approved in 2008, with various modifications approved between 2011 and 2019. It encompasses a gas gathering system, a compressor and associated flare, a gas flow line from Bibblewindi to Wilga Park within a 10 metre (**m**) corridor with a riser at Leewood and an expansion of the existing Wilga Park Power Station from 12 to 40 megawatts.

#### 1.1.2 Current Project

On 30 September 2020, Santos NSW (Eastern) Pty Ltd (**Santos**) obtained consent for State significant development (**SSD**) 6456 to develop the Narrabri Gas Project (**NGP**) (**the Project**). Approval EPBC 2014/7376 under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (**EPBC Act**) was granted on 24 November 2020.

The Project includes the progressive installation of up to 850 new gas wells on up to 425 new well pads over approximately 20 years and the construction and operation of gas processing and water treatment facilities. The Project area covers about 950 square kilometres (95,000 hectares) in size and the Project footprint will only directly impact about 1% of that area.

Four phases of development are defined under the consent, including:

- Phase 1 - exploration and appraisal;
- Phase 2 - construction activities for production wells and related infrastructure;
- Phase 3 - gas production operations; and
- Phase 4 - gas well and infrastructure decommissioning, rehabilitation and closure.

Phase 1 of the Project is defined in the consent as the phase of the development comprising ongoing exploration and appraisal activities in the Project area, including:

- seismic surveys;
- core and chip holes;
- construction and operation of pilot wells (up to 25 wells on up to 25 well pads across the project area); and
- pilot well ancillary infrastructure, including access tracks, gas and water gathering lines, water balance tanks, safety flaring infrastructure, utilities and services, and environmental monitoring equipment including groundwater monitoring bores.

Santos plans to continue exploration and appraisal of the resource in the near term until a final investment decision can be made. The exploration and appraisal activities will include continued operation of Santos' existing wells, infrastructure and facilities in PEL 238 and PAL 2, and construction and operation of new core holes, pilot wells and supporting infrastructure permitted under Phase 1.

Santos' existing exploration and appraisal activities in PEL 238 and PAL 2 include:

- Tintsville Pilot;
- Bibblewindi East Pilot;
- Bibblewindi West Pilot;
- Dewhurst North Pilot;
- Dewhurst South Pilot;
- Dewhurst northern and southern flow lines;
- Leewood Water Management Facility including ponds, water treatment plant and irrigation area;
- Bibblewindi Facility including gathering system, water balance tank, compressor and flare; and
- Bibblewindi to Leewood buried gas pipeline.

These exploration and appraisal activities will continue as part of the NGP. The initial, new-appraisal Phase 1 scope is a relatively minor extension to these existing exploration and appraisal activities.

The Phase 1 scope is planned to include the construction and operation of:

- 4 coreholes;
- 6 pilot wells;
- 2 deep reservoir monitoring bores (converted coreholes);
- new shallow water monitoring bores;
- associated linear infrastructure;
- seismic surveys (length and location to be determined); and
- continued operation of Santos' existing exploration and appraisal activities, including workover activities.

The full definitions of the approved activities for Phases 2, 3 and 4 of the Project are provided in the consent. Santos is not prevented from carrying out any or all of the phases concurrently, subject to the conditions of this consent.

Further details regarding the NGP, including a full overview of the regulatory framework and statutory provisions of the NGP and the current approvals, leases and licences related to the management of water, are provided in the overarching Water Management Plan (**WMP**). Further details regarding the staging of the works and the exact scope for each are as approved in the Field Development Plan.

## 1.2 Purpose and scope of the Protocol - Phase 1

This Dust Suppression Protocol (**Protocol**) details the management measures, obligations and restrictions on the use of treated produced water for dust suppression and construction activities (including rehabilitation and drilling & completions [**D&C**]). Note that the dust management and mitigation to minimise any negative effect on air quality will be described in the Air Quality and Greenhouse Gas Management Plan (to be developed prior to the commencement of Phase 2) and are

not within the scope of this document. Santos will implement all reasonable and feasible measures to prevent, and if prevention is not reasonable and feasible, minimise any harm to the environment that may result from the activities associated with the use of treated water for dust suppression and construction activities (including rehabilitation and drilling).

This Protocol applies only to the beneficial reuse of treated water for dust suppression and construction activities (including rehabilitation and D&C) during Phase 1 of the Project. It will be revised and updated for subsequent phases of the Project.

This Protocol has been developed in accordance with the requirements of the SSD 6456 conditions of consent (**CoC**). It forms part of a suite of documents prepared as part of the NGP Water Management Plan under Condition B41(d), which includes the following:

- (i) An Erosion and Sediment Control Plan, prepared in accordance with the Blue Book<sup>1</sup> and identifying details including but not limited to activities that could cause soil erosion, generate sediment or affect flooding; the location, function, and capacity of erosion and sediment control structures and flood management structures; and measures to manage any effects of soil erosion, sediment transport and flooding;
- (ii) A Site Water Balance, which includes but is not limited to details of the inflows and outflows in the Project area; sources and security of water supply for the life of the Project; water storage and treatment capacity; water use and management, including sharing and transfers; licenced discharge points; and reporting procedures, including the annual preparation of an updated site water balance;
- (iii) A Surface Water Management Plan, which includes but is not limited to specific details on baseline data on surface water flows and quality of watercourses; the surface water management system; detailed plans, design objectives and performance criteria for water infrastructure; performance criteria; a program and procedures for monitoring, evaluation and reporting; and plan to respond to any exceedances of the performance measures or performance criteria, and repair, mitigate and/or offset any adverse surface water impacts of the development;
- (iv) A Groundwater Management Plan, which provides details including but not limited to baseline data of hydrogeology and groundwater levels, formation parameters and quality for groundwater resources; a description of the groundwater management and monitoring system; performance criteria, trigger and response levels; a program and procedures for monitoring, evaluation and reporting; and a plan to respond to any exceedances of the groundwater performance criteria, and repair, mitigate and/or offset any adverse groundwater impacts of the Project;
- (v) A Produced Water Management Plan (**PWMP**) that provides detailed baseline data on produced water yield and quality, and includes but is not limited to details regarding the produced water management system; performance criteria, including trigger levels; and a program and procedures for monitoring, evaluation and reporting;
- (vi) An Irrigation Management Plan (**IMP**) for managing beneficial reuse of treated water for crop irrigation and stock watering, that includes but is not limited to details regarding site selection and assessment; agreements with third parties; baseline soil and groundwater conditions and quality; a protocol for operation of the irrigation management system; and measures to manage any effects on soils structure, erosion, groundwater quality and maintain a water balance;
- (vii) A Dust Suppression Protocol (this document);

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<sup>1</sup> The 2004 Landcom publication *Managing Urban Stormwater: Soils and Construction - Volume 1* is commonly known as the 'Blue Book'.

- (viii) A Managed Release Protocol for managing disposal of treated water to Bohena Creek, that includes but is not limited to details of water flows, quality and health; predicted plume dispersal; a protocol and detailed procedures for managed release; and measures to manage any effects of water quality, stream and riparian health, erosion and sedimentation and downstream flooding. There will be no managed release to Bohena Creek during Phase 1 of the Project and as such this protocol will be developed for Phase 2. A summary of the managed release is provided in section 6 of the PWMP;
- (ix) A Salt Management Plan, which includes but is not limited to details of salt and other waste volumes and composition generated by the produced water management system; a program for investigating and implementing beneficial reuse options for the salt product; a protocol and procedures for the full-cycle management of salt and salt-related waste products; and measures to ensure appropriate storage and disposal of any salt waste. There will be no salt produced during Phase 1 of the Project (only brine will be generated) and there is adequate storage in the existing facilities to manage this brine for Phase 1. Section 7 of the PWMP describes this proposed approach for salt management for the Project. A stand-alone plan will be developed for Phase 2 of the Project, based on the findings of the Produced Salt Beneficial Reuse and Disposal Study required by condition B65;
- (x) A Pollution Incident Response Management Plan, prepared in accordance with the Protection of the Environment Operations (General) Regulation 2022 (POEO Regulation) and which includes detailed procedures for responding to incidents, spills and leaks associated with the produced water management system; and a Dam Safety Emergency Plan for managing potential incidents and emergencies associated with produced water storages, and
- (xi) A protocol to report on the measures, monitoring results and performance criteria identified above, in the Annual Review referred to in consent condition D8.

A full list of the conditions applicable to the Protocol is presented in section 3.1.5. A copy of the consent conditions relevant to each of the other sub-plans and protocols listed above is provided in each of the individual documents. This Protocol will be reviewed at least annually and in accordance with the conditions of approval, as detailed in section 11.

As required by CoC B42, Santos will implement the latest revision of the WMP (including this Protocol) once approved by the Planning Secretary.

### 1.3 Objectives

The objectives of this Protocol are to provide the following:

- details of the relevant statutory requirements (including any relevant approval, licence or lease conditions);
- details of any relevant commitments or recommendations identified in the EIS for the Project;
- provide context regarding the use of treated produced water for dust suppression and construction activities as an option for its beneficial use and the selection of the sites this may be applicable to, noting that only bore water will be used for dust suppression during Phase 1;
- provide details on the existing conditions and quality of the soil and groundwater of the sites subject to dust suppression, and the risks of using bore water for this purpose;
- provide a protocol for the operation of the dust suppression system;
- outline the considered risks associated with using treated water for dust suppression and any monitoring and mitigation measures to minimise any impacts; and
- provide the basis for a trigger action response plan, if required for Phase 1, that can be used to modify the dust suppression operation(s) and to outline any reporting protocols.

## 1.4 Performance measures

Consent condition B37 states that Santos must ensure that the development complies with the following water management performance measures related to beneficial reuse management:

Feature	Performance measure	Reference
Water management – General	Maximise water recycling, reuse and sharing opportunities	Section 5. Only bore water will be used for dust suppression and rehabilitation during Phase 1. Amended treated water will be used for construction activities (including drilling)
	Maximise beneficial reuse of treated water	Section 5. Only bore water will be used for dust suppression and rehabilitation during Phase 1. Amended treated water will be used for construction activities (including drilling)
	Minimise the need for discharge of treated water to Bohena Creek	Not relevant to Phase 1. There will be no managed release to Bohena Creek during Phase 1.
	Design, install, operate and maintain water management infrastructure in a proper and efficient manner	Details regarding the design, installation, operation and maintenance of water management infrastructure are provided in section 5 of the PWMP.
Irrigation and beneficial reuse management	Negligible change to soil quality and groundwater quality and levels in irrigation areas and other areas subject to treated water application;	Refer to the IMP regarding soil quality and groundwater quality in irrigation areas. Note that only bore water will be used for dust suppression and rehabilitation during Phase 1.
	Only amended treated water to be used for reuse activities (except for firefighting), unless other use of treated water has been approved as part of the Water Management Plan; and	Only amended treated water will be produced by the Leewood water treatment plant during Phase 1. Note that only bore water will be used for dust suppression and rehabilitation during Phase 1.
	No irrigation (no application of treated water) in forested areas, apart from dust suppression and construction activities on operational areas and access roads	Only amended treated water will be produced by the Leewood water treatment plant during Phase 1. Only bore water will be used for dust suppression and rehabilitation during Phase 1.

Note that Table 3.1 in section 3.3.4 of the Phase 1 Water Management Plan, as the overarching document regarding the management of water, provides a full overview of where each of the water management performance measures of CoC B37 have been addressed. Note that some management measures are relevant to and addressed in more than one management plan.

## 1.5 Consultation

Extensive consultation was undertaken during the preparation and finalisation of the previous versions of the PWMP which provided details on the use of treated water for dust suppression.

As stated in section 1.5 of the WMP, this Protocol has been prepared by a suitably qualified and experienced person in consultation with the Water group within the Department of Planning and Environment (**DPE**) (generally referred to as **DPE Water**), the NSW Environment Protection Authority (**EPA**) and the Water Technical Advisory Group (**WTAG**) and provides the relevant information related to the beneficial use of treated produced water for the suppression of dust.

Minor comments were received from the Natural Resources Access Regulator (**NRAR**) [on behalf of DPE Water] on the draft Dust Suppression Protocol (Revision C) and the attachments, generally centred around the water access licences that are associated with the water take used for dust suppression.

The comments received from the EPA on the draft document queried the inconsistency in the consent regarding the use of both treated water, and amended treated water, for dust suppression purposes. The EPA noted that predominantly bore water will be used for dust suppression.

The comments provided by the WTAG predominantly focussed on the capacity of the Leewood water treatment plant, the composition of treated water and the groundwater monitoring locations. The comments also identified a number of discrepancies and opportunities for improvement.

All consultation correspondence and the responses to comments are provided in Appendix A.

## 1.6 Structure of this Protocol

Together with the suite of water management sub-plans listed in section 1.2, this Protocol is a supporting document to the Water Management Plan. The Water Management Plan sets out the overall details how the documents are related and where information or details are located in the event of any overlap or commonality. The structure of this Protocol is as follows:

### Sections

- |                  |   |
|------------------|---|
| <b>Section 1</b> | Provides an introduction to the Project and the context, scope, purpose and objectives of this Protocol. It further provides the performance measures related to beneficial use of treated water for dust suppression |
| <b>Section 2</b> | Defines the roles and responsibilities of personnel involved with the NGP, including staff, consultants, contractors and service providers  |
| <b>Section 3</b> | Outlines the statutory provisions relevant to the use of the different sources of water for dust suppression and construction activities, and the extraction of water   |
| <b>Section 4</b> | Provides a description of the quality of treated and amended treated produced water and bore water  |
| <b>Section 5</b> | Provides details of the dust suppression protocol and the quality of water to be used at different locations  |
| <b>Section 6</b> | Details the risk assessment of potential impacts and a description of measures to be implemented to minimise the potential impacts of beneficial use of treated water for dust suppression                            |
| <b>Section 7</b> | Outlines the monitoring associated with the dust suppression activities   |

- Section 8** Describes the trigger, action and response plan (to be developed) to assess and respond to abnormal conditions and to manage risks to operations, personnel and the environment
- Section 9** Provides details on the process that is implemented to manage data and records in a consistent, efficient and effective manner
- Section 10** Outlines the process for reporting incidents and non-compliances to the relevant agencies, and the management procedure for complaints
- Section 11** Describes the reporting, evaluation and review process of this Protocol
- Section 12** References
- Section 13** Glossary

## **Appendices**

- Appendix A** Provides copies of the consultation records and responses to all comments
- Appendix B** Consent conditions relevant to the Protocol
- Appendix C** Treated water quality

## **1.7 Distribution**

A copy of this approved Protocol is available to all Santos personnel via the Santos intranet. In accordance with consent condition D13, the latest copy of the Plan including all associated appendices, audits and reports, and summaries of all monitoring data (where relevant), can also be found on the Project website, once these have been approved by the Planning Secretary. This information will be kept up to date.

In accordance with specific licence, approval or code of practice conditions, a copy of this Protocol is available at the Santos Operations Centre located at 300 Yarrie Lake Road in Narrabri. This is where operational and field staff commence and finish each workday.

Note that any printed copies of this Protocol are uncontrolled.

## 2. Roles and responsibilities

All Santos employees and contractors involved in the Narrabri Gas Project are responsible for the environmental performance of their activities and for complying with all legal requirements and obligations. Project personnel will be required to comply with approval requirements of the activities they undertake and potential environmental impacts from all activities will be managed in accordance with the Project's relevant management plan(s).

In accordance with consent condition D1, the Environmental Management Strategy (**EMS**) sets out the roles, responsibilities, authorities and accountabilities of all key personnel involved in the environmental management of the Project, including the requirements and obligations in this Protocol. All roles, responsibilities and accountabilities have been assigned in accordance with Santos Management System *SMS-MS\_14 People Management Standard*.

### 3. Regulatory requirements

The Project is permissible with development consent under the *State Environmental Planning Policy (Resources and Energy) 2021* and is identified as a 'State significant development' under section 4.38 of the *Environmental Planning and Assessment Act 1979* (NSW) (**EP&A Act**) and the *State Environmental Planning Policy (Planning Systems) 2021*. The Project was subject to the State significant development assessment and approval provisions of Division 4.1 of Part 4 of the EP&A Act and was approved as a State significant development under the EP&A Act and the EPBC Act.

The Project will be carried out in accordance with the:

- relevant existing development consents and activity approvals;
- the provisions of the *Petroleum (Onshore) Act 1991* (NSW) (**PO Act**) and relevant codes of practice and guidelines;
- water access licences under the *Water Management Act 2000*;
- Environment Protection Licence (**EPL**) 20350 issued by the EPA and the provisions of the *Protection of the Environment Operations Act 1997* (**POEO Act**); and the
- conditions of consent for the NGP SSD 6456.

#### 3.1 Compliance conditions

Compliance conditions associated with the following licence(s), lease(s) and consent(s) are or will be relevant to this Protocol:

- PEL 238, granted on 1 September 1980 and most recently renewed on 12 April 2022;
- PAL 2, granted on 30 October 2007;
- PPL 3, granted on 15 December 2003;
- PPLs 13, 14, 15 and 16, once issued;
- EPL 20350, as varied; and
- SSD 6456.

##### 3.1.1 PEL 238

There are no specific conditions or obligations in PEL 238 related to this Protocol.

##### 3.1.2 PAL 2 and PPL 3

Lease condition 2 of PAL 2 and PPL 3 state that activities must only be carried out in accordance with a Petroleum Operations Plan (**POP**) which has been approved by the Director-General of the Department of Primary Industries. Further, the POP must (i) identify how operations will be carried out on site in order to prevent and or minimise harm to the environment; and (ii) reflect conditions of approval under the EP&A Act, the POEO Act, and any other approvals relevant to PAL 2 and PPL 3.

This Protocol supplements the PWMP which in turn supports the POP and satisfies condition 2 of PAL 2 and PPL 3 by providing information about how Santos beneficially uses treated produced water resulting from the operation of its activities within PAL 2 and PPL 3.

### 3.1.3 Water access licences

Under Section 60A of the *Water Management Act 2000* (NSW) all extraction from a water source requires a water access licence (**WAL**). Therefore, all water extracted from the pilots and appraisal wells during Phase 1 will be within an allocated volume granted by a WAL in the relevant water sharing plan/water source.

Santos has two water supply bores at Bibblewindi (BBD 1 and BBD 5) from which it abstracts water for construction and operational purposes including for construction/civil works, dust suppression, drilling and completions (**D&C**), rehabilitation and firefighting. These bores, their water supply works approval numbers and associated WAL numbers are listed in Table 3.1. Each bore includes a metering point which is used to quantify the water take. Metering meets the requirements of the *NSW Non-Urban Water Metering Policy*.

Where there is a requirement to source local groundwater for construction/operational purposes, Santos would do this under third-party lease arrangements, or would secure additional water allocation for the Great Artesian Basin Southern Recharge Groundwater Source.

**Table 3.1 - Bibblewindi water bores**

Water supply works	Water access licence	Water source	Water extraction limit
BBD 1: <ul style="list-style-type: none"> <li>90WA811395</li> </ul>	WAL 15819	Great Artesian Basin Southern Recharge Groundwater	5 ML
BBD 5: <ul style="list-style-type: none"> <li>90WA811395</li> <li>90WA811397</li> <li>90WA832041</li> </ul>	WAL 15847	Great Artesian Basin Southern Recharge Groundwater	5 ML

### 3.1.4 EPL 20350

‘Petroleum exploration, assessment and production’ is a scheduled activity listed in Schedule 1 of the POEO Act. Under section 48 of this Act, all scheduled activities are required to hold an environment protection licence. EPL 20350 is held for Santos’ current CSG activities in PEL 238, PAL 2 and PPL 3. There are three specific operational conditions related to dust suppressions and control in EPL 20350, specifying that carrying out of activities and any operation of plant in or on the premises must be conducted ‘*by such practicable means as to prevent or minimise the emission of dust into the air*’. The premises themselves must be maintained to this same condition.

Since these conditions are principally related to the management and minimisation of fugitive dust rather than the beneficial use of treated produced water to suppress dust, they are addressed in the Air Quality and Greenhouse Gas Management Plan, to be developed prior to the commencement of Phase 2.

### 3.1.5 Development Consent SSD 6456

There are a number of SSD 6456 consent conditions directly relevant to this Protocol for Phase 1, with the key condition CoC B37 and B41(d)(vii) provided in full below. Table B1 in Appendix B specifies where each of the requirements of all the relevant SSD 6456 consent conditions are addressed in this Protocol.

**Consent condition B37** states that Santos must ensure that the development complies with the following treated produced water beneficial reuse management performance measures:

- negligible change to soil quality and groundwater quality and levels in irrigation areas and other areas subject to treated water application;
- only amended treated water to be used for reuse activities (except for firefighting), unless other use of treated water has been approved as part of the Water Management Plan; and
- no irrigation (no application of treated water) in forested area, apart from dust suppression and construction activities on operational areas and access roads.

**Consent condition B41** states that prior to the commencement of Phase 1, Santos must prepare a Water Management Plan for the NGP to the satisfaction of the Planning Secretary and that this plan must include an

(vii) Dust Suppression Protocol for managing beneficial reuse of treated water for dust suppression and construction activities (including rehabilitation and drilling<sup>2</sup>), that includes details of:

- site selection and assessment;
- baseline soil and groundwater conditions and quality;
- a protocol for operation of the dust suppression system;
- measures to:
  - maintain soil structure, stability and productive capacity;
  - minimise erosion and sedimentation, ponding and waterlogging;
  - ensure effective surface water and stormwater runoff controls; and
  - maintain groundwater quality and minimise changes to groundwater levels.

## 3.2 Relevant codes, standards, policies and guidelines

### 3.2.1 Produced Water Code

The *Exploration Code of Practice Produced Water Management, Storage and Transfer* (NSW Department of Planning and Environment, 2017) (the **Produced Water Code**) does not include the assessment of the environmental impacts of the beneficial reuse and disposal of the produced water. However, under the Produced Water Code it is mandatory to prepare a PWMP and the PWMP in turn *'must set out how identified risks will be managed and mitigated, including the characterisation, consideration of beneficial reuse and the fate of the produced water'*.

The details on the use of treated water for dust suppression that were previously part of the PWMP are now contained within this Protocol. As such, the Produced Water Code is applicable to this Protocol. There are no other specific codes, standards, policies and guidelines applicable to the use of treated produced water for dust suppression.

<sup>2</sup> Note that when 'drilling' is stated in consent conditions, where relevant this has been interpreted to mean 'drilling and completions'.

### 3.2.2 NSW Non-Urban Water Metering Policy

The NSW Government is implementing a robust metering framework to measure and meter non-urban water take in NSW. The purpose of the metering framework is to improve the standard and coverage of non-urban water meters in NSW. It has been informed by broad community consultation, economic analysis and technical expertise.

The metering framework includes the *NSW Non-Urban Water Metering Policy* (DPIE, 2020) the metering-related provisions of the *Water Management (General) Regulation 2018* and the metering-related provisions of the *Water Management Act 2000*. The Act provides for and strengthens the legal basis for the metering framework. It imposes a metering condition requiring metering equipment to be installed, used and properly maintained on all water supply work approvals.

The Regulation sets out the requirements that must be complied with by all holders of approvals, licences and entitlements who are subject to the metering condition.

### 3.3 EIS commitments

In the EIS Chapter 31, and updated in Appendix B of the Response to Submissions, Santos has committed to implement a number of measures pending Project approval and a final investment decision. The EIS commitments relevant to the beneficial use of treated produced water for dust suppression have been reproduced below in Table 3.2, in accordance with consent condition D3(c) which states that Santos will ensure that (where relevant) the management plans include any relevant commitments or recommendations identified in the EIS.

**Table 3.2 - EIS commitment relevant to the Protocol**

Number	EIS Commitment relevant to the use of treated water for dust suppression
3.2 / 5.7	Only treated, amended <sup>3</sup> or bore water will be used for dust suppression and rehabilitation.

As described in section 11 of this Protocol and section 8 of the EMS, this Protocol will be subject to regular evaluation and review. This will include the EIS commitments to ensure they remain current, applicable, and generally improve the environmental performance of the Project.

<sup>3</sup> 'Amended' is defined to mean amended treated produced water.

## 4. Water quality

The quality of the produced water at the well head is detailed in section 4.3 of the PWMP. When the Leewood Water and Brine Treatment Plant (**WBTP**) is operating, it has the capacity to treat up to 1.5 ML of produced water per day. Treatment processes include:

- pre-treatment to enable the removal of solids and/or scale-causing compounds from the water. To remove solids and/or scale causing compounds, produced water first undergoes microfiltration/ultrafiltration to remove solids between 0.01 - 0.1 microns within the feed water. The final pre-treatment process involves using a biocide for bio-fouling control. This step controls the growth of microorganisms, both in the microfiltration/ultrafiltration and reverse osmosis (**RO**) stages;
- treatment by RO where the produced water is pumped through a semi-permeable membrane, separating treated water into one stream and salts into another stream known as rejected concentrate or 'brine'. Feed water is pumped at high pressure through the membranes, typically separating over 99 % of the total dissolved solids from the water; and
- post-treatment (amendment) which involves a series of steps in order to chemically balance the treated water prior to beneficial reuse (particularly for irrigation). This includes:
  - dechlorination by sodium bisulphate addition (this is dosed prior to the RO to protect the RO membranes from oxidation by chlorine);
  - addition of calcium and magnesium to lower the sodium adsorption ratio; and
  - adjustment of pH by acid or caustic addition, if required.

The current water treatment plant has the capacity to produce approximately 1 ML/day of amended treated water, which is held in a 5 ML treated water storage tank prior to its beneficial reuse. All produced water is treated to meet the water quality criteria in Appendix 6 of the CoC [reproduced as Table C1 in Appendix C], unless otherwise authorised in the EPL. Monitoring of the treated water from this tank is conducted in accordance with the conditions of EPL 20350 prior to beneficial reuse. This is further described in section 5.5 of the PWMP and in section 5.2 of the IMP.

Although the amended treated water will be used for a range of approved beneficial uses, only bore water will be used for dust suppression during Phase 1. Water quality data from the Bibblewindi 1 (BBD 1) and Bibblewindi 5 (BBD 5) bores located at the Bibblewindi facility are presented as monitoring locations BWD1WB and BWD5WB respectively in Table 4.21 and Table 4.22 of Appendix G4 of the EIS. The historical monitoring results are also available on the Santos water portal.

No water quality monitoring is required under the WALs or the water supply works approvals associated with BBD 1 and BBD 5, unless directed by the Minister by notice in writing.

The locations of the two bores at Bibblewindi are presented in Figure 4.1.



**Santos**

**LEGEND**

- Groundwater supply bore

**ONWARD**  
CONSULTING

**NARRABRI GAS PROJECT**

Figure 4.1

Bibblewindi Groundwater Supply Bores

## 5. Dust suppression protocol

As detailed in CoC B37 [Table 7], the amended treated water from the WBTP is approved for a number of beneficial uses, including a managed irrigation system on the Leewood property (refer to IMP for more details), dust suppression, construction and D&C activities, watering of rehabilitation areas and firefighting.

Only bore water from the Bibblewindi bores BBD 1 and BBD 5 will be used for dust suppression during Phase 1. The bores are connected to standpipes and truck fill points, and watercarts with dribble bars will be used to apply water to the surfaces of access roads and tracks, and at well pads to suppress dust.

The operation of dust suppression activities will take into consideration:

- managing spraying to avoid erosion, ponding, sedimentation, waterlogging and runoff of water;
- avoiding spraying during significant rainfall events;
- adjusting application rates and frequency based on climatic conditions, surface conditions and activities being undertaken; and
- routine visual inspections by the truck driver and site construction personnel each and every time of water application to check for erosion, ponding, sedimentation, waterlogging or runoff.

In summary, the beneficial reuse hierarchy that will apply during Phase 1 for the various water types is provided in Table 5.1.

**Table 5.1 - Preferential reuse options**

Water type	Beneficial reuse						
	Dust suppression and rehabilitation	Construction	D&C	Irrigation at Leewood	Managed release	Stock watering	Firefighting
Bore water	✓	✓	✓	✓			✓
Treated water	There will be no treated water produced, stored and/or used during Phase 1. Only amended treated water will be produced, stored and/or used during Phase 1.						
Amended treated water		✓ (preferred)	✓ (preferred)	✓ (preferred)			✓ (preferred)
Potable water	For personal use / ablutions only						

The use of amended treated water for the various beneficial reuse options is described in detail in section 5 of the Site Water Balance, provided as attachment 2 to the WMP.

The specific use of amended treated water for irrigation is fully addressed in the Irrigation Management Plan, provided as attachment 6 to the WMP.

The hierarchy of preferential uses may change for Phase 2 and subsequent phases.

## 6. Risk assessment and mitigation

The key findings of the EIS in relation to the use of treated produced water for dust suppression were that there will be negligible impacts on the soil and groundwater at the locations that this process is applied. Dust suppression impacts are also expected to be low given that treated and amended treated water qualities that will be used for dust suppression are consistent with baseline water qualities of the receiving catchments.

As stated in section 12.1.5 of the EIS, the potential impacts on surface water quality as a result of beneficially reusing treated, and amended treated water, for dust suppression, D&C and construction, were assessed in a semi-quantitative manner using guidance from the ANZECC/ARMCANZ (2000) irrigation guidelines. These guidelines were used as this water reuse option will have largely the same potential environmental impact issues as those assessed for irrigation of amended treated water to agricultural land. However, the total quantity of water and frequency of application will be substantially less for dust suppression, D&C and rehabilitation activities than for irrigation.

As shown in Table C1 in Appendix C, the target average concentration of total dissolved solids in treated water is approximately 200 to 250 milligrams per litre (**mg/L**), while amended treated water has average target concentrations of total dissolved solids of approximately 350 to 400 mg/L. Actual average concentrations are 56 and 71 mg/L respectively. The difference in total dissolved solids between treated and amended treated water is due to the addition of gypsum. As noted above, gypsum is typically added to irrigation water to raise the concentration of calcium and improve water quality for the soil. As discussed in Chapter 7 of the EIS, the concentrations of dissolved solids in the amended treated water are consistent with bore water qualities used regionally for similar activities. All data related to groundwater bore monitoring is available at the [Santos water portal](#).

The potential impacts of dust suppression will be minimised due to the quality of the bore water used and the nature of the activities. The quality of the bore water is similar or better than the amended treated water from the WBTP, and meets or exceeds Australian Drinking Water and Recreational Guidelines. As such, the potential impact from using bore water is even lower than that if amended treated water were used.

The quantity of water applied will be restricted to that required to control dust and will only be applied in dry conditions, minimising the potential for waterlogging and ponding. Water will be applied to disturbed and non-productive area such as construction sites or access tracks, and/or well pads under construction. These areas will typically be levelled and/or compacted, thereby preventing deep drainage.

## 7. Monitoring

An infrastructure monitoring program is implemented across the produced water and brine storage facilities and gathering and transfer infrastructure. A summary of the infrastructure monitoring measures and their frequency for each storage is included in Table 5.1 of the PWMP.

Routine visual inspection by the truck driver and site construction personnel during the application of bore water will be undertaken each and every time to check for erosion, ponding, sedimentation, waterlogging or runoff, to ensure that the quantity of water applied is restricted to that required to suppress dust. Application rates and application frequency will be adjusted based on the observed climatic conditions (wind, temperature, time of day) and the activities being undertaken. Active use of roads and tracks during construction or maintenance, and activities at well pads, may require more frequent application of bore water to maximise the dust suppression effect.

## 8. Trigger action response plans

A trigger action response plan (**TARP**) is generally developed to identify, assess and respond to abnormal conditions and is implemented to manage risk to operations, personnel and the environment. All TARP documents are stored on the Santos intranet and are available to all Santos Operations personnel. In addition to the trigger points and associated actions to be undertaken, these documents also detail the delegation of responsibility at each trigger points and contact details for both internal and external notification requirements.

In later phases of the Project and once the produced water treatment plant has been upgraded for operations and significant volumes of treated and/or amended treated water is used for dust suppression, a TARP will be developed for dust suppression similar to the TARPs for other beneficial uses of treated and amended treated water. A TARP for dust suppression is not required for Phase 1 for the following reasons:

- only bore water from the Bibblewindi bores will be used for dust suppression; and
- there will be negligible impacts on the soil and groundwater through the use of bore water for dust suppression, given that the bore water qualities that will be used for dust suppression are generally consistent with or better than baseline water qualities of the receiving catchments. This is further detailed in section 6.

## 9. Record keeping

Santos has a data management plan for the NGP that outlines the policies and procedures that will be implemented to ensure that data is managed in a consistent, efficient and effective manner in order to provide accurate records of activity operations and enhance the value of the data collected. An overview of Santos' data management plan is presented in Figure C1 of Appendix C of the Water Management Plan, in the form of a data-management flow chart.

Santos uses a number of systems and platforms to manage the documentation and data associated with the activities under this Protocol. These include Sharepoint for management plans, procedures and laboratory reports; Santos' EHS Toolbox for capturing inspections and field assessments; and EQulS<sup>4</sup>, an advanced environmental data management and decision support system, for capturing all data and any laboratory results.

Key records associated with this Protocol that will be stored and managed include:

- inspection and monitoring records;
- operational monitoring and performance data for the water treatment systems and dust suppression water transfer systems;
- water sampling and laboratory analytical reports;
- calibration records for field instruments and continuous water quality monitoring systems;
- records of implementation of any TARP (post-Phase 1 only);
- records of any reviews of this Protocol; and
- annual inspection reports and/or certifications.

Monitoring data is subject to quality assurance (**QA**) and quality control (**QC**) protocols and procedures that ensure that data is accurate and usable. Data is subjected to consistent validation and verification procedures. Any data that fails QA and QC procedures is rejected for future use.

Currently only bore water from the Bibblewindi groundwater bores is used for dust suppression. If treated and/or amended treated water is used for dust suppression, the Produced Water Code will become applicable to this Protocol (refer to section 3.2.1). The records required to be kept and maintained according to the Produced Water Code will be kept from the time the Code applies as a term imposed on an activity approval. Records will be kept in a legible form for production to any inspector for a period of four years following the expiry or termination of a prospecting title (refer to sections 97D and 97E of the PO Act).

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<sup>4</sup> EQulS (Environmental Quality Information System) is a proprietary software application.

## 10. Incidents, non-compliances and complaints

### 10.1 Incidents and non-compliances

Incident reporting and non-compliance notification will be in accordance with CoC D6 and D7 respectively, as described in section 6 of the EMS. Santos will notify the DPE and any other relevant agency via the Major Projects Portal immediately after becoming aware of an incident.

Within 7 days of becoming aware of a non-compliance with the CoC, Santos will notify the Department of the non-compliance via the Major Projects Portal. This notice will set out the non-compliance, the reasons for the non-compliance (if known) and what actions have been taken, or will be taken, to address the non-compliance. A non-compliance which has been notified as an incident will not be notified as a non-compliance.

Where incidents or non-compliances associated with this Protocol are identified, Santos will:

- take all reasonable and feasible steps to ensure that the incident or non-compliance ceases and does not reoccur;
- consider all reasonable and feasible options for remediation (where relevant) and submit a report to the relevant department(s) describing options and any preferred remediation measures or other courses of action; and
- implement remediation measures as directed by the relevant department(s).

### 10.2 Complaint management

Santos has a documented *Complaint Management Procedure* that is communicated to all relevant staff members. Complaints can be directed to Santos via phone or email 24 hours a day, 7 days a week. Contact details are publicly available on the Project website and are presented in Appendix D of the EMS.

All complaints are logged on a complaint form which includes the following details:

- date and time of the complaint;
- complainant details;
- details of the issue or complaint;
- actions taken to remediate the issue, if any;
- follow up actions required, if any;
- details of further liaison with complainant, if any; and
- closure date and time of the issue.

As per CoC D13, Santos maintains a complaint register which is updated as required and available on the Project website.

## 11. Reporting, evaluation and review

### 11.1 Annual Review

In accordance with condition D8 and as further described in section 8 of the EMS, Santos will review the performance of its dust suppression management processes for the previous calendar year and report the relevant results within the Annual Review, to the satisfaction of the Planning Secretary. The Annual Review will be submitted to the Department via the Major Projects Portal by the end of March each year, and will, at a minimum, provide the following information regarding:

- the effectiveness of the dust control and suppression management measures to prevent, and if prevention is not reasonable and feasible, to minimise any impact from the use of water for dust suppression; and
- any dust suppression incidents or non-compliances.

Further, the annual review under consent condition D8 requires a number of items to be reviewed or assessed. In summary these are:

- monitoring results and complaints;
- non-compliances and incidents;
- compliance with performance measures;
- discrepancies between predicted and actual impacts; and
- measures to be implemented to improve environmental performance.

The Annual Review may also make recommendations for any additions, changes or improvements to the dust suppression strategy and processes, and the water used for this purpose.

### 11.2 Independent environmental audits

Within one year of commencement of Phase 1 and every three years thereafter, Santos will commission an Independent Environmental Audit (IEA) of the operation, to be conducted in accordance with CoC D9. The audit team will be led by a suitably qualified auditor and include experts in groundwater, well integrity, hazards, and any other fields specified by the Planning Secretary.

The IEA process is further described in section 8.3 of the EMS.

### 11.3 Management Plan review and evaluation

As required by CoC D4, Santos will review the suitability of existing strategies, plans and programs required under this consent, within two months of:

- (a) the submission of an incident report;
- (b) the submission of an Annual Review;
- (c) the submission of an Independent Environmental Audit;
- (d) the submission of a Field Development Plan;
- (e) the submission of a Groundwater Model Update; or
- (f) the approval of any modification of the conditions of this consent.

This is to ensure the Protocol is updated on a regular basis and to incorporate any recommended measures to improve the environmental performance of the Project.

In view of the various conditions requiring annual reviews, suitability assessments and performance evaluations, it is recommended that this Protocol be reviewed and, if necessary, updated in at least the following circumstances:

- in accordance with any direction from the NSW EPA or the Minister administering the PO Act;
- before making any significant change to the design or operation of the dust suppression system(s) or location; and
- otherwise at intervals of no longer than one year.

The review history table in the front of this Protocol provides the details of each review, conducted in accordance with condition D4.

As required by CoC D5, if the review under condition D4 determines that this Protocol requires revision - to either improve the environmental performance of the development, cater for a modification or comply with a direction - then Santos will submit the revised document to the Planning Secretary for approval within 6 weeks of the review.

Further details on the reporting, evaluation and review of the Protocol are provided in section 8 of the EMS.

## 11.4 Improvement measures

Santos will conduct a program to investigate and implement ways to improve the environmental performance regarding dust suppression over time, and implement a protocol for the periodic review of the Dust Suppression Protocol, in accordance with CoC D3(g) and (i) respectively.

Measures to improve the environmental performance of the Project that will be implemented following review and evaluation include the following:

- regular internal audits of the dust suppression process and implementation;
- modifications to the Protocol to reflect changing site conditions; and
- regular monitoring and site inspections.

The protocol for review is set out by consent conditions D8, D4 and D5, which have been addressed in sections 11.1 and 11.3 above.

In accordance with CoC D13 and as described in section 6 of the EMS, all relevant monitoring data and associated reports will be made available on the Project website, for the duration of the Project. This information will be kept up to date.

## 12. References

CDM Smith (2016a). *Narrabri Gas Project EIS Appendix F: Groundwater Impact Assessment*. Prepared for Santos Ltd.

DPE (2017). *Code of Practice: Produced Water Management, Storage and Transfer*. NSW Department of Planning and Environment.

DPE (2022). *Guidelines for Groundwater Documentation for SSD/SSI Projects*. Technical guideline. NSW Department of Planning and Environment.

DPIE (2020). *NSW Non-Urban Water Metering Policy*. NSW Department of Planning, Industry and Environment.

GHD (2017). *Narrabri Gas Project Environmental Impact Statement*. Prepared for Santos Ltd.

## 13. Glossary

Term	Definition <sup>5</sup>
Access track	Cleared and graded track constructed where existing tracks are not available
Alignment	The line or lines that describe a linear-infrastructure route; it defines how linear infrastructure (such as a road, access track or pipeline) will be located in relation to the features encountered along the route
Amended treated water	Produced water that has undergone treatment and amendment, as generally described in the EIS, to enable it to be used for beneficial reuse purposes including irrigation, stock watering, drilling <sup>6</sup> , construction and dust suppression
Approved disturbance area	The disturbance areas shown in the EIS as modified by any approved Field Development Plan
Aquatic ecosystems	The physical and chemical environment that contains a community of organisms (plants, animals, and microbes), and ecological processes within rivers and their riparian zones and reservoirs, lakes, wetlands and their fringing vegetation
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
Baseline	A starting point used for future comparisons. Water baselines in context of the Narrabri Gas Project have been derived from long term water level and quality data presented in the Narrabri Gas Project Water Baseline Report
Beneficial use	Beneficial use refers to the use of waters, including produced water from an oil or gas well, for a secondary purpose that has a positive value. Potential beneficial use options for produced water include domestic and livestock supply, industrial supply, irrigation supply, dust suppression and recreation
Brine	Saline water with a total dissolved solid concentration of greater than 40,000 milligrams per litre. May be a wastewater produced by the desalination of coal seam water (e.g. by reverse osmosis)
Bund (or bunding)	Wall of a secondary containment system, usually in the form of an embankment, used to prevent sediment and liquids from entering the environment
Catchment	The area of land that collects and transfers rainwater into a watercourse
Cation exchange capacity	The number cations (positively charged ions) available in a soil. Cation exchange capacity can be used as a measure of soil fertility
Council	Narrabri Shire Council
Department	NSW Department of Planning and Environment (DPE)
Depressurisation	The extraction of coal seam water to facilitate gas production causes depressurisation of the target coal seams, which has the potential to propagate into surrounding formations
Discharge spring	Occur where water that has recharged sandstone sediments that outcrop on the margins of the Great Artesian Basin discharges after having travelled underground for relatively large distances and over an extended period of time
EIS	The Environmental Impact Statement titled Narrabri Gas Project Environmental Impact Statement, dated 31 January 2017, submitted with the development application, including the Applicant's response to submissions and supplementary response to submissions, and the additional information provided by the Applicant to the Department in support of the application

<sup>5</sup> The majority of the definitions are as provided in the Development Consent for SSD 6456.

<sup>6</sup> Note that when 'drilling' is stated in consent conditions, where relevant this has been interpreted to mean 'drilling and completions'.

Term	Definition <sup>5</sup>
Erosion	Wearing away of rock or soil caused by physical or chemical processes
Exploration well	A petroleum well that is drilled to: a) Explore for the presence of petroleum or natural underground reservoirs suitable for storing petroleum, or b) obtain stratigraphic information for the purpose of exploring for petroleum. For clarity, an exploration well is not a production well
Feasible	Means what is possible and practical in the circumstances
Fugitive dust	Dust derived from a mixture of non-point or not easily defined sources; examples include dust from vehicular traffic on unpaved roads, materials transport and handling and disturbed (unvegetated) soils and surfaces
Gas compression facility	A facility that houses multiple compressor units, either nodal or hub compressors or a mixture of both used to increase the pressure of gas for the purpose of transmission; may be collocated with a gas treatment facility and/or water management facility
Gas field infrastructure	All Project-related infrastructure, excluding the Leewood facility, Bibblewindi facility and the road upgrades required under SSD 6456
Gas well	Pilot wells and production wells
Gathering lines	Pipelines used to transfer gas and produced water from wells
Groundwater	Water contained in the interconnected pore spaces and voids of the saturated zone of sediments and rocks
Groundwater level (or static / standing water level)	The depth to groundwater from some reference point (usually the natural surface)
Groundwater quality	A measure of groundwater value expressed in physio-chemical terms, such as acidity / alkalinity, dissolved oxygen, dissolved salts, ions and contaminants like hydrocarbons
Incident	An occurrence or set of circumstances that causes or threatens to cause material harm and which may or may not be or cause a non-compliance
Linear infrastructure	Project related infrastructure of a linear nature including gas and water gathering lines, gas and water pipelines, access tracks, power lines, communication lines and other service lines
Major facilities	Leewood facility and Bibblewindi facility
Material harm	<p>Is harm that:</p> <ul style="list-style-type: none"> <li>involves actual or potential harm to the health or safety of human beings or to the environment that is not negligible, or</li> <li>results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding \$10,000 (such loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment)</li> </ul> <p>This definition excludes “harm” that is authorised under either SSD 6456 or any other statutory approval</p>
Minimise	Implement all reasonable and feasible mitigation measures to reduce the impacts of the Project
Mitigation	Activities associated with reducing the impacts of the development
Non-compliance	An occurrence, set of circumstances or development that is a breach of the SSD 6456 consent
Petroleum Assessment Lease 2 (PAL 2)	A PAL is required to hold the exclusive right to prospect for petroleum and to assess any petroleum deposit over a specified area of land in NSW. A lease allows the holder to maintain a title over a potential area, without having to

Term	Definition <sup>5</sup>
	commit to further exploration. The holder can, however, continue prospecting operations and to recover petroleum in the course of assessing the viability of commercial mining. PAL 2 is held by Santos NSW Pty Ltd.
Petroleum Exploration Licence 238 (PEL 238)	Before exploring for minerals or petroleum in NSW, an explorer must first obtain a Petroleum Exploration Licence (PEL) under the Petroleum (Onshore) Act 1991. An exploration licence gives the licence holder exclusive rights to explore for petroleum or specific minerals within a designated area but it does not permit mining, nor does it guarantee a mining or production lease will be granted. PEL 238 is held by Santos NSW Pty Ltd.
Petroleum Production Lease 3 (PPL 3)	A petroleum production lease gives the holder the exclusive right to extract petroleum within the production lease area during the term of the lease. PPL 3 is held by the following titleholders: <ul style="list-style-type: none"> <li>• Santos QNT Pty Ltd;</li> <li>• Santos NSW (Hillgrove) Pty Ltd; and</li> <li>• Santos NSW (Eastern) Pty Ltd.</li> </ul>
Petroleum production lease application (PPLA)	A petroleum production lease gives the holder the exclusive right to extract petroleum within the production lease area during the term of the lease. Development consent under the Environmental Planning and Assessment Act 1979 must be in place before a petroleum production lease can be granted. Santos, on behalf of its joint venture partner lodged four petroleum production lease applications under the PO Act in May 2014 for the Project area, being PPLAs 13, 14, 15 and 16. The ownership of the application is now held by Santos NSW Pty Ltd.
Pilot well	A well for gas and water extraction, for the purpose of exploration, appraisal and assessment of the gas field potential
Planning Secretary	Planning Secretary under the EP&A Act, or nominee
Pollution incident	Has the same meaning as in the POEO Act
Produced water	Any form of groundwater that is actively extracted from a borehole, well or excavation, excluding incidental groundwater mixed with drilling fluids
Production well	A well for gas and water extraction, for the purpose of commercial gas production and/or use
Project area	The area of approximately 95,000 hectares that encompasses the Project
Project footprint	The area of surface expression being about 1,000 hectares occupied by the infrastructure components of the Narrabri Gas Project
Project-related infrastructure	All infrastructure and other structures associated with the development. This includes linear infrastructure and non-linear infrastructure, surface infrastructure and subsurface infrastructure, major facilities, wells and well pads and other gas field infrastructure
Public infrastructure	Linear and related infrastructure that provides services to the general public, such as roads, railways, water supply, drainage, sewerage, gas supply, electricity, telephone, telecommunications, etc.
Reasonable	Means applying judgement in arriving at a decision, considering mitigation benefits, cost of mitigation versus benefits provided, community views and the nature and extent of potential improvements
Registered bore	A water bore whose presence has been notified to the Water NSW and included in its registered groundwater bore database. The database typically includes details on bore location, construction and where possible, the source aquifer.

Term	Definition <sup>5</sup>
Rehabilitation	The restoration of land disturbed by the development to ensure it is safe, stable and non-polluting over the short, medium and long term
Riparian	Situated along or near the bank of a watercourse
RREO	Resource Recovery Exemption under clauses 91 and 92, and/or Resource Recovery Order under clause 93, of the Protection of the Environment (Waste) Regulation 2014
Spring	A naturally occurring discharge of groundwater flowing out of the ground, often forming a small stream or pool of water. Typically, it represents the point at which the water table intersects the ground level.
Scour	Erosion of sediment that occurs around structures in a watercourse due to increased velocity
Sediment	Particles derived from rocks or biological materials that have been transported by air or water
Sedimentation	Deposition or accumulation of mineral or organic matter deposited by air or water
Treated water	Produced water that has undergone treatment to enable it to be used for beneficial reuse purposes including irrigation, stock watering, drilling <sup>7</sup> , construction and dust suppression, and/or for managed release to Bohena Creek <sup>8</sup>
Unacceptable risk	The level of risk at which mitigation actions are deemed to be warranted.
Watercourse	A river, creek or other stream, including a stream in the form of an anabranch or tributary, in which water flows permanently or intermittently, regardless of the frequency of flow events: In a natural channel, whether artificially modified or not, or in an artificial channel that has changed the course of the stream. It also includes weirs, lakes and dams
Well	Pilot wells and production wells
Well pad	An area of up to 1 hectare in size upon which the gas wells are to be located, with the area decreasing to no more than 0.25 hectares following rehabilitation <sup>9</sup> , or other area as may be approved in the Field Development Plan

<sup>7</sup> Note that when 'drilling' is stated in consent conditions, where relevant this has been interpreted to mean 'drilling and completions'.

<sup>8</sup> Note that there will be no discharge to Bohena Creek during Phase 1.

<sup>9</sup> Workover activities will be contained within the operational area of the well pad area of around 0.2 ha, with an additional laydown area that could be approximately 0.2 ha in size.

## Appendix A - Consultation records



## Natural Resources Access Regulator

Contact: Tim Baker  
Phone: 0428 162 097  
Email: Tim.Baker@nrar.nsw.gov.au

Our ref: V15/3875-5#53  
File No:  
Your Ref:

10 November 2021

Dave Gornall  
Santos Limited  
email: David.Gornall@santos.com

Dear Dave

### Re: Narrabri Gas Project - Water Management Plans third batch

Thank you for the opportunity to provide comment on the third set of plans under the Water Management Plan requirement for Phase 1 of the Narrabri Gas Project. It is understood this consultation is in accordance with Condition B41 of Project Approval SSD 6456. The plans reviewed include the Dust Suppression Protocol, Site Water Balance and the Surface Water Management Plan. NRAR is satisfied the consultation requirements have been met in respect to the plan preparation and provides the following comments and recommendations.

#### Dust Suppression Protocol

- Recommend a reference to the Water Access Licences held under the *Water Management Act 2000* be included in Section 3 that are to be used to account for water take used for dust suppression. Include in Section 3.1 the need to comply with conditions on the licence.
- Include details of monitoring and reporting on the volumes of water taken for dust suppression from the various sources proposed, eg. bores, treated or amended water.
- Include a map to depict the points where water used for dust suppression is sourced from, stored and any transfer infrastructure.
- Include protocols to determine the priority of water sources used for dust suppression. It is noted relevant details are included in Section 5.1.1 of the Site Water Balance.

#### Site Water Balance

- It is noted two of the WALs in Table 4.2 currently do not nominate any works. If these WALs are to be used to account for water take in Phase 1, the relevant Miscellaneous Work will need to be nominated on the WAL via an application to WaterNSW. Where any WALs that currently nominate works are now not required because of the State Significant Development status, it is recommended these be amended via application to WaterNSW to nominate the relevant Miscellaneous Work.

- Include a detailed plan overlying an aerial image to a suitable scale depicting the location of water related infrastructure, including water supply bores, wells that supply water, water storage facilities (produced water, runoff capture - dirty/clean), water pipelines and monitoring bores. This information is critical to understand the locations of infrastructure to aid interpretation of system operation, monitoring and potential impacts, and to also clarify the location of extraction and storage of licensed water or where exemptions/exclusions apply. It is recommended a table be included which lists each water storage, the source of the water it receives and whether licensed entitlement or an exemption applies.
- Include locations of metering points on the water infrastructure which are to be used to quantify water take from authorised extraction points, water take from exempt sources, and/or used to inform the water balance for the site. Please note metering will need to meet the requirements of the NSW Non-Urban Water Metering Policy and associated roll out timeframes. Further information on this can be obtained at the following link: <https://water.dpie.nsw.gov.au/nsw-non-urban-water-metering> or email [metering.reform@dpie.nsw.gov.au](mailto:metering.reform@dpie.nsw.gov.au)
- In Table 7.1 clarification is requested on the source of water that applies to the reference to "groundwater" in inflows. It is assumed this is referring to supply from bores. If correct, please add a reference to bore supply or something related in the name.

## Surface Water Management Plan

- It is noted the Surface Water Management Plan doesn't include any references to management of surface water via capture in storages or diversions. Based on condition B41 which refers to the need for detailed plans, design objectives and performance criteria for these types of works this information should be included in this plan. A detailed plan overlying an aerial image is requested which depicts the surface water management infrastructure eg. sediment basins, diversions, and their design and operational objectives to mitigate impact.
- In Table 6.1 it is recommended to include in the mitigating measures for watercourse crossings a reference to the Guidelines for Controlled Activities on Waterfront Land in relation to the design, construction and rehabilitation of watercourse crossings. This is consistent with condition B37 of the consent.
- As there is a performance measure to maintain or improve baseline channel stability in affected watercourses it is recommended appropriate monitoring sites be selected downstream of potential disturbance areas such as watercourse crossings and discharge points. Disturbance areas associated with future phases of the project should also be considered for monitoring sites as this will assist in gathering required baseline data.

For further information please contact Tim Baker, Senior Water Regulation Officer on 0428162097 or e: [Tim.Baker@nrar.nsw.gov.au](mailto:Tim.Baker@nrar.nsw.gov.au)

Yours sincerely



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# Santos

## Management Plan Consultation Feedback Form

**DOCUMENT TITLE:** Dust Suppression Protocol

**STAKEHOLDER:** NSW Environment Protection Authority

**CONSULTATION  
RELEASE DATE:** 30 August 2021

**COMMENTS DUE DATE:** 29 October 2021

General Feedback	
<b>Key Issues</b>	<p>EPAs comments on the Produced Water Management Plan (PWMP) identified that using unamended effluent for reuse as dust suppression in forested areas is not acceptable and is not consistent with the Consent due to potential sodium adsorption ratio (SAR) risk. This issue needs to be addressed throughout all management plans including those in the current batch being reviewed, i.e. the DSP, Surface Water Management Plan and Site Water Balance.</p> <p>Consent condition B37 states that Santos must ensure that the development complies with a range of management performance measures. Irrigation performance measures include:</p> <ul style="list-style-type: none"> <li>Only amended treated water to be used for reuse activities (except for firefighting), unless other use of treated water has been approved as part of the Water Management Plan (IMP Section 5.2)</li> <li>No irrigation in forested area, apart from dust suppression and construction activities on operational areas and access roads (IMP Section 5.4)</li> </ul> <p>The DSP does not include any further assessment of SAR risk from using unamended effluent for dust suppression as it simply considers the salinity of unamended and amended effluent.</p> <p>It is noted that predominantly bore water will be used for dust suppression during Phase 1.</p>
<b>Suggestions for improvement</b>	<p>The Dust Suppression Protocol should be revised to address the issues outlined above.</p>

Section	Type	Specific Feedback
		<i>Detail specific issues with certain sections in the document</i>
eg Section 2	Legislative + Regulatory reqs./ Readability / Usability /	Further detail is required about when a report is required and how the report is to be submitted.

## Dust Suppression Protocol – NRAR comments received on Revision C (draft)

Item	Section #	Section heading	Existing text	Comment	Draft response
1	3	Regulatory requirements	No specific text reference	Recommend a reference to the Water Access Licences held under the <i>Water Management Act 2000</i> be included in Section 3 that are to be used to account for water take used for dust suppression. Include in Section 3.1 the need to comply with conditions on the licence.	A reference has been provided in section 3.1 to the Water Access Licences (WLAs) which are detailed in section 4.1.3 of the Site Water Balance.
2	N/A	General comment	No specific text reference	Include details of monitoring and reporting on the volumes of water taken for dust suppression from the various sources proposed, e.g. bores, treated or amended water.	Only bore water will be used for dust suppression during Phase 1. Monitoring of water take from the bores is per metering, as per the Water Access Licence requirements presented in section 4 of the Site Water Balance.
3	N/A	General comment	No specific text reference	Include a map to depict the points where water used for dust suppression is sourced from, stored and any transfer infrastructure.	Only bore water will be used for dust suppression during Phase 1. The WALs and Water Supply Works (WSPs) are detailed in section 4 of the Site Water Balance.
4	N/A	5.1.1	Operational support Dust suppression	Include protocols to determine the priority of water sources used for dust suppression. It is noted relevant details are included in Section 5.1.1 of the Site Water Balance.	Only bore water will be used for dust suppression during Phase 1. Details of the WALs are presented in section 4 of the Site Water Balance.

**Note:**

The numbering of the sections and appendices between the draft and final version of the document may have changed.

## Dust Suppression Protocol - EPA comments received on Revision C (draft)

Item	Section #	Section heading	Existing text	Comment	Final response
1	N/A	General	No specific text reference	<p>EPA's comments on the Produced Water Management Plan (PWMP) identified that using unamended effluent for reuse as dust suppression in forested areas is not acceptable and is not consistent with the Consent due to potential sodium adsorption ratio (SAR) risk.</p> <p>This issue needs to be addressed throughout all management plans including those in the current batch being reviewed, i.e. the DSP, Surface Water Management Plan and Site Water Balance.</p> <p>Consent condition B37 states that Santos must ensure that the development complies with a range of management performance measures. Irrigation performance measures include:</p> <ul style="list-style-type: none"> <li>Only amended treated water to be used for reuse activities (except for firefighting), unless other use of treated water has been approved as part of the Water Management Plan (IMP Section 5.2)</li> <li>No irrigation in forested area, apart from dust suppression and construction activities on operational areas and access roads (IMP Section 5.4)</li> </ul> <p>The DSP does not include any further assessment of SAR risk from using unamended effluent for dust suppression as it simply considers the salinity of unamended and amended effluent.</p> <p>It is noted that predominantly bore water will be used for dust suppression during Phase 1.</p>	<p>Only bore water will be used for dust suppression, and dust suppression will only occur in forested areas on operational areas and access roads, as per Table 7 of condition B37 of the consent.</p> <p>Note that the definition for treated water in the CoC is as follows:</p> <p><i>Produced water that has undergone treatment, as generally described in the EIS, to enable it to be used for beneficial reuse purposes including irrigation, stock watering, drilling, construction and dust suppression, and/or for managed release to Bohena Creek</i></p> <p>The definition for amended treated water in the CoC is as follows:</p> <p><i>Produced water that has undergone treatment and amendment, as generally described in the EIS, to enable it to be used for beneficial reuse purposes including irrigation, stock watering, drilling, construction and dust suppression.</i></p> <p>As such, both treated and amended treated water are approved to be used for dust suppression (and may be used as such after Phase 1).</p>
2	N/A	General	No specific text reference	The Dust Suppression Protocol should be revised to address the issues outlined above.	The document has been revised to address the issues outlined above, with specific reference to the use of only bore water for dust suppression during Phase 1.

**Note:**

The numbering of the sections and appendices between the draft and final version of the document may have changed.

## Dust Suppression Protocol – WTAG comments received on Revision C (draft)

Comments received from Randall Cox, Jack Warnock and Michael Williams

Item	Section #	Section heading	Existing text	Comment	Final response
1	1.4	Performance measures	No specific text reference	<b>[Jack Warnock]</b> Use of the word “irrigation” to describe “water use in forested areas” could be reviewed. I realise the Conditions of Consent B37 makes reference to “No irrigation in forested areas ...”. However, it is not strictly correct. <i>“Irrigation is the artificial process of applying controlled amounts of water to land to assist in the production of crops, but also to grow landscape plants and lawns, where it may be known as watering: (Source: Wikipedia)”</i>	Where applicable for forested areas, the wording in the Plans will be amended to avoid the use of ‘irrigation’ when ‘water application’ can be used.
2	4	Water quality	[Refer to comment]	<b>[Jack Warnock]</b> In paragraph 1 reference is made to “ ... the Leewood Water and Brine Treatment Plant having the capacity to treat up to 1.5 ML of produced water per day” Further down the page in paragraph 2, reference is made to “ ... the current water treatment plant has the capacity to produce approximately 1 ML/day of amended treated water.” Could an explanation be provided to describe what the 0.5 ML per day is (brine?) and how it is managed/stored?	The produced water and brine treatment is further described in sections 5.4 and 5.5 of the PWMP.  The expected capacity (untreated water input and amended treated water output) is as stated. The raw CSG <b>input</b> capacity and treated water <b>output</b> capacity is not the same. Input capacity must be greater than output capacity, unless output also factors in the brine waste volume (and some process losses) A cross-reference to the relevant sections of the Produced Water Management Plan has been added to the text.
3	4	Water quality	No specific text reference	<b>[Michael Williams]</b> Are the waters consistent with not deflocculating the clays that will be watered for dust suppression? For instance, water suitable for irrigation will often deflocculate clay exposed in constructed water storages.	In fine-textured soils, high concentrations of sodium can lead to a loss of soil structure and sodium-induced soil deflocculation, resulting in reduced permeability. It will be the Agricultural Supervisor’s responsibility to assess soil structure, soil moisture and water quality for irrigation, as stated in section 2 of the Irrigation Management Plan. The text has been clarified to reiterate that bore water will almost exclusively be used for dust suppression for Phase 1.
4	4	Water quality	As shown by the operational results in the second set of columns in Table B1, the minimum limits of reporting (LOR) for magnesium (Mg), aluminium (Al), potassium (K), calcium (Ca), mercury (Hg), ammonia (as N), nitrate (as N), total nitrogen (N), sulfate (SO <sub>4</sub> ), fluoride (F) and total phosphorous (P) are different from the target values, which reflect Appendix 6 of the CoC10. These LOR align with standard practices and NATA accredited laboratory methodologies.	<b>[Randall Cox]</b> Page 13 last paragraph. This is not clear to me.	As stated in notes (a) and (b) below Table B1, the ‘target’ values are theoretical values based on manufacturers’ specifications; and the calculated composition based on theoretical treated water and amendment with 1 mol gypsum prior to commissioning of the RO plant. Operational results have been removed from Table C1 (previously Table B1).
5	6	Risk assessment and mitigation		<b>[Randall Cox]</b> Para 2 refers to Table B1 as showing a ‘target average concentration’ for TDS of treated water as approximately 200 to 250 mg/l. I can’t see this from the table – I see a single value of 232mg/l – same with the amended treated water.	This is directly from the EIS. Section 12.1.5 in Chapter 12 provides the following: <i>It is likely that treated water would have an average concentration of total dissolved solids of approximately 200 to 250 milligrams per litre, while treated then amended water would have average concentrations of total dissolved solids of approximately 350 to 400 milligrams per litre.</i> It then refers to EIS Table 7-2, which is reproduced in full as part of Table B1. Refer to item #4 for further explanation on the ‘target values’ in Table B1.

<sup>10</sup> The CoC requires tighter LOR (or method detection limit) than is typical for our historic monitoring data. This is simply a reflection of historical requirements and laboratory limitations.

Item	Section #	Section heading	Existing text	Comment	Final response
6	6	Risk assessment and mitigation	No specific text reference	<b>[Michael Williams]</b> While it may be outside the WTAG ToR, is there a rationale for the widespread monitoring in the Namoi catchment upstream of the Narrabri Gas Project? The EIS predicts areal impacts significantly less than the area monitored? The displayed sites appear inconsistent with the sites identified in the Section 4 of the Surface Water MP.	A number of the monitoring points are stream flow stations (Figure 4.4 of the Surface Water MP) and the displayed sites in the Santos Water Portal coincide with those in Figure 4.5 of the Surface Water MP. Note that some of the locations are Government owned, and the upstream locations do not provide any data post 2016. As such, this seems like historical data only.
7	6	Risk assessment and mitigation	All data related to groundwater bore monitoring is available at the <a href="#">Santos water portal</a> .	<b>[Michael Williams]</b> Many of the groundwater quality sites are NoW bores that are nested piezometers of which only one is monitored. Is there a piezometer monitoring cross-reference (for the slotted interval) or does the user interrogate the NoW data system?	Note that NSW Office of Water (NoW) is DPE Water. A full list of all groundwater monitoring locations is provided in the Groundwater Baseline Report, as part of the Groundwater Management Plan.
8	9	Record keeping		<b>[Jack Warnock]</b> Could the Acronyms and Abbreviations be updated? On Page 18: Section 9 “EQuIS” is used, but there is no reference to its meaning.	EQuIS (Environmental Quality Information System) is a proprietary software application. A footnote with an explanation has been provided, and ‘EQuIS’ has been added to the acronyms and abbreviations list.
9	Appendix B	Table B1 Treated, amended and bore water quality ‘target’ criteria		<b>[Michael Williams]</b> SAR is calculated from mEq and is dimensionless (?)	The SAR is the ratio of the sodium concentration divided by the square root of half the sum of the calcium and magnesium concentration. Since it is a ratio it is dimensionless. As per the heading of the first column of Table B1, the unit of all parameters is (mg/L) unless stated. The sodium adsorption ration (SAR) in Table B1 does not have any units.
10	Appendix B	Table B1 Treated, amended and bore water quality ‘target’ criteria		<b>[Randall Cox]</b> For ‘Treated water Leewood WBTP’ Why is SAR given as 29 in the ‘actual values’ column and ‘n/a’ in the ‘operational results’? All the other numbers in the columns are the same.	In Table B1, the value of ‘29’ for the SAR is in the ‘Treated Water Leewood WBTP’ column, under the ‘Target values (from CoC) sub-column. Neither electrical conductivity or SAR were analysed, presented as ‘n/a’. It should be noted that only amended treated water is currently produced by the water and brine treatment plant. Operational results have been removed from Table C1 (previously Table B1).
11	Appendix B	Table B1 Treated, amended and bore water quality ‘target’ criteria		<b>[Randall Cox]</b> In the CoC ‘treated water (Leewood WBTP)’ is called up as ‘Actual’ – in the Table B1 (and the equivalent table in the produced water management plan) it is called up as ‘Target’.	Correction has been made to the relevant tables in both the Dust Suppression Protocol and the Produced Water Management Plan appendices. The sub-column heading for ‘Target values’ should only be across two columns (treated water and amended treated water). The ‘Actual values’ sub-column should be across the next three columns.
12		General	No specific text reference	<b>[Randall Cox]</b> For this (and the Produced Water Management Plan) the water quality criteria Table B1 is difficult to follow. I know the left-hand columns flow from the CoC, but some textual explanation would help.	Refer to the response to Item #4. Operational results have been removed from Table C1 (previously Table B1).

**Note:**

The numbering of the sections and appendices between the draft and final version of the document may have changed.

## Appendix B - Consent conditions relevant to this Protocol

**Table B1 - SSD 6456 consent conditions directly relevant to this Protocol**

SSD 6456 consent conditions directly relevant to this Protocol	Section reference
<b>Consent condition A1</b> In meeting the conditions of this consent, the Applicant must implement all reasonable and feasible measures to prevent and, if prevention is not reasonable and feasible, minimise any material harm to the environment that may result from the construction, operation or rehabilitation of the development.	Section 1.2
<b>Consent condition A5</b> The Applicant may only undertake the development in the following stages:	Section 1.1.2
a) Phase 1, comprising ongoing exploration and appraisal activities;	
b) Phase 2, comprising construction activities for production wells and related infrastructure;	
c) Phase 3, comprising gas production operations; and	
d) Phase 4, comprising gas well and infrastructure decommissioning, rehabilitation and mine closure.	
<b>Consent condition A23</b> With the approval of the Planning Secretary, the Applicant may:	
a) prepare and submit any strategy, plan or program required by this consent on a staged basis (if a clear description is provided as to the specific stage and scope of the development to which the strategy, plan or program applies, the relationship of the stage to any future stages and the trigger for updating the strategy, plan or program	Section 1.2
b) combine any strategy, plan or program required by this consent (if a clear relationship is demonstrated between the strategies, plans or programs that are proposed to be combined);	No combination proposed as part of this Plan
c) update any strategy, plan or program required by this consent (to ensure the strategies, plans and programs required under this consent are updated on a regular basis and incorporate additional measures or amendments to improve the environmental performance of the development); and	Section 1.2 Section 11.4
d) combine any strategy, plan or program required by this consent with any similar strategy, plan or program required by a consent	No combination proposed as part of this Plan
<b>Consent condition B37</b> The Applicant must ensure that the development complies with the water management performance measures in Table 7 [of the CoC]:	
<ul style="list-style-type: none"> <li>Water management – General</li> </ul>	
<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>maximise water recycling, reuse and sharing opportunities</li> </ul> </li> </ul>	Section 1.4
<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>maximise beneficial re-use of treated water</li> </ul> </li> </ul>	
<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>minimise the need for discharge of treated water to Bohena Creek</li> </ul> </li> </ul>	
<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>design, install, operate and maintain water management infrastructure in a proper and efficient manner</li> </ul> </li> </ul>	
<ul style="list-style-type: none"> <li>Irrigation and beneficial reuse management</li> </ul>	

SSD 6456 consent conditions directly relevant to this Protocol	Section reference
<ul style="list-style-type: none"> <li>negligible change to soil quality and groundwater quality and levels in irrigation areas and other areas subject to treated water application;</li> </ul>	Refer to the IMP
<ul style="list-style-type: none"> <li>only amended treated water to be used for reuse activities (except for firefighting), unless other use of treated water has been approved as part of the Water Management Plan; and</li> </ul>	Section 5
<ul style="list-style-type: none"> <li>no irrigation [no application of treated water] in forested area, apart from dust suppression and construction activities on operational areas and access roads.</li> </ul>	Section 5
<b>Consent condition B41</b> Prior to the commencement of Phase 1, the Applicant must prepare a Water Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:	
(d) include a	
(vii) Dust Suppression Protocol for managing beneficial reuse of treated water for dust suppression and construction activities (including rehabilitation and D&C), that includes details of:	This document
<ul style="list-style-type: none"> <li>site selection and assessment;</li> </ul>	Section 4
<ul style="list-style-type: none"> <li>baseline soil and groundwater conditions and quality;</li> </ul>	Section 4 Section 6
<ul style="list-style-type: none"> <li>a protocol for operation of the dust suppression system;</li> </ul>	Section 5
<ul style="list-style-type: none"> <li>measures to:               <ul style="list-style-type: none"> <li>maintain soil structure, stability and productive capacity;</li> <li>minimise erosion and sedimentation, ponding and waterlogging;</li> <li>ensure effective surface water and stormwater runoff controls; and</li> <li>maintain groundwater quality and minimise changes to groundwater levels</li> </ul> </li> </ul>	Sections 5, 6 and 7
<b>Consent condition D3</b> The Applicant must ensure that (where relevant) the management plans required under this consent include:	
a) summary of relevant background or baseline data;	Section 6
b) details of:	
(i) the relevant statutory requirements (including any relevant approval, licence or lease conditions);	Section 3.1.3
(ii) any relevant limits or performance measures and criteria; and	Section 1.4
(iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;	Section 1.5
c) any relevant commitments or recommendations identified in the documents listed in the NGP EIS;	Section 3.3

SSD 6456 consent conditions directly relevant to this Protocol	Section reference
d) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria	Section 1.4 Section 3.1.3 Section 5 Table C1 Appendix C
e) a program to monitor and report on the:	Section 4
(i) impacts and environmental performance of the development; and	Section 11.1
(ii) effectiveness of the management measures set out pursuant to paragraph (d);	
f) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;	Section 8
g) a program to investigate and implement ways to improve the environmental performance of the development over time	Section 11.4
h) a protocol for managing and reporting any:	
(i) incident, non-compliance or exceedance of any impact assessment criterion and performance criterion	Section 10.1
(ii) complaint; or	Section 10.2
(iii) failure to comply with other statutory requirements; and	Section 10.1
i) a protocol for periodic review of the plan.	Section 11.3
<b>Consent condition D4</b> Within 2 months of: (a) the submission of an incident report; (b) the submission of an Annual Review; (c) the submission of an Independent Environmental Audit; (d) the submission of a Field Development Plan; (e) the submission of a Groundwater Model Update; or (f) the approval of any modification of the conditions of this consent, the Applicant must review the suitability of existing strategies, plans and programs required under this consent.:	Section 11.3
<b>Consent condition D5</b> If the review determines that the strategies, plans and programs required under this consent require revision – to either improve the environmental performance of the development, cater for a modification or comply with a direction - then the Applicant must submit the revised document to the Secretary for approval within 6 weeks of the review. <b>Note:</b> <i>This is to ensure strategies, plans and programs are updated on a regular basis and to incorporate any recommended measures to improve the environmental performance of the development.</i>	Section 11.3
<b>Consent condition D6</b> The Applicant must notify the Department and any other relevant agencies via the Major Projects Portal immediately after it becomes aware of the incident. This notice must describe the location and nature of the incident.	Section 10.1

SSD 6456 consent conditions directly relevant to this Protocol	Section reference
<p><b>Consent condition D7</b></p> <p>Within 7 days of becoming aware of a non-compliance with the conditions of this consent, the Applicant must notify the Department of the non-compliance via the Major Projects Portal. This notice must set out the non-compliance, the reasons for the non-compliance (if known) and what actions have been taken, or will be taken, to address the non-compliance.</p> <p><b>Note:</b> A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance</p>	Section 10.1
<p><b>Consent condition D8</b></p> <p>By the end of March each year, unless the Planning Secretary agrees otherwise, the Applicant must submit an Annual Review of the environmental performance of the development to the Department via the Major Projects Portal.</p>	Section 11.1
<p><b>Consent condition D9</b></p> <p>Within one year of commencement of Phase 1 and every 3 years thereafter, unless the Planning Secretary directs otherwise, the Applicant must commission and pay the full cost of an Independent Environmental Audit of the development.</p>	Section 11.2
<p><b>Consent condition D13</b></p> <p>From the commencement of Phase 1, until the completion of all rehabilitation required under this consent, the Applicant must:</p>	
<p>a) make copies of the following information publicly available on its website:</p> <ul style="list-style-type: none"> <li>(i) the document/s listed in condition A2(c);</li> <li>(ii) current statutory approvals for the development;</li> <li>(iii) approved strategies, plans and programs;</li> <li>(iv) detailed plans for the Phases of the development;</li> <li>(v) minutes of CCC and Advisory Group meetings;</li> <li>(vi) regular reporting on the environmental performance of the development in accordance with the reporting requirements in any plans or programs approved under the conditions of this consent;</li> <li>(vii) a comprehensive summary of the monitoring results of the development, reported in accordance with the specifications in any conditions of this consent, or any approved plans and programs;</li> <li>(viii) a summary of the current phase/s and progress of the development;</li> <li>(ix) contact details to enquire about the development or to make a complaint;</li> <li>(x) a complaint register, updated monthly;</li> <li>(xi) a record of all incidents and non-compliances;</li> <li>(xii) the Annual Reviews of the development;</li> <li>(xiii) audit reports prepared as part of any Independent Environmental Audit of the development and the Applicant's response to the recommendations in any audit report; and</li> <li>(xiv) any other matter required by the Planning Secretary; and</li> </ul>	<p>Section 1.7</p> <p>Section 10.2</p> <p>Section 11.4</p>
<p>b) keep such information up to date.</p>	<p>Section 1.7</p> <p>Section 10.2</p> <p>Section 11.4</p>

## Appendix C - Treated water quality

Table C1 - Treated water quality

Parameter	Australian Drinking Water and Recreational Guidelines (NHMRC, NRMCC 2008; 2011, 2017)	ANZECC / ARMCANZ (2000) Irrigation Guidelines (long term > 20 years)	ANZECC / ARMCANZ (2000) Stock watering	Treated water <sup>a</sup>	Treated and amended water <sup>b</sup>	Treated water <sup>c</sup> (Leewood WBTP)	Treated and amended water <sup>d</sup> (Leewood WBTP)	RO brine <sup>e</sup> (Leewood WBTP)
	(mg/L)			Target (mg/L)		Actual (mg/L)		
pH (pH units)	6.5 – 8.5	6.0 -9.0	Not referenced	7.1	7.1	7.9	7.1	(Lab) 9.3
Electrical conductivity (laboratory) (µS/cm)	Not referenced	Crop specific -Lucerne (2,700 in loamy soils)	Not referenced	357	566	n/a	107	76,000
Total dissolved solids	Health: Not referenced Aesthetic as follows: <600 good quality 600-900 fair quality 900-1200 poor quality >1,200 Unacceptable	Crop specific – Lucerne (1,273 - 3,015)	No adverse effects to: Beef cattle, pigs and horses 4,000  Sheep 5,000	232	368	56	71	N/A
Sodium Adsorption Ratio	Not referenced	<1 excellent 1-2 Good 2-4 Fair 4-8 Poor 8-15 Very poor >15 Unacceptable	Not referenced	130	3.3	29	3.7	1,046
Sodium (filtered)	Health: Not referenced Aesthetic: 180	Crop specific - Lucerne (230 - 460)	Not referenced	77	77	17	18	41,600
Magnesium (filtered)	Not referenced	Not referenced	Not referenced	<0.01	<0.01	<1	<1	55
Aluminium	Health: Not ref Aesthetics: 2	5	5	<0.001	<0.001	<0.01	<0.01	<0.05
Silica (SiO <sub>2</sub> ) (µg/L)	80	Not referenced	Not referenced	23	0.15	<0.1	<0.1	135
Potassium (filtered)	Not referenced	Not referenced	Not referenced	0.8	0.8	<1	<1	387
Calcium (filtered)	Health: Not referenced Aesthetic as follows: <60 Soft 60-200 Good quality >200 Increased scaling	Not referenced	1,000	0.01	40.01	<1	6	28
Chromium (III+VI)	0.05	0.1 (Cr <sup>IV</sup> )	1	<0.001	<0.001	<0.001 (Cr <sup>IV</sup> )	<0.001 (Cr <sup>IV</sup> )	<0.01
Manganese	0.5	0.2	Not sufficiently toxic	<0.001	<0.001	<0.001	<0.001	0.014
Iron	<1	0.2	Not sufficiently toxic	<0.001	<0.001	<0.05	<0.05	0.27
Boron	4	Crop specific: 0.5 (sensitive) to 15 (very tolerant)	5	0.12	0.12	0.11	0.09	5.57
Cobalt	Not referenced	0.05	1	<0.001	<0.001	<0.001	<0.001	<0.005
Nickel	0.02	0.2	1	<0.001	<0.001	<0.001	<0.001	<0.005
Copper	2	0.2	0.4 (sheep) 1 (cattle) 5 (pigs)	<0.001	<0.001	<0.001	<0.001	<0.005

Parameter	Australian Drinking Water and Recreational Guidelines (NHMRC, NRMCC 2008; 2011, 2017)	ANZECC / ARMCANZ (2000) Irrigation Guidelines (long term > 20 years)	ANZECC / ARMCANZ (2000) Stock watering	Treated water <sup>a</sup>	Treated and amended water <sup>b</sup>	Treated water <sup>c</sup> (Leewood WBTP)	Treated and amended water <sup>d</sup> (Leewood WBTP)	RO brine <sup>e</sup> (Leewood WBTP)
		(mg/L)		Target (mg/L)		Actual (mg/L)		
Zinc	Health: Not referenced Aesthetic: 3	2	20	<0.001	<0.001	<0.005	<0.005	<0.025
Arsenic	0.01	0.1	0.5 – 5	<0.001	<0.001	<0.001	<0.001	0.018
Selenium	0.01	0.02	0.02	<0.001	<0.001	<0.01	<0.01	<0.05
Molybdenum	0.05	0.01	0.15	<0.001	<0.001	<0.001	<0.001	0.006
Cadmium	0.002	0.01	0.01	<0.001	<0.001	<0.0001	<0.0001	0.0012
Barium	2	Not referenced	Not referenced	<0.001	<0.001	<0.001	<0.001	12.3
Mercury	0.001	0.002	0.002	0.0000067	<0.001	<0.0001	<0.0001	<0.0005
Lead	0.017	2	0.1	<0.001	<0.001	<0.001	<0.001	<0.005
Uranium	0.017	0.01	0.2	<0.0028	<0.0028	<0.001	<0.001	<0.005
Alkalinity (total as CaCO <sub>3</sub> )	Not referenced	Not referenced	Not referenced	139	139	34	28	73,500
Ammonia (as N)	Health: Not referenced Aesthetic: 0.5	Crop specific as N (25 - 125)	Not referenced	0.005	0.005	0.25	0.24	N/A
Nitrate (as N)	50	Crop specific as N (25 - 125)	400	0.005	0.005	0.04	0.25	N/A
Total N	Not referenced	25 - 125	Not referenced	0.005	0.005	0.23	0.42	N/A
Sulfate	500	Not referenced	1,000	0.003	95.9	<1	<1	58
Chloride	Health: Not referenced Aesthetics: 250	Crop specific –Lucerne (350 –700)	Not referenced	15	15	10	19	7030
Fluoride	0.5	1	2 (1 if livestock feed contains fluoride)	0.08	0.08	<0.1	<0.1	47
Total phosphorous	Not referenced	0.05 <sup>g</sup>	Not referenced	0.01	0.01	<0.01	<0.01	N/A

N/A - not analysed.

a - Theoretical composition based on manufacturers' specifications.

b - Calculated composition based on theoretical treated water and amendment with 1 mol gypsum.

c - All values reported as maximum recorded values, except pH reported as average.

d - Treated water amended with calcium chloride.

e - Laboratory limits raised due to high salinity.

f - To minimise blocking of irrigation equipment only.