ntepa Northern Territory Environment Protection Authority

# Statement of Reasons

**SANTOS QNT PTY LTD – ENVIRONMENT MANAGEMENT PLAN (EMP) FOR THE MCARTHUR BASIN 2019 DRILLING PROGRAM EP 161**

## PROPOSAL

The Environment Management Plan (EMP) for the McArthur Basin 2019 Drilling Program Exploration Permit 161 (the Proposal)[1] was prepared by Santos QNT Pty Ltd (the Proponent)[2] and referred to the Northern Territory Environment Protection Authority (NT EPA) on 9 April 2019 for consideration under the Environmental Assessment Act 1982 (EA Act).

The Proposal does not include hydraulic fracturing[3] (stimulation) of a petroleum exploration well. No seismic, land clearing or civil works are proposed under the scope of this EMP, having previously been considered by the NT EPA[4] and approved by the Minister for Environment and Natural Resources[5] (Minister). The Proposal is in the Beetaloo sub-basin.

The technical works programme involves the drilling of one vertical pilot and horizontal petroleum exploration well at the Inacumba well site and one horizontal petroleum exploration well at the Tanumbirini well site on Tanumbirini Station. The Tanumbirini well site is approximately 18km N-NW from Inacumba. The drilling activities are expected to be undertaken over approximately 17 weeks during the second half of 2019. A temporary 40 person camp site will be established at each well site for the drilling operations. It is estimated that up 20 truck movements per week will be required for each well site.

Diagnostic Fracture Injection Testing (DFIT) is proposed for all wells. This process involves injecting a small volume of water (without sand) into the target reservoir at low pumping rates and high pressure until the initiation of a fracture. The purpose of a DFIT is to obtain information on reservoir properties. A DFIT is conducted only after the well is complete and the overall integrity of the well has been tested. DFIT activities differ from hydraulic fracturing as it involves only a small volume (~ 5000 litres) of water and no proppant or sand. Conversely, hydraulic fracturing involves a high volume (> 1 megalitres) of water, chemicals and sand to produce and keep open fractures that may conduct hydrocarbons for extraction, as defined in the Petroleum (Environment) Regulations 2016. If hydraulic fracturing is later proposed at the three well sites it will need to be addressed in a separate EMP, available for public comment and approved by the Minister for Environment and Natural Resources.

The Proposal includes:

**Inacumba-1H**

- drilling of vertical pilot well to the basement Bessie Creek Formation, with a total vertical depth (TVD) of 3,250 +/- 50 m

[1] 'Proposal' has the same meaning as 'regulated activity' under the Petroleum Act 1984.
[2] 'Proponent' has the same meaning as 'Interest Holder' under the Petroleum Act 1984.
[3] Under the Petroleum (Environment) Regulations: Hydraulic fracturing means the underground gas and oil extraction process that involves the injection of fluids at high pressure into a geological formation to induce fractures that conduct hydrocarbons for extraction.
[4] Santos McArthur Basin Civil and Seismic EP161 EMP, NT EPA statement of reasons available at: https://ntepa.nt.gov.au/__data/assets/pdf_file/0004/691951/decision_statement_reasons_emp_mcarthur_basin_civil_seismic_program.pdf
[5] Minister's approval notice and statement of reasons available at: https://denr.nt.gov.au/__data/assets/pdf_file/0019/706132/ep161-santos-mcarthur-basin-an-sor.pdf

- open-hole formation integrity testing (FIT) at each casing shoe during drilling
- well evaluation during and/or on completion of drilling the pilot well using a variety of techniques including:
  - mud sampling to ensure drilling mud is optimised while drilling
  - mudlogging while drilling to assess cuttings brought to surface for creation of a detailed record or well log
  - logging while drilling using an array of techniques such as gamma and resistivity
  - wireline logging which involves making a detailed record of the geologic formations penetrated by the borehole
  - formation testing and core acquisition of rock samples in formations of interest
- drill cutting samples and/or core will be collected for geological assessment and analysis and wireline logs will be acquired over the open hole
- subject to well evaluation and logging results, either well decommissioning in accordance with the Code of Practice: Onshore Petroleum Activities in the Northern Territory (the Code) or the drilling of a horizontal well involving:
  - a cement plug from TVD to the kick-off point for the deviated horizontal leg of the well that will target the Velkerri B shale formation
  - drilling of the deviated (horizontal section bore hole towards the north-east from the vertical pilot hole kick off point for a total length of the wellbore measured along the actual well path, or Measured Depth (MD) of 5,100m.
- undertaking well integrity assessment of Inacumba-1H including conducting cement bond logging (CBL)
- conducting a DFIT of Inacumba-1H
- suspension of the Inacumba 1H well in accordance with the Code.

**Tanumbirini-1**

- undertaking well integrity assessment of Tanumburini-1 including conducting cement bond logging (CBL)
- conducting a DFIT in Tanumbirini-1
- suspension of the Tanumbirini-1 well in accordance with the Code.

**Tanumbirini-2H**

- drilling of the Tanumbirini-2H horizontal well which is planned to reach a maximum 5,800m Measured Depth (MD) and approximately 3,450m TVD
- open-hole formation integrity testing (FIT) at each casing shoe during drilling
- well evaluation during and/or on completion of drilling the well using a variety of techniques
- undertaking well integrity assessment of Tanumburini-2H including conducting cement bond logging (CBL) conducting a DFIT of Tanumbirini-2H
- suspension of the Tanumbirini-2H well in accordance with the Code.

This Proposal will use an estimated total of 12 megalitres (ML) of groundwater sourced from existing bores. 8ML will be used for well drilling, camp site, vehicles wash-down and cementing and 4ML is required for ongoing gravel road and site maintenance. The Proponent has estimated up to 500$m^3$ of drilling waste (cuttings plus residual drilling mud) will be generated at each well site, primarily comprised of drill cuttings.

Approximately 2,758 tonnes of carbon dioxide equivalent ($tCO_2$-e) emissions will be generated by the Proposal, with emissions comprising; 44$tCO_2$-e from transport fuel combustion, 2,678$tCO_2$-e from non-transport fuel consumption and 36$tCO_2$-e as fugitive emissions from drilling waste. This is in addition to the 11,714$tCO_2$- estimated for the civils and seismic activities associated with this Proposal, for a total cumulative quantity of 14,472 $tCO_2$

## CONSULTATION

The EMP has been reviewed as a notification under the EA Act in consultation with Northern Territory Government (NTG) advisory bodies (see Attachment A) and the responsible Minister, in accordance with clause 8(1) of the Environmental Assessment Administrative Procedures.

The Proposal includes the drilling of a petroleum exploration well and in accordance with the Petroleum (Environment) Regulations 2016, the EMP was made available for public comment for a period of 28 days from 12 April 2019 – 9 May 2019. A total of 22 public submissions (one duplicate) were received and the Proponent provided responses to the issues raised and where relevant, revised the EMP. An overview of the key topics raised during the public consultation is provided under **Public consultation**

The NT EPA has reviewed the public submissions as part of its decision making and when providing advice to the Minister.

## JUSTIFICATION

The NT EPA assessed the potentially significant environmental impacts and risks associated with the Proposal in line with the NT EPA's environmental factors and objectives, and in accordance with the requirements under the EA Act. The NT EPA identified six environmental factors that could be significantly impacted by the Proposal (Table 1).

The NT EPA considered the importance of other environmental factors during the course of its assessment, however, the potential for significant impacts were not identified for those environmental factors.

The Quarterly Update of Australia's National Greenhouse Gas Inventory: December 2018 report, prepared by the Department of the Environment and Energy[6], estimated that Australia's greenhouse gas emissions for 2018 were 538.2Mt $CO_{2\text{-}e}$ and NT emissions 16.5Mt $CO_{2\text{-}e}$. The cumulative greenhouse gas emissions estimate of 14,472 t$CO_{2\text{-}e}$ for the Santos McArthur Basin civils and drilling activities represents 0.0027% of annual national greenhouse gas emissions and 0.09% of NT annual emissions. The NT EPA considers that greenhouse gas emissions from the proposal, and in combination with the approved civils activities, are minimal and the potential impacts not significant.

*Table 1: Key environmental factors considered for this assessment*

| Theme | Environmental factor | Objective |
|---|---|---|
| Water | Inland water environmental quality | Maintain the quality of groundwater and surface water so that environmental values including ecological health, land uses, and the welfare and amenity of people are protected. |
| | Hydrological processes | Maintain the hydrological regimes of groundwater and surface water so that environmental values are protected. |
| Land | Terrestrial environmental quality | Maintain the quality of land and soils so that environmental values are protected. |
| | Terrestrial Flora and Fauna | Protect NT's flora and fauna so that biological diversity and ecological integrity are maintained. |

[6] https://www.environment.gov.au/system/files/resources/408fcc37-dcfd-4ab8-a4f9-facc6bd98ea6/files/nggi-quarterly-update-dec-2018.pdf

| Theme | Environmental factor | Objective |
|---|---|---|
| People and Communities | Social, economic and cultural surroundings | Protect the rich social, economic, cultural and heritage values of the Northern Territory. |
| | Human Health | Ensure that the risks to human health are identified, understood and adequately avoided and/or mitigated |

### 1. Inland water environmental quality

**Objective:** Maintain the quality of groundwater and surface water so that environmental values including ecological health, land uses, and the welfare and amenity of people are protected.

*Surface water*

The two well sites are located at the top of the Limmen Bight River catchment where second and third-order ephemeral tributaries may flow for a short period during the wet season. During heavy wet seasons, large areas of the internal drainage system of the catchment may be flooded. The generally flat landscape also has a range of wetlands associated with springs, sinkholes and minor depressions.

Potential impacts to surface water quality include:

- overflow from drill cutting sump from flooding events
- spills associated with chemicals, wastewater, fuel storage, handling and transport

Flood modelling undertaken as part of the EMP shows that sections of the Tanumbirini well site including the cuttings sump and laydown area and adjacent to the Inacumba well site are within the flood zone associated with a 1% annual exceedance probability (AEP) flood event. The Proponent has addressed risks associated with flooding by requiring all works, including drilling, removal of wastes, stabilisation of the well sites in accordance with the site specific Erosion and Sediment Control Plan and stabilisation of the drill cuttings area to be completed prior to the onset of wet season rainfall which in this region is generally occurs mid-December based on historical average rainfall records.

The Code defines the wet season as the months October to April inclusive and requires the transport of chemicals and wastewater on unsealed roads to not be undertaken during the wet season unless a risk assessment on spills has been conducted. The EMP provides a wet season risk assessment of transport of chemicals and wastewater (before the onset of monsoon rainfall) that shows the risk of spills is as low as reasonably practicable and acceptable and commits to:

- assessing road conditions prior to mobilisation on unsealed roads and using detailed weather forecasting
- in the event of a truck being stuck due to mechanical or weather reason, transfer or recovery will only occur once safe
- transport of wastewater will only occur in enclosed tanks
- use of licensed waste transporters to transport listed waste

The Proponent has detailed the implementation strategy for the emergency contingency plan in the EMP and commits to not transporting chemicals and drilling waste once wet season rainfall has commenced. With the demobilisation of the drilling rig and support infrastructure completed before the onset of monsoon rains that would impede heavy vehicle access, the potential impacts to surface water quality as a result of spills, flooding and run-off from the sites during the wet season, are considered to be low.

In addition, the EMP commits to the following measures to reduce the potential risks and impacts to inland water quality from a sudden storm event:

- an activity specific Wastewater Management Plan (WWMP) and Spill Management Plan (SMP) that include secondary containment barriers where hazardous chemicals and fuel are stored
- recycling of drilling mud during the drilling operation to minimise the quantity of water and chemicals required and reduce disposal requirements
- lining of the cuttings sump with an impermeable membrane in compliance with the Code standards for resistance to tearing, puncture and tensile strength
- incorporating more than 1000mm of freeboard to manage a 90-day 0.1% annual exceedance probability (AEP) for rainfall event and surrounded by a 300mm high compacted earth bund to prevent ingress of potential overland stormwater
- a usable volume capacity (not including 1m freeboard) within the cuttings sump of approximately 4,000$m^3$ which is several times the estimated total of 500$m^3$ of drill cuttings and residual drilling mud
- the removal from site, before the onset of monsoon rains, of residual drilling mud in the drill cuttings sump that does not evaporate, and fails to meet disposal requirements as outlined in the Code, for disposal at a licensed facility in Queensland
- monitoring and management to meet environmental performance standards for spills or unauthorised releases of potential contaminants at each well site, with the Proponent required to report to the Department of Environment and Natural Resources (DENR) if an environmental performance standard in the EMP is not met

The EMP provides a WWMP in accordance with the Code and identifies that no produced water or flowback fluid will be produced as part of the proposed activities under this EMP. The Proponent has committed to transferring drilling mud (consisting of a low toxicity saline solution containing bentonite, barite, mud conditioner and buffering agents) from operational tanks to contingency storage tanks when required, with no drilling mud stored in open sump or tanks during the wet season. Given the importance of ensuring there is no overtopping of open storage tanks or the drill cuttings sump, the NT EPA has advised the Minister that the Proponent provides updated weather forecasts to DENR for the duration of the activity and submit a Rapid Response Site Demobilisation and Stabilisation Plan, in the event of early onset of the wet season that may result in early termination of the activity.

*Groundwater*

The major hydrogeological unit present in the project area is the Cambrian Limestone Aquifer (CLA). The CLA forms the major water resource for the Beetaloo Basin providing groundwater supply for the communities of Elliot, Daly Waters, Larrimah, Newcastle Waters as well as the pastoral industry that comprises 90% of land use in the Beetaloo Basin. The CLA also supports a range of important ecosystem functions in the region. The CLA is sub-divided into the Anthony Lagoon aquifer and the Gum Ridge aquifer. The Anthony Lagoon aquifer overlies the Gum Ridge aquifer across parts of the region. At both well sites only the Gum Ridge aquifer occurs, confirmed by stratigraphic bore logs drilled at both well sites as part of the groundwater monitoring program required by the Code.

The construction of petroleum wells that intersect aquifers has the potential to impact the groundwater quality in a number of ways. This includes:

- the use of drilling muds that contain chemicals or other substances that could leave a residual toxic effect in the aquifer

- the risk of cross flow, driven by different head pressures, between aquifers that may result in flow of low quality groundwater into an aquifer that contains high quality groundwater

The Code requires the Proponent to ensure that when drilling through local aquifers, and until these aquifers are isolated by a minimum of two verified barriers:

- only air, water or water-based drilling muds are permitted to be used, and
- chemicals or other substances that could leave a residual toxic effect in the aquifer must not be added to the drilling mud

The CLA is karstic (cavernous) in nature which requires additional risk management measures to ensure that aquifers that are intersected by a petroleum well are isolated from the surface and from deeper hydrocarbon bearing zones; and where multiple aquifers occur they must be isolated from each other. Stratigraphic bore holes have been drilled at both the Inacumba and Tanumbirini well sites that provide an accurate understanding of what aquifers and potential geohazards within the CLA, if any, exist at the sites and their depth from surface.

The Code requires the Proponent to comply with petroleum well integrity criteria to ensure isolation of aquifers is met and continues to be met throughout the lifecycle of the well and includes:

- A requirement for the proponent to develop a Well Operations Management Plan (WOMP) that includes a site specific well integrity monitoring system for approval and oversight by the DPIR
- An ongoing well site-specific groundwater monitoring plan based on the Preliminary Guideline: Groundwater Monitoring Bores for Exploration Petroleum Wells in the Beetaloo Sub-basin (the Guideline) (DENR, 2019). The Proponent established baseline monitoring bores at both well sites in December 2018.

Figure 1 and 2 illustrate the proposed casing depths and well design to ensure integrity of aquifers for the Inacumba-1 and Tanumbirini-2 wells respectively. Aquifers will be isolated behind the cemented concentric casing strings.

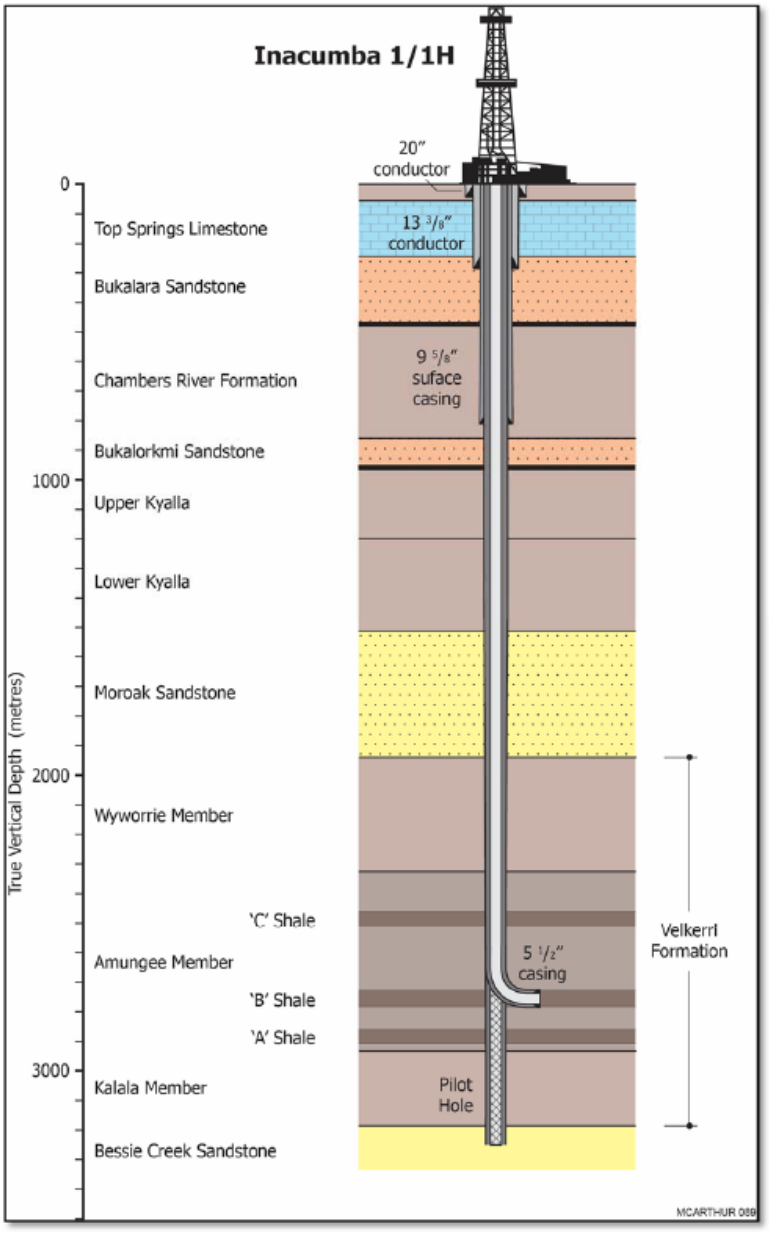



Figure 1: Schematic diagram illustrating locations of proposed casing shoes relative to stratigraphy in Inacumba-1/1H (horizontal section not to scale)[7]

[7] Environment Management Plan: McArthur Basin 2019 Drilling Program EP161

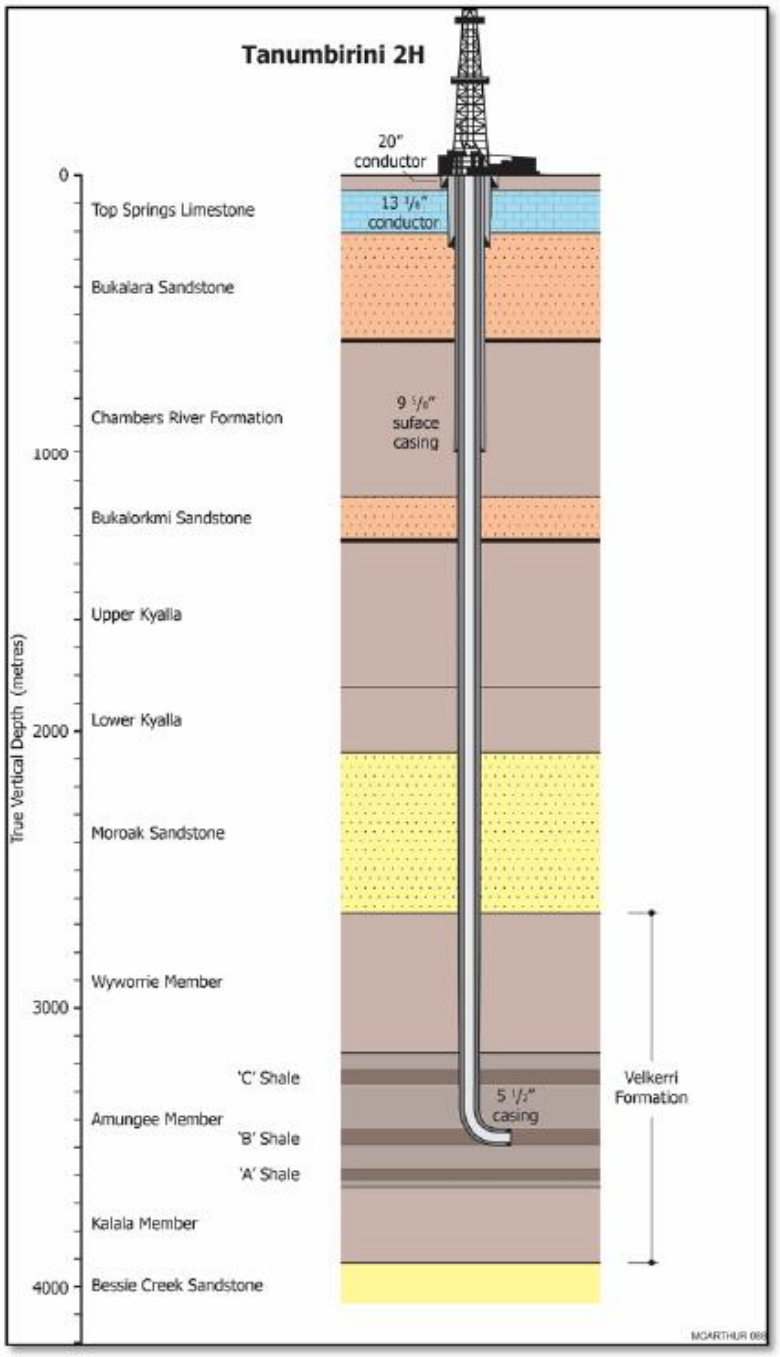



Figure 2: Schematic diagram illustrating locations of proposed casing shoes relative to stratigraphy in Tanumbirini-2 (horizontal section not to scale)[8]

The EMP outlines the controls identified in the Well Operations Management Plan (WOMP) that will be implemented for the 2019 Drilling Program design to ensure isolation of the Gum Ridge aquifer and overall petroleum well integrity is achieved. These include:

- development of critical controls and hold points throughout the well construction process that will need verification by a competent person prior to proceeding to the next operation

[8] Environment Management Plan: McArthur Basin 2019 Drilling Program EP161

- barrier verifications and monitoring throughout well construction, maintaining primary and secondary well control measures

- a cemented production casing string that will provide an additional barrier between producing hydrocarbon bearing zones and shallow aquifers, with pressure testing once the cement is set to ensure overall integrity of the production casing

- multiple strings of steel casing with each casing string cement grouted to the surface and multiple engineered and system mitigations to adequately detect water quality threats to the CLA
- well barrier integrity validation reporting (WBIV report) for each well demonstrating compliance with the Code to be provided to the regulator (DPIR) for approval[9]
- DFIT of wells will not be conducted until the WBIV Report has been approved by the regulator.

The proposed well design results in a vertical separation distance between the base of the Gum Ridge aquifer and the target formation of approximately 2630m TVD for the Inacumba well and 3260m TVD for the Tanumbirini well. Recognising that this EMP covers drilling and testing, including DFIT activities only, this is more than 4-5 times respectively the minimum vertical separation distance of 600m from an aquifer required by the Code for hydraulic fracturing activities.

The NT EPA has advised the Minister that a cementing completion report for the 13-3/8" steel Conductor casing through the Gum Ridge aquifer be provided to DENR as soon as practicable but not more than seven days after completion of the cementing job for Inacumba-1 and Tanumbirini-2 exploration wells.

The well design and construction method described in the EMP meets the requirements of the Code for protection of aquifers. Key features include:

- shallow aquifers isolated from hydrocarbon bearing zones with more than two verified barriers
- Gum Ridge aquifer isolated with cemented 13-3/8" Conductor 2 casing
- Bukalara Sandstone isolated with cemented 9- 5/8" surface casing.

The NT EPA has advised the Minister that results of ongoing groundwater monitoring undertaken in accordance with the Code and Guideline should be submitted to the DENR every quarter for three years from the approval date of the EMP. The results of the groundwater monitoring will be published on the DENR website on a quarterly basis. To ensure a robust groundwater quality baseline dataset, the NT EPA advises a minimum of seven sampling events be completed from the control monitoring bores (up gradient of the petroleum well) prior to completion of the drilling program. The baseline dataset will provide for the establishment of well site specific performance targets to ensure no long term adverse effects on water quality. These performance targets will be established following completion of the petroleum well and will require approval by DENR.

Provided that the mitigation and management measures outlined in the EMP, including the wastewater and spill management plans, and controls outlined in the WOMP are implemented, the NT EPA considers the proposal is unlikely to have a significant impact on surface water and groundwater quality, and the NT EPA's objective for inland water environmental quality is likely to be met.

### 2. Hydrological processes

[9] The WBIV Report must be certified by an independent validator in accordance with clause 302a of the Schedule of Onshore Petroleum and Production Requirements (2019). The WBIV Report must comply with the DPIR Well Barrier Integrity Validation Reporting Guideline (WBIV Reports will be publically available on the DPIR website).

**Objective:** Maintain the hydrological regimes of groundwater and surface water so that environmental values are protected.

*Groundwater Extraction*

Groundwater from the Cambrian Limestone Aquifer (CLA) will be extracted from existing bores in the Gum Ridge aquifer and the estimated groundwater volume required for the Proposal is 12ML. The nearest sensitive receptor is the Tanumbirini Homestead situated 22km from the Inacumba location and 8.5km from the Tanumbirini location. There is a low potential for terrestrial and aquatic Groundwater Dependent Ecosystems (GDEs) in the project area.

The Proposal has potential to impact on groundwater drawdown or alter groundwater flows associated with groundwater extraction. The well pads are located in accordance with the Code which requires a minimum distance of at least 1km between an existing water supply bore used for domestic or stock consumption. The closest existing water bores are approximately 4km from the Tanumbirini well site and at approximately 6km from the Inacumba well site.

The Proponent was granted a water extraction licence under the Water Act 1992 on 8 May 2019 (Licence No. GRF10280). This extraction licence has a Maximum Water Entitlement of 193.5ML/year for five years. The water entitlement takes into account the requirements for related exploration activities on EP161 including civil works, camp requirements, petroleum well construction and potential hydraulic fracturing. Drawdown modelling was undertaken and considered as part of the groundwater extraction licence application and DENR concluded the proposed extraction would have no change in reliability of spring flows at Bitter Springs or Rainbow Springs (both more than 200 km northwest of the well sites), or impact groundwater users.

Water levels and quality will be monitored in accordance with the DENR Guideline. The groundwater extraction licence requires groundwater levels to be monitored prior to extracting water and for the Proponent to verify modelled estimates of groundwater level drawdown. Groundwater extraction volumes will be recorded and submitted to the DENR Water Resources Division. The NT EPA has advised the Minister ongoing water level monitoring using water level loggers and electrical conductivity loggers should be installed at the monitoring bores at each well site, with results to be provided to the DENR for public disclosure on the DENR website.

*Cumulative Impacts*

The estimated quantity of groundwater required for works proposed under this EMP is 12ML. This volume combined with the 45.5ML estimated for works proposed under the Civils and Seismic EMP, totals a cumulative groundwater requirement of 57.5ML. This water extraction licence volume includes allowance of water requirements for future hydraulic fracturing activities and is well within the volume of groundwater the Proponent is permitted to extract under its water extraction licence of 193.5ML/year.

Provided that the conditions of the water extraction licence are complied with, the NT EPA considers that the proposal is unlikely to have a significant impact on the ground water hydrological regime in the region, and the NT EPA's objective for hydrological processes is likely to be met.

### 3. Terrestrial environmental quality

**Objective:** Maintain the quality of land and soils so that environmental values are protected

The Proposal area has intact soils dominated by kandosols and rudosols. There is potential for localised contamination of soil through chemical spills and leaks associated with storage, handling and transport of chemicals, drilling muds and fuel.

*Drilling Muds, Chemicals and Hazardous Materials*

There is potential for drilling mud to contaminate soil if not managed and isolated from the ground. The drilling mud that will be utilised for this Proposal is comprised predominately of water, salt, barite and bentonite plus buffering and mud conditioning agents of low toxicity throughout the drilling process. Approximately 0.4 to 0.5ML of drilling cuttings will be stored in a combination of above ground open tanks and open mud cuttings sump. Chemical additives will not contain benzene, toluene, ethylbenzene or xylene (BTEX). No non-aqueous drilling muds will be utilised.

The above ground storage tanks for drilling mud will have spill containment provisions installed, comprising of a lined secondary containment barrier that sits underneath the tank.

The EMP outlines design details for the cuttings sump. Waste drilling muds and cuttings will be managed in accordance with the Code. They will be contained within an engineered cuttings sump, lined in compliance with the Code with an impermeable membrane tested in accordance with the relevant Australian Standards specified in the Code. The cuttings sump will have storage capacity for several times (not including 1m freeboard) the estimated total of 500 $m^3$ of drill cuttings and residual drilling mud. Well pads will be engineered with suitable gravel fill material to meet specific compaction requirements for stability of the drill rig and associated infrastructure and minimise impacts of infiltration from potential spills.

Approximately 100$m^3$ of diesel fuel, 3.785$m^3$ of hydraulic oil and 10$m^3$ of other chemicals (excluding drilling mud additives) will be stored on site. Each of these hazardous substances will be stored in bunded containment in a location that is protected from escape into the surrounding environment.

Transportation of chemicals and hazardous materials via road is subject to the risk of vehicle accident and loss of materials to the adjacent terrestrial environment. This risk is increased when transportation is being undertaken on non-public, unsealed roads. Evaporation of residual drilling muds during the dry season reduces the quantity of material that potentially requires transport off-site.

As part of the previously approved civil works, the non-public roads into the well sites will be upgraded to a higher standard by the Proponent to allow for the increased traffic load and heaver vehicles associated with the Proposal. This upgrading of the road will reduce the risk of vehicle accidents. Transport of dangerous goods is governed by the *Transport of Dangerous Goods by Road and Rail (National Uniform Legislation) Act*. The Proponent will ensure that the required licences are held by all transportation contractors. All spills that occur off-site of the Exploration Permit (EP) area will be reported as per the requirements of the *Waste Management and Pollution Control Act*.

*Drill Cuttings*

Inappropriate disposal of drill cuttings has the potential to impact on terrestrial environmental quality where the cuttings contain contaminants of concern. If cuttings containing contaminants of concern are left in-situ, there is the risk that these contaminants may eventually leach into the soils and lead to impacts to regional flora and fauna as well as ground and surface water.

Drill cuttings will be separated from drilling muds and stored within the engineered and lined cuttings sump on site to prevent potential contaminants entering into the adjacent ecosystem. The cuttings sump will be inspected daily to check integrity.

A Wastewater Management Plan (WWMP) and a Spill Management Plan (SMP) have been prepared that meet the requirements of Sections C.7.1 and C.7.2 of the Code of Practice.

At the completion of the drilling operations, a suitably qualified independent third party approved by DENR, as defined in Section C.4.1.2(f) of the Code, will undertake sampling for laboratory testing of the drill cuttings and residual drilling muds, including leachability testing of heavy metals, Naturally Occurring Radioactive Materials (NORMs) and other contaminants of potential concern, as required by the Code, to determine the suitability of in-situ disposal. A subsequent decision, based on the laboratory report, for an acceptable final disposal of the drilling waste will be made by DENR on

receipt of an assessment report of environmental impacts and environmental risks posed by the drill cuttings and residual drilling fluids.

If certification, or departmental approval, cannot be obtained for on-site disposal then this waste will be disposed of to a licensed facility in Mount Isa. In accordance with the Code, the Proponent has committed to assessing the environmental impacts posed by drill cuttings and residual drilling muds that includes leachability testing of drill cuttings and drilling mud to determine the final disposal options. The NT EPA has advised the Minister that the laboratory report on leachability testing of drill cuttings and drilling mud be provided to DENR within three months of completion of the drilling program.

The NT EPA considers that the potential impacts and risks to terrestrial environmental quality from this short term and localised exploration program can be mitigated through implementation of the EMP, including the Wastewater Management Plan and Spill Management Plan, and requirements of the Code and that its objective for terrestrial environmental quality is likely to be met.

### 4. Terrestrial Flora and Fauna

**Objective:** Protect NT's flora and fauna so that biological diversity and ecological integrity are maintained.

The EMP refers to flora and fauna baseline surveys conducted in 2018 and 2019 including at the two proposed well sites. The potential impacts and risks to terrestrial flora and fauna from land clearing for the well sites was previously assessed by the NT EPA[10]. The NT EPA concluded that the potential impacts and risks to terrestrial flora and fauna could be mitigated through measures proposed in the EMP.

The EMP for this Proposal identifies risks to terrestrial flora and fauna arising from vehicle strike, dust, erosion and spills. Adequate avoidance and mitigation measures are detailed in the EMP to reduce these risks to as low as reasonably practicable. The Flora and Fauna Division of DENR has advised that the proposed drilling activities do not pose a significant risk to threatened species or significant habitats and vegetation types.

Potential impacts and risks to the welfare of fauna include entrapment in cuttings sump of individual animals or ingestion of contaminated water/materials collected during drilling by individual animals. A number of public submissions raised concern about potential risks to fauna, particularly birds associated with use of open sump for cuttings storage. The activities for this EMP include open cuttings sump that will not contain oils, hydrocarbons or hydraulic fracturing fluids that pose a risk to birds and other fauna. During the drilling activities, it is unlikely the open sump would be attractive to birds and other fauna due to noise and human disturbance. As discussed above in section 3 **Terrestrial environmental quality**, the open cuttings sump will be sampled for laboratory assessment of environmental impacts and environmental risks posed by the drill cuttings and residual drilling fluids in compliance with the Code. The sump may then be capped with earth to mitigate wet season incursion thus removing the risk of fauna including birds accessing the sump.

In accordance with the Code, the Proponent has provided control measures to be implemented to prevent interactions of wildlife and stock with wastewater. These controls include fencing open water storages to prevent fauna access and installing escape routes/fauna ladders in the cuttings sump and water storage dams as a contingency measure to assist egress of any large or small wildlife. The Proponent will undertake daily monitoring of the open sump and water storage dams, and

[10] Statement of Reasons – Environment Management Plan for the McArthur Basin Civil and Seismic Program EP161 (https://ntepa.nt.gov.au/__data/assets/pdf_file/0004/691951/decision_statement_reasons_emp_mcarthur_basin_civil_seismic_program.pdf

associated fencing, throughout the drilling program. Inspection records of theses daily checks will be kept to quantify the potential use of open sump by fauna.

In similar operations conducted in the Northern Territory and other jurisdictions, impacts to birdlife from open cuttings sump are considered low due to the saline nature of the water not being attractive or injurious to bird species.

The NT EPA has advised the Minister any fauna observed trapped, injured or deceased attributable to interaction with open storage sump and tanks, is to be reported under the Petroleum (Environment) Regulations 2016 as an incident with appropriate corrective action provided to prevent similar incidents from occurring. Where incident reporting demonstrates that the impacts to fauna are greater than expected, the NT EPA has provided advice to the Minister to consider requiring additional monitoring (such as fauna cameras) and/or mitigation measures such as flagging, netting, screening or other measures to deter entry by birds and fauna. As a result of implementing the above controls, the NT EPA expects that the numbers of individual animals impacted will be very low, concluding that biological diversity and ecological integrity is highly likely to be maintained. Due to the different nature of the proposed activities in relation to the Civils and Seismic EMP, cumulative impacts to fauna are likely to be low.

The NT EPA considers that the potential impacts and risks to flora and fauna can be mitigated through implementation of the EMP and that its objective for terrestrial flora and fauna is likely to be met.

## 5. Social, economic and cultural surroundings

**Objective:** Protect the rich social, economic, cultural and heritage values of the Northern Territory.

*Social considerations*

The Proponent has undertaken stakeholder engagement with NT Government, landholders and land managers, Traditional Owners, the Northern Land Council (NLC) and the Aboriginal Areas Protection Authority (AAPA). The EMP sets out the stakeholder engagement undertaken and summarises the method of contact and matters raised during consultation with land owners in the Proposal area.

The nearest sensitive receptor to the project area Tanumbirini Homestead, approximately 8.5 km south-west from the Tanumbirini-1/2 wells. Potential amenity impacts such as noise and dust from the Proposal were assessed in the McArthur Basin Drilling Program EP161 EMP and are not considered to be significant due to implementation of control measures and distance to the nearest sensitive receptors. All prior civil works will have been completed for each site and access roads and well pads stabilised to mitigate dust generation. Vehicle speed limits of 80kph are imposed by the Proponent on all gravel access tracks. Noise from the drilling rig operations is not expected to be heard at the drillers' camp located less than 500m from the well site. The Proponent has committed to ongoing stakeholder engagement with the Tanumbirini station to ensure nuisance factors and simultaneous operations such as station mustering are not impacted. The Proponent has committed to engaging with the road authority; the Department of Infrastructure, Planning and Logistics, to determine traffic management requirements for the Carpentaria Highway. A Traffic Impact Assessment (TIA) has been prepared and provided to the road authority.

*Cultural and Heritage Values*

The Aboriginal Areas Protection Authority (AAPA) has confirmed that the works proposed under this EMP are covered under Authority Certificate C2019/043.

The NT EPA notes that the activities in this EMP relate to the drilling and testing of up to three wells, including DFIT and is a short-term, small-scale exploration activity. Any social, cultural or economic impacts are likely to be minimal and localised.

The NT EPA considers that the potential impacts and risks on social, economic and cultural surroundings can be mitigated through implementation of the management measures presented in the EMP and that its objective for social, economic and cultural surroundings is likely to be met.

**6.** Human Health

**Objective:** Ensure that the risks to human health are identified, understood and adequately avoided and/or mitigated.

The Cambrian Limestone Aquifer – Gum Ridge aquifer, forms the major water resource for the region supplying water for remote communities and pastoral operations. The Code requires the proponent to ensure that when drilling through local aquifers, until they are isolated by a minimum of two verified barriers, chemicals or other substances that could leave a residual toxic effect in the aquifer must not be added to the drilling mud. The proposed well design and construction includes three verified well barriers to ensure the aquifer will be isolated, and therefore protected, from hydrocarbon bearing zones. This exceeds the Code requirements.

Ongoing well integrity monitoring and verification through the life-cycle of the well(s) is required under the Well Operations Management Plan as specified in the Code and discussed above in the Inland Water Environmental Quality factor.

Through implementation of the EMP, the Code and the development, approval and implementation of a WOMP, the NT EPA's objective for human health is likely to be met.

**Public consultation**

In accordance with the Petroleum (Environment) Regulations 2016, the EMP was made available for public comment for a period of 28 days. A total of 22 public submissions were received on the EMP from a number of stakeholders residing in the Northern Territory including community members, business entities and non-government organisations. Frequent comments (raised in at least 65% of submissions), in order of frequency, related to:

- Water - concern regarding potential overflow or spills of contaminated water, drilling into aquifers and risks to water quality
- Social and cultural – potential impacts on Traditional Owners and cultural values, tourism, concern about lack of information provided to stakeholders during engagement, negative impacts on health and the community
- Waste - concern about the use of open wastewater sump, lack of waste details, disposal of waste
- Chemicals – concern about a lack of information on drilling chemicals in particular hydraulic fracturing chemicals, storage of chemicals
- Flora and fauna – impacts to fauna, particularly birds from open waste water sump and tanks
- Regulation and compliance - separation of different regulated activities in EMPs, Code of Practice not yet finalised

The Proponent provided responses to the issues raised in the NTG agency and public submissions and where appropriate, the issues were addressed/incorporated in a revised EMP. The Proponent has provided a revised EMP to ensure it meets the requirements of the final Code.

From the public submissions, the NT EPA recognises the value that the community places on the protection of the environment and in particular the protection of water quality and fauna welfare. The NT EPA considers many of the public concerns raised about the protection of environmental values, have been adequately addressed by the Proponent in the EMP and the mitigation and management measures provided in the WWMP and SMP. These are discussed in the **Inland water**

**environmental quality**, **Terrestrial environmental quality** and **Terrestrial Flora and Fauna** sections above.

Nearly half of the public submissions were generally opposed to the unconventional shale gas industry and hydraulic fracturing. The NT EPA notes the findings of the Final Report of the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory concluded the risks associated with onshore gas development could by managed and minimised to an acceptable level with the implementation of its 135 recommendations, adherence to the legally enforceable Code of Practice and by effective regulation. The NT EPA notes the Northern Territory Government's commitment to implementing all 135 of the recommendations in the Final Report.

The NT EPA supports an open and transparent regulatory regime that demonstrates the Proposal can proceed in a manner that protects the environment. Under the Petroleum (Environment) Regulations 2016, the EMP must be published as well as all reportable and recordable incident reports. The NT EPA supports the public release of monitoring data and environmental performance reporting as part of a transparent regulatory regime that will assist in informing the community about the potential impacts and risks associated with the onshore petroleum industry and their management.

NT EPA notes that the Minister must take into account any comments submitted when making a decision whether to approve the EMP in accordance with the Petroleum (Environment) Regulations 2016.

## CONCLUSION

The NT EPA considers that the potential environmental impacts and risks associated with the Proposal are not significant and that the Proposal does not require assessment under the EA Act. The Proponent has prepared the EMP in accordance with the Petroleum (Environment) Regulations 2016 and to demonstrate how it will also meet compliance with the Code of Practice: Onshore Petroleum Activities in the Northern Territory (2019).

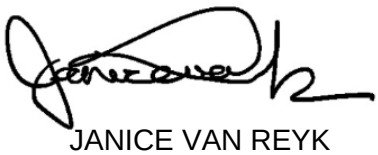
Comments from NTG advisory bodies and public submissions have been provided to the Proponent. The NT EPA has provided advice to the Minister for Environment and Natural Resources to ensure that potential impacts on the environment are minimised and responsibilities under the legislation can be met.

The Minister for Environment has asked the NT EPA to provide advice under the Petroleum (Environment) Regulations as to whether the EMP meets certain requirements of the Regulations (specifically regulations 9(1)(b), 9(1)(c) and 9(2)(a)). As part of the assessment to provide that advice, the NT EPA may make recommendations to the Minister for Environment on conditions to improve environmental outcomes. The NT EPA's decision not to assess the EMP under the EA Act is not reliant on the Minister accepting the NT EPA recommendations.

## DECISION

The proposal by Santos QNT Pty Ltd has been examined by the NT EPA and investigations and inquiries conducted. The NT EPA has decided that the potential environmental impacts and risks of the proposed action are not so significant as to warrant environmental impact assessment by the NT EPA under provisions of the Environmental Assessment Act 1982. Environmental management of the potential environmental impacts is the responsibility of Santos QNT Pty Ltd through preparation and implementation of the procedures and management plans presented in the EMP and any conditions imposed by the Minister under the Petroleum Regulations. Groundwater extraction will be subject to a licence under the Water Act 1992. Prior to commencing well activities (including drilling), a Well Operations Management Plan (WOMP) will be prepared and approved by the Department of Primary Industry and Resources (DPIR).

This decision is made in accordance with clause 8(2) of Environmental Assessment Administrative Procedures, and subject to clause 14A the administrative procedures are at an end with respect to the proposed action.



JANICE VAN REYK

ACTING CHAIR

NORTHERN TERRITORY ENVIRONMENT PROTECTION AUTHORITY

12 JULY 2019

**Attachment A: Northern Territory Government Advisory bodies consulted on the Notice of Intent**

| Department | Division |
|---|---|
| Department of Environment and Natural Resources | Flora and Fauna<br>Water Resources<br>Weeds<br>Environment<br>Bushfires NT<br>Rangelands |
| Department of Infrastructure, Planning and Logistics | Infrastructure<br>Transport |
| Department of Primary Industry and Resources | Petroleum<br>Mining Compliance |
| Department of Tourism and Culture | Heritage<br>Tourism NT<br>Parks and Wildlife |
| Department of Health | Environmental Health |
| Department of Trade, Business and Innovation | Strategic Policy and Research |
| Power and Water Corporation | |
| Aboriginal Areas Protection Authority | Technical |
| Department of the Attorney-General and Justice | Commercial Division<br>NT Worksafe |
| Department of the Chief Minister | Economic and Environmental Policy |
| Treasury | |