

Water resource management plan

Dawson River discharge scheme receiving environment monitoring program summary

AE-G

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Gas Field Development Project Environmental Impact Statement

Appendix AE-G: Dawson River Discharge Scheme Receiving Environmental Monitoring Program Summary

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1 Receiving environment monitoring program

1.1 Dawson River Release Scheme (DRRS)

The need to release treated coal seam water to the Dawson River, within the Fairview gas field, was considered as part of the coal seam water management strategy for the GLNG Project EIS (released in 2009). Following detailed studies of the potential impacts on the surface water and groundwater environmental values, in 2012 the DRRS was identified as being the only remaining viable, sustainable option to utilise the balance of coal seam water produced from the Fairview gas field once on-site operational use (mainly for dust suppression) and irrigation had taken place. An Environmental Authority (EA; EPPG00928713, effective from 14 April 2014) was granted for Santos GLNG to release treated coal seam water to the Dawson River under certain conditions. Treated coal seam water shall be released, where necessary, via a pipe outlet to a receiving wetland. The release scheme is designed so that when the wetland reaches capacity and overflows, the treated coal seam water will then flow into the Dawson River via an existing ephemeral watercourse.

A Receiving Environment Monitoring Program (REMP) for the DRRS is required by the EA. As such, it will also form a component of the coal seam water management strategy for the GFD Project. The following sub-sections outline the key contents of the REMP, which are based on conditions contained in the EA, and *EM1260: Receiving environment monitoring program guidelines* (EHP 2014).

1.2 REMP structure

The overall purpose of the REMP is to “monitor, identify and describe any adverse impacts to surface water environmental values, quality and flows” as a result of authorised releases of treated coal seam water to the Dawson River (EPPG00928713). The REMP will be structured to include the elements specifically listed by the EA; however, a high level summary is included here to provide an indication of its content, and demonstrate how the REMP will be relevant for the GFD Project.

1.2.1 Receiving environment characteristics

The REMP defines the receiving waters for releases of treated coal seam water as the waters of the Dawson River and those of connected or surrounding waterways, including a receiving wetland, to Yebna Crossing approximately 8.5 km downstream of the wetland. The wetland is comprised of a large semi-permanent oxbow lake located on the floodplain of the Dawson River. It has an estimated volume of 500 megalitres (ML) and is fed by several small tributaries. It is connected to the Dawson River by a well-defined ephemeral channel, which has a number of small intermittent pools along its course.

The receiving wetland and the ephemeral watercourse that connects it with the Dawson River have moderate aquatic ecological values (Simmonds and Bristow 2012; frc environmental 2013a). The Dawson River within the receiving environment has moderate to high aquatic ecological values (frc environmental 2013a). The following sub-sections provide a brief summary of the condition of the receiving environment; the REMP will contain a higher level of detail obtained from various baseline assessments and technical reports previously commissioned by Santos GLNG.

1.2.1.1 Hydrology, geomorphology and aquatic habitat

The receiving wetland is lacustrine and has an approximate volume of 500 megalitres (ML). The banks of the wetland have a low gradient and trees within the riparian margin, which contribute to a stable condition overall. Habitat types observed within the wetland include shallow and deep pools, large woody debris and aquatic plants. The latter includes floating plants such as water primrose; and emergent plants along the banks (frc environmental 2013b,c).

The ephemeral watercourse connecting the wetland with Dawson River has a well-defined channel with a number of small intermittent pools along its course. These pools contain a range of submerged and emergent aquatic plants, and are likely refugia for invertebrates and small fish species during the dry season. The lower reaches of the channel were assessed as having a high risk for erosion in 2011 (Alluvium 2012).

The Dawson River is a major tributary within the Fitzroy River Basin; within the receiving environment it contains perennial waterholes, with dominant stream flow occurring during summer months. A diverse range of aquatic habitats are present; including shallow and deep pools, riffle and run flow habitats, large woody debris and a varied substrate.

1.2.1.2 Water quality

Surface waters within both the receiving wetland and the Dawson River are characterised as having moderate levels of electrical conductivity, with a high nutrient load dominated by organic nitrogen. Some heavy metals (such as aluminium and iron) are also present in elevated concentrations (frc environmental 2014).

1.2.1.3 Sediment quality

Sediment quality within the receiving environment complied with interim sediment quality guidelines during an assessment in 2013 (frc environmental 2013b,c). Sediments from the receiving wetland were found to have elevated concentrations of nutrients (dominated by organic nitrogen compounds); major cations (calcium, magnesium, sodium, and potassium), and most metals and metalloids when compared with sediment from the Dawson River.

1.2.1.4 Macroinvertebrates

Macroinvertebrate communities within the receiving wetland have been assessed as being in poor condition, based on surveys for species richness and abundance (Simmonds & Bristow 2012; 2013). The majority of species found were tolerant rather than sensitive. In contrast, macroinvertebrate communities within the receiving environment of the Dawson River were assessed as being in good condition, with a more diverse combination of tolerant and sensitive species (frc environmental 2013b,c). No macroinvertebrate species observed within the receiving environment were listed as being significant for conservation under the EPBC Act or the NC Act.

1.2.1.5 Fish

Five species of fish were observed within the receiving wetland during baseline assessments (frc environment 2013). Twenty fish species were previously recorded in the Upper Dawson River by Platten (2011), however only five were observed during baseline assessments conducted on behalf of Santos GLNG (frc environmental 2013). It has been documented that fish species observed in the receiving wetland and the Dawson River are generally common, and can tolerate a wide range of water quality conditions (Allen et al. 2002 & Pusey et al. 2004). No fish species observed within the receiving environment were listed as being significant for conservation under the EPBC Act or the NC Act.

1.2.1.6 Turtles

Two species of freshwater turtle have been recorded within the receiving environment; both are common species for the region, and are not listed as being significant for conservation under the EPBC Act or NC Act. It is possible that the receiving environment may support two additional protected species; the Fitzroy River turtle (*Rheodytes leukops*; protected under the EPBC Act) and the white-throated snapping turtle (*Elseya albagula*; a priority species under Queensland's 'Back on Track' species prioritisation framework), however neither species was identified in the baseline assessments reviewed by Santos GLNG (frc environmental 2013b,c).

1.2.1.7 Other vertebrates

The receiving wetland and the Dawson River also provide habitat for a variety of waterbirds and native frog species. Baseline surveys identified at least twenty-eight species of waterbird within the receiving wetland, and nine species of waterbird on the Dawson River. Table 1-1 lists the protected waterbird species that have been recorded for the receiving environment.

Table 1-1 Protected species of waterbird observed within the receiving environment of the Dawson River Release Scheme (adapted from frc environmental 2013b,c)

Common name	Species	Protected listing	Observed location
Glossy ibis	<i>Plegadis falcinellus</i>	EPBC Act – migratory species	Receiving wetland
Latham's snipe	<i>Gallinago hardwickii</i>	EPBC Act – migratory species	
Sharp-tailed sandpiper	<i>Calidris acuminata</i>	EPBC Act – migratory species	
Black-necked stork	<i>Ephippiorhynchus asiaticus</i>	NC Act – near-threatened species	

Three species of native frog were identified within the receiving wetland, and two additional native species were observed within Dawson River. Cane toads (*Rhinella marina*; an introduced frog species) were observed within both receiving environments. None of the observed frog species were listed as being significant for conservation under the EPBC Act or the NC Act.

1.2.2 Protection of environmental values

The following environmental values (EVs) have been identified for the Dawson River Release Scheme receiving environment:

- Aquatic ecosystem (moderately disturbed waters)
- Irrigation
- Stock water
- Human consumers
- Primary recreation
- Secondary recreation
- Visual recreation; and
- Cultural and spiritual values.

Water quality objectives (WQOs) have been set for water quality parameters that are specified in the EA and will be listed in the REMP; they were derived from published water quality guidelines for the identified EVs of the region, and baseline water quality data.

In order to protect the identified EVs for the receiving environment, the following aspects of the environment will be assessed as part of the REMP:

- Assessment of baseline key aquatic communities (macroinvertebrates; fish, frog, turtle; waterbird and aquatic flora communities)

- Background surface water quality characteristics, determined via analysis of baseline water quality data
- Evaluation of existing bank stability, and issues such as bank slumping along the watercourse
- Applicable environmental values (identified during baseline assessments), including:
 - Hydrological characteristics (flow, duration, periodicity, connectivity with groundwater systems)
 - Physio-chemical properties
 - Aquatic ecosystem parameters
 - Geomorphological features
- The findings of any relevant reports prepared by other governmental or professional research organisations that are related to the receiving environment
- Historic and/or baseline datasets that will be relied upon to inform the REMP assessments

1.2.3 Sources of potential discharges to the environment

The REMP shall provide details of the specific locations where releases of treated coal seam water to the Dawson River may occur. For example, ROP2, the existing pipeline outfall for discharges of reverse osmosis permeate (ROP); and ROP1, the release point for the existing Water Treatment Plant (WTP) at Pony Hills. Information provided in the REMP will include Global Positioning System (GPS) coordinates for each release point, and the direct receiving waters.

1.3 Monitoring methodology

Recommended methodologies for monitoring the receiving environment for the DRRS are outlined in the EA. Relevant information such as specific parameters to be monitored; frequency of monitoring, and techniques to be employed by field personnel when undertaking monitoring activities will be clearly outlined in the REMP. Table 1-2 includes a summary of the types of monitoring to be included.

Routine monitoring will be undertaken at a total of nine locations; including seven locations within the receiving environment, and two upstream background locations. Additionally, three permanent water quality monitoring stations will be installed within the Dawson River and receiving wetland environments.

Table 1-2 REMP monitoring for the GFD Project

Environmental value	Type of monitoring	Parameters	Methodology	Location type	Frequency
Aquatic ecosystems	Fish communities	Population samples from fixed wetland and/or watercourse monitoring locations	Method consistent with baseline assessment methodology	- Receiving environment - Background	Minimum of quarterly
	Turtle communities				
	Frog communities				
	Waterbird communities				
	Aquatic flora communities				
	Macroinvertebrates	Population samples – species richness and abundance (SIGNAL scoring)	AusRivAS biological assessment; consistent with baseline assessment methodology		
	Ecosystem health assessment	Assess availability of calcium and magnesium (e.g. exoskeleton density) for at least three local invertebrate species	Method consistent with baseline assessment methodology		
Surface water quality	Routine sampling of receiving waters	- In-situ physico-chemical: - Temperature, pH, electrical conductivity (EC), turbidity, dissolved oxygen (DO) - Visual monitoring for algal blooms	- ANZECC & ARMCA NZ 2000 guidelines - QWQG 2009	- Receiving environment - Background - At release point	Minimum of quarterly
	Event-based sampling of receiving waters	In-situ physico-chemical: Temperature, pH, electrical conductivity (EC), turbidity, dissolved oxygen (DO)		- Receiving environment - Background	Daily during release
		In-situ EC		At release point	Daily during release
		Laboratory analysis: - Total suspended solids (TSS) - Total nitrogen - Ammonia - Total and dissolved (field		- Selected receiving environment - Selected background	Weekly during release

Environmental value	Type of monitoring	Parameters	Methodology	Location type	Frequency
		filtered) metals: — Boron — Zinc			
		Laboratory analysis: • Hardness • Major anions and cations (Calcium, magnesium, potassium, sodium, chloride, sulphate) • Fluoride • Total and dissolved (field filtered) metals: — Al, As, B, Cd, Cr (VI), Cu, Fe, Pb, Mn, Hg, Ni, Se, Zn		At release point	Weekly during release
Hydrology	Automatic gauging and/or periodic observations Desktop analysis	• Stream flow (duration; periodicity) • Connectivity between surface water and groundwater systems	Method consistent with baseline assessment methodology; may include automatic sampling	Receiving environment	Continuous, at defined interval (e.g. hourly or daily)
Sediments	Sediment quality	• Heavy metals/metalloids	• AS/NZS 5667.1 Guidance on sampling of bottom sediments • Batley et al. (ANZECC & ARMCANZ 2000)	Receiving environment	Minimum of quarterly
Geomorphology	Physical/visual observations	• Bank stability and/or slumping • In-channel features • Floodplain features	Method consistent with baseline assessment methodology	Receiving environment	Minimum of quarterly

Monitoring frequencies will vary for different types of monitoring; however, REMP monitoring will be conducted on a regular basis at a frequency appropriate to the scope of environmental assessment. A key focus will be to design the monitoring program for the purpose of collecting sufficient data to derive site-specific reference values for the GFD Project where these are required. Monitoring frequency will be in accordance with the specific instructions scheduled in the relevant EA.

1.4 Reporting

The REMP will outline reporting requirements to be addressed prior to, during, and following GFD Project activities involving releases of coal seam water to the receiving environment. These requirements may include:

- Procedures for notification to the administering authority (EHP) in the event of a non-conformance with the EA conditions
- Procedures that will be followed to notify EHP of emergencies or incidents as defined in the EA
- Frequency and content of regular reporting for the various monitoring programs
- Record keeping, such as that for planned and unplanned releases to watercourses and procedures followed for each event
- Deadlines for development and submission of baseline assessment results to the relevant authority prior to commencement of releases
- Deadlines for completion of assessments of impacts on the environmental values relevant to the GFD Project, and submission of findings to the relevant authority
- Conditions under which site-specific reference values will be developed (for example, volume and quality of data required; time periods for data collection; parameters for which reference values will be developed, and methodologies that will be used to calculate the values)

The REMP will be maintained and certified by a suitably qualified person, and will contribute to an overall adaptive framework to address the potential impacts to environmental values.

1.5 Data management

Data collected in associated with the REMP will be managed in accordance with the Santos GLNG Environmental Data Management Plan (EDMP). Specific procedures for management of associated data will be outlined in the REMP, including interactions with existing Santos GLNG databases such as EQUIS or Historian.

2 References

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