Contents

Introduction 2
   The Gwydir River system 2
   Regulated and unregulated system flow trends 3
   Rainfall trends 4
   Water users in the valley 4

Water availability 7
   Current drought conditions 7
   Copeton Dam Storage 8
   Resource assessment 9

Water resource forecast 10
   Gwydir catchment- past 24 month rainfall 10
   Copeton Dam - past 24 month inflows/statistical inflows 11
   Weather forecast - 3 month BoM forecast 11
   Copeton Dam forecast 12

Annual operations 13
   Deliverability 13
   Scenarios 14
   Deliverability of ordered water 15

Critical Dates 16

Projects 16

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWD</td>
<td>Available Water Determination</td>
</tr>
<tr>
<td>BLR</td>
<td>Basic Landholder Rights</td>
</tr>
<tr>
<td>BoM</td>
<td>Bureau of Meteorology</td>
</tr>
<tr>
<td>CWAP</td>
<td>Critical Water Advisory Panel</td>
</tr>
<tr>
<td>CWTAG</td>
<td>Critical Water Technical Advisory Group</td>
</tr>
<tr>
<td>DPI CDI</td>
<td>Department of Primary Industries - Combined Drought Indicator</td>
</tr>
<tr>
<td>DPI EES</td>
<td>Department of Planning, Industry and Environment - Environment, Energy &amp; Science</td>
</tr>
<tr>
<td>DPI Fisheries</td>
<td>Department of Primary Industries - Fisheries</td>
</tr>
<tr>
<td>DPIE Water</td>
<td>Department of Planning, Industry and Environment - Water</td>
</tr>
<tr>
<td>FSL</td>
<td>Full Supply Level</td>
</tr>
<tr>
<td>HS</td>
<td>High Security</td>
</tr>
<tr>
<td>IRG</td>
<td>Incident Response Guide</td>
</tr>
<tr>
<td>ISEPP</td>
<td>Infrastructure State Environmental Planning Policy</td>
</tr>
<tr>
<td>LGA</td>
<td>Local Government Areas</td>
</tr>
<tr>
<td>ROSCCo</td>
<td>River Operations Stakeholder Consultation Committee</td>
</tr>
<tr>
<td>D&amp;S</td>
<td>Domestic and Stock</td>
</tr>
<tr>
<td>vTAG</td>
<td>Valley Technical Advisory Group</td>
</tr>
</tbody>
</table>
**Introduction**

This annual operations plan provides an outlook for the coming year in the Gwydir Valley. The plan considers the current volume of water in storage and weather forecasts. This plan may be updated as a result of significant changes to the water supply situation.

This year’s plan outlines WaterNSW’s response to the drought in the Gwydir Valley including:

- identification of critical dates,
- our operational response, and
- potential projects to mitigate the impact of the drought on customers and communities within the valley.

The NSW Department of Planning, Industry and Environment’s Extreme Events Policy and Incident Response Guides outline 4 stages of drought. The Gwydir regulated river system is assessed to be in stage 3, which is categorised as ‘drought/water shortage’.

**The Gwydir River system**

The Gwydir Valley is a highly productive rural region located in north-west New South Wales and is characterised by rich alluvial soils. The main watercourse is the Gwydir River, which has two main tributaries, the Mehi River and Carole Creek. The headwaters of the Gwydir River are west of Armidale and Guyra, on the New England Tablelands.

The Gwydir catchment is an inland terminal river network, or closed system as it is commonly referred to. Rivers within the Gwydir Valley diverge into a series of branching channels that distribute their flows across large areas, especially during flood times. Typically, water only reaches outside the valley, into the Barwon River during major flood events, with smaller flows discharged into the two main river channels - the Gingham and Lower Gwydir, which incorporate the Gwydir Wetlands.

Water for the environment is generally focused on the river and wetlands systems west of Moree, where the Gwydir River branches into two defined systems: the Gwydir Wetlands, consisting of both the Gingham Watercourse and Lower Gwydir (Big Leather) River; and the Mehi River, which includes the Mallowa and Moomin systems to the south.

Multiple tributaries enter the Gwydir River as it travels through the valley including:

- Halls Creek
- Myall Creek
- Horton River
The Gwydir River rises west of Armidale on the New England Tablelands in the Great Dividing Range, New South Wales. The river flows north-west through the steep valleys of the tablelands and down the north-western slopes of New South Wales. The valley widens into an almost completely flat alluvial floodplain near Pallamallawa, where the river flows slowly westward towards the Barwon River.

West of Moree, the Gwydir River diverges at the Gwydir Wetlands into the Gingham Watercourse and the lower Gwydir (or Big Leather) Watercourse. These watercourses flow into the Gwydir wetlands. The lower half of the catchment is characterised by numerous anabranches and effluents, the most significant being the Mehi River and Moomin Creek to the south, and the Carole–Gil Gil Creek system to the north. The latter creek system joins with the southern effluents of the Border Rivers. Several of the branching streams from the Gwydir enter the Barwon River between Collymongle and north of Collarenebri.

Regulated and unregulated system flow trends

The Gwydir River is regulated by a number of weirs and dams, most notable is Copeton Dam. Before regulation, the lower Gwydir catchment resembled an inland delta, with water inundating the floodplain and wetlands and only flowing through to the Barwon River in major floods.

Copeton Dam, 35 kilometres (km) south-west of Inverell, was built to supply water for town water supplies, irrigation, domestic and stock requirements, with a storage capacity of 1,364,000 megalitres (ML). Completed in 1973, the dam regulates 93% of inflows to the catchment.

A series of weirs and regulators assist the diversion of water to the various watercourses of the lower Gwydir catchment. The first of these is Tareelaroi Weir, about 18 kms east of Moree, which controls diversions to the Mehi River. Five other major structures are located on the Gwydir River downstream of Moree or on the Mehi River and Mallowa Creek, south-west of Moree.

The tablelands, where the river and its feeding streams rise on the tablelands, have an elevation of up to 1,200 metres (m). Lower, but still significant, ranges define the catchment, with the Mastermans Range in its north and the Nandewar Range, with remnant volcanoes, in the south. The wide western floodplains that cover much of the catchment have an elevation between 100 and 300 m.

The eastern half of the catchment has an annual average rainfall of 700-900 millimetres (mm). Average annual rainfall on the floodplains of the western portion, ranges from 450-550 mm. Rainfall throughout the catchment is summer dominant and the climate is described as sub-humid and sub-tropical.

The major groundwater aquifers in the Gwydir catchment are found in extensive unconsolidated alluvial sediments, associated with rivers and channels in the western half of the catchment. Groundwater is found in fractured rock of several types in the eastern part of the catchment. There is a relatively small seam of porous rock aquifers in the middle of the catchment, which yields water from the Great Artesian Basin lying deep below the catchment.

Land use is dominated by extensive grazing for cattle and sheep production, with lucerne and pasture grown on the narrow alluvial floodplains of the upper Gwydir River for grazing enterprises. Dryland cropping occurs predominantly on the plains. Wheat is the main crop, but a range of other cereals, legumes and oilseeds are also grown. Irrigated crops account for a small amount of land use (about 5%) but are a significant contributor to the regional economy, especially cotton growing and ginning.
Rainfall trends

For the period April 2017 to March 2019, the lowest-on-record rainfall was observed over southern inland Queensland and areas of northwestern New South Wales. Over most of this area, rainfall for the period was less than 50% of the 1961–1990 average.

Large areas from central to southwestern Queensland, and northcentral and northwestern New South Wales, into northeastern South Australia, have seen rainfall totals between 40% to 60% of this average, implying that nearly one year’s worth of average rainfall has been missed over this two-year period.

The recent dry periods have been especially severe during the cooler months of April to September, an important time for agriculture and the replenishment of surface and groundwater storages across southern Australia. Averaged over the Murray-Darling Basin (MDB), the total rainfall over two consecutive April to September periods was the lowest on record, at 217.5 mm. This is around 15% below the previous record, which saw 255.7 mm over the 1940–41 April to September period. It was also the only instance of an April to September rainfall total below 125 mm in two consecutive years.

Rainfall for the combined two-year 2017 and 2018 April to September period was the lowest on record and very much below average (lowest 10% of all such periods) for large parts of southeastern and southwestern Australia. Around 50% of New South Wales was lowest-on-record for these two periods combined.

The winter of 2019 again saw continuing dry conditions exist, which will mean three consecutive winters of below average rainfall.

Over the 24-month period, there has been a large decline in water resources in the northern half of the MDB.

Water users in the valley

Basic Land Holder Rights (BLR)

BLR includes water for Domestic and Stock extracted from a water source fronting a landholder’s property, or from any aquifer underlying the land, and for native title rights.

From 1 July 2004, the water requirements of holders of Domestic and Stock rights are estimated to be 6,000 megalitres per year (ML/year).

The water supply system shall be managed so that it would be capable of maintaining supply to those exercising Domestic and Stock rights through a repeat of the worst period of low inflows into this water source (based on historical flow information held by the Department as at 1 July 2004).

To ensure sufficient water is available for BLR, sufficient volumes of water must be set aside from assured inflows into the plan area and reserves held in Copeton Dam water storage.

The Minister for Water may issue an order under section 324 of the Water Management Act 2000 to restrict the exercise of Domestic and Stock basic rights from this water source to protect the environment, for reasons of public health, or to preserve basic landholder rights.

Domestic and Stock use

The share components of Domestic and Stock access licences authorised to take water from the Gwydir Regulated River water source are 2,824 ML/year.
Local Water Utilities

The share components of Local Water Utility access licences authorised to take water from the Gwydir Regulated River water source are 3,836 ML/year.

High Security

The share components of regulated river (High Security) access licences in the Gwydir Regulated River water source are 20,259 unit shares.

General Security

The share components of regulated river (General Security) access licences in the Gwydir Regulated River water source are 509,665 unit shares. Over the last decade, irrigators in the Gwydir Valley have received an annual allocation average of 29% (145,800 ML).

Supplementary Water access licences

The share components of Supplementary Water access licences authorised to take water from the Gwydir Regulated River water source are 181,398 unit shares.

Environmental Water

The Regulated River Gwydir Water Sharing Plan (WSP) establishes the following planned environmental water rules:

• Water availability is to be managed to ensure any water volume in excess of the long-term extraction limit is not being taken. By limiting long-term average annual extractions to an estimated 392,000 megalitres per year, the WSP ensures that approximately 66% of the long-term average annual flow in this water source (estimated to be 1,141,000 megalitres per year) will be preserved and will contribute to the maintenance of basic ecosystem health.

• The minimum flow passed through to the Gwydir wetlands is to be the lesser of:
  o the sum of flows in the Horton River at Rider, Myall Creek at Molroy, and Halls Creek at Bingara, plus any water spill or pre-release for flood mitigation purposes from Copeton Dam water storage, and
  o 500 megalitres per day.

• Whenever an available water determination for regulated river (General Security) access licences is made, the Environmental contingency allowance (ECA) account shall be credited with a volume equal to the lesser of:
  o 45,000 megalitres multiplied by the number of megalitres per unit share specified in that available water determination, and
  o 90,000 megalitres minus the volume currently in the account.

• Water in the ECA account may be released for any of the following purposes:
  o to support a colonially nesting native bird breeding event that has been initiated in the Gwydir wetlands following natural flood inundation
  o to provide additional inundation in the Gingham and Lower Gwydir Wetlands during or following periods of extended dry climatic conditions
  o to provide inundation of higher-level benches in the river reaches between Copeton Dam and the Gwydir River at Gravesend
to provide short-term inundation of the wetlands to promote germination of Hyacinth as part of a weed management strategy involving a wetting and drying cycle
- to provide flows for environmental purposes in effluent streams
- to support native fish populations and habitat
- to support invertebrates and other aquatic species
- to support threatened species
- to maintain aquatic ecosystem health.

Gwydir Unregulated and Alluvial access licenses (as per Water Sharing Plan for the Gwydir Unregulated and Alluvial Water Sources 2012)

Share components of Domestic and Stock access licences
- It is estimated that the share components of Domestic and Stock access licences authorised to extract water from Gwydir Unregulated and Alluvial water sources total 545.6 ML/year.

Share components of Local Water Utility access licences
- It is estimated that the share components of Local Water Utility access licences authorised to extract water from Gwydir Unregulated and Alluvial water sources total 817 ML/year.

Share components of Unregulated River access licences
- It is estimated that the share components of Unregulated River access licences authorised to extract water from Gwydir Unregulated and Alluvial water sources total 67,318 unit shares.

Share components of aquifer (High Security) access licences
- It is estimated that the share components of aquifer (High Security) access licences authorised to take water from the Upper Gwydir Alluvial Groundwater Source will total 1,115 unit shares.
**Water availability**

Water allocations in the Gwydir Regulated River water source for 2019-20, as of 1 July 2019:

- Local Water Utility and Domestic and Stock access licence holders on the Gwydir regulated river received an allocation of 100 percent of entitlement.
- High Security access licence holders received one megalitre per unit share of entitlement.
- General Security access licence holders did not receive an allocation at 1 July. These licence holders have access to general security account water carried over from the previous water year, subject to the actual volume of carryover for each individual account.
- Local Water Utility, Domestic and Stock, and Unregulated River access licence holders covered by the Gwydir unregulated and alluvial water sharing plan received an allocation of 100 percent or one megalitre per unit share of entitlement.
- Aquifer (High Security) access licence holders received one megalitre per unit share.
- Local Water Utility and Domestic and Stock licence holders, who access the Lower Gwydir groundwater source, received an allocation of 100 percent of entitlement.
- Aquifer access licence holders received an allocation of one megalitre per unit share of entitlement.
- Supplementary Water access licence holders on the Gwydir regulated river received an allocation of one megalitre per unit share of entitlement. Supplementary Water access licence holders may only divert water in accordance with announcements during declared supplementary access events.

**Current drought conditions**

The system continues to experience low inflows to both Copeton Dam and downstream tributaries. Over the last 10 years, good inflows occurred in three years: 2010-11, 2011-12 and 2016-17.

Extremely low inflows occurred in six years: 2009-10, 2013-16, and 2017-19. Over the last six years, the drought has caused a significant reduction in inflows to the valley with average inflows of 715,000 ML/year. This is lower than the long-term average of 800,000 ML/year.
The inflows for the 24 months (November 2017 to October 2019) were about 60,000 ML, which is almost half as much as the previous lowest record inflow of 115,000 ML over the 24-month period from November 1993 to October 1995.

As of 31 October, Copeton Dam is at 7.7% capacity with an active storage volume of 103,000 ML. Deliveries to town water and Domestic and Stock supplies are being maintained.

**Copeton Dam storage**

Over the last five years, Copeton Dam has only seen one major inflow event. During 2014-15, and 2015-16, the storage level hovered around 20%. In 2016-17, a wet winter and spring resulted in the dam filling to close to 60% by December 2016. While remaining at around 50% until summer of 2017, the dam’s storage levels since this time have continued to fall with very little inflows to replace releases made.

**Resource assessment**

The Resource Assessment is the process of calculating how much water is available based on the rules of the Water Sharing Plan (WSP). This is done at the end of the month and when any significant inflow event occurs.

The planning horizon for this resource assessment is 24-months. Taken into consideration is the volume of water held in storage, plus the expected minimum inflows.

As of 1 November 2019, the total amount of water available in Copeton Dam was 122,830 ML. Currently the total commitment is higher than the available resource and the shortfall is about 57,500 ML. Therefore, no additional allocation is possible at this time.

At the start of November 2019, the distribution of resources is:

- Storage loss 13,900 ML
- Essential Supplies (which includes Local Water Utility, High Security, Domestic and Stock) 53,400 ML
- Environmental Contingency Allowance 21,300 ML
- General Security 15,260 ML
Water resource forecast

Gwydir catchment - past 24-month rainfall

Over the last 24-months, the total rainfall across the Gwydir catchment was in the range of 400 mm to 1,200 mm, which is the lowest on record. The median annual rainfall across the Gwydir catchment is 600-1,000 mm per year.

Total NSW rainfall (mm) for 24 months - 1 November 2017 to 31 October 2019

NSW rainfall deciles for 24 months - 1 November 2017 to 31 October 2019
Copeton Dam - past 24-month inflows/statistical inflows

The inflows for last the 24-months were the lowest on record.

The last 24-months have seen only about 60,000 ML inflows occurring, which is almost half as much as the previous lowest record inflow of 115,000 ML over the same period from 1993 to 1995. When looking over a 12-month period, the last 12-months have seen only 19,100 ML inflows occurring, which is almost double as much as the lowest record inflow of 10,500 ML over the same time.

Copeton past 24-months cumulative inflow/statistical inflows

Three-month weather forecast

Forecasts from the Bureau of Meteorology (BoM) indicate a warmer and drier spring. BoM have indicated that the main influence on weather patterns across NSW at present is the positive Indian Ocean dipole, as sea surface temperatures in the Indian Ocean impact rainfall and temperature patterns over Australia. Cooler than average sea surface temperatures can provide less moisture for frontal systems and lows crossing Australia. Generally, this means there is less moisture than normal in the atmosphere to the northwest of Australia.

Rainfall is likely to be below average across most of the country during November and December. Daytime temperatures are very likely to be above average across Australia for the remainder of 2019 and into early 2020.

The strong positive Indian Ocean Dipole (IOD) is continuing to influence Australian climate, while a negative Southern Annular Mode (SAM) is also likely to affect the southern half of the country for the remainder of spring. Both these drivers typically bring warmer and drier conditions to much of the southern mainland during spring.

The figure opposite shows that there is a 40-55% probability of the Lachian Valley receiving above median rainfall during summer.
Copeton Dam forecast

While rainfall over spring is forecast to be below average, weather patterns can change - especially over summer where northern New South Wales can see increased rainfall with the northern monsoonal season.

The figure below demonstrates the behaviour of Copeton Dam under different inflow scenarios through to October 2021.

Under wet conditions (dark blue line) with 20th percentile inflows (meaning flows that are expected to exceed in only 2 years out of 10), the dam may reach 1,250,000 ML (90%) and spill by the end of October 2021.
Under median conditions (light blue line) with inflows expected to exceed 5 years out of 10, the storage is likely to exceed 50% capacity by April 2021.

A dry scenario (green line), where conditions are expected to exceed this inflow 8 years out of 10, would still see the storage improve to above 30% capacity by October 2021.

The forecast under a repeat of minimum inflow (grey) conditions indicates that Copeton Dam will remain below 10% of capacity through to October 2021.

While the short-term forecast is for dry conditions to continue through to summer, a change in weather patterns could see conditions improve quickly.

**Annual operations**

**Deliverability**

The following figure shows a depletion curve for Copeton Dam considering zero inflows to the dam, and zero downstream tributary flows.

It indicates that from August 2021, there will be cease-to-flow conditions from Copeton Dam as the dam reaches deep storage level.

While the use of the zero-inflow scenario is extremely conservative due to the very dry catchment and the significant depletion of soil moisture across the catchment, the use of this extreme scenario is justified.

**Notes**

The above forecast scenario is based on the end of October 2019 assessment and considers:

- No General Security irrigation supply from 1 July 2019 onwards.
- No delivery loss has been considered for Environmental Contingency Allowance (ECA) and General Security Environment License water delivery (dam wall debiting).
• Timing of General Security environment and ECA watering can change. In the above scenario, delivery of 2,000 ML in October 2019, 5,000 ML (4 ECA, 1 GS) in January 2020, 4,000 ML (3 ECA, 1 GS) in March is considered.

• 100% High Security licence water delivery considered for the year 2019-2020.

• Assumption of deep storage is 19,000 ML.

**Critical environmental needs**

The freshwater environment of the Gwydir Valley is comprised of a range of aquatic habitats, including extensive in-stream pools, small flood runners, anabranches, point gravel bars and terraces. Of particular importance for the riverine ecology of the Gwydir, are the in-channel structures such as terraces or benches on which debris or detrital material deposits accumulate during low flows.

WaterNSW, in partnership with NSW Department of Primary Industries - Fisheries and NSW Office of Environment and Heritage, will be identifying critical habitats along the Mehi, Corale and Gwydir Rivers and establishing a monitoring program to assess the health of these sites during the drought.

Based on the monitoring program results, water entering the Gwydir from downstream tributaries may be able to be used to protect the health of critical environmental habitat.

**Basic Landholder Rights and Domestic and Stock**

Under the Water Management Act 2000, extraction of water for BLR does not require a licence. Although, in the case of accessing groundwater under BLR the water supply work must still be approved. BLR includes water for Domestic and Stock purposes extracted from a water source fronting a landholder’s property or from any aquifer underlying the land.

**Scenarios**

Inflow scenarios and management outcomes:

1. **Major inflow event**
   
   More than 57,000 ML is required for General Security allocation. With low storage levels, there is still a shortfall to meet critical needs for the next 24-months, and to account for river deliveries and evaporation from the dam.

2. **Medium tributary inflows**
   
   Medium tributary flows may be protected to provide for critical human and environmental needs in the Gwydir Valley and/or in the Barwon-Darling depending upon the conditions downstream. If Town Water Supply and Domestic and Stock have not received flow for an extended period, flows may be protected through a Section 324 Order.

3. **Small tributary inflows**
   
   Small tributary flows will be used to meet critical needs including critical Environmental or Domestic and Stock use along the system. Depending upon the conditions in the downstream systems, water will be diverted to the system that is most at risk for critical human needs or environmental risk.
## Deliverability of ordered water

<table>
<thead>
<tr>
<th>River Section</th>
<th>Licence Category</th>
<th>Type of restriction</th>
<th>Period of applicability</th>
<th>Method of placing water order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gwydir Regulated River System</td>
<td>High Security</td>
<td>Releases from Copeton will be grouped together where possible (block releases), however delivery to all river sections is not guaranteed. Limited access may be available from existing river pools and/or tributary inflows. A water order is still required to be placed and needs to be approved by WaterNSW.</td>
<td>Until further notice</td>
<td>Only via customer help desk. Orders cannot be placed via iWAS. Confirmation of water order from WaterNSW is required.</td>
</tr>
<tr>
<td></td>
<td>Domestic and Stock</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Local Water Utility</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>General Security</td>
<td>Any releases from Copeton Dam for General Security licences will be grouped together. Due to there being no reserves for General Security delivery losses, the accounting point will be Copeton Dam. A water order is still required to be placed and needs to be approved by WaterNSW</td>
<td>Until further notice</td>
<td>iWAS and customer help desk.</td>
</tr>
<tr>
<td>(carry over allocations)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Replenishment Flow)</td>
<td>The next Thalaba Creek Replenishment Flow will be supplied by tributary inflows were possible. If sufficient tributary inflows do not occur before the end of 2019, releases from Copeton may be made.</td>
<td>Until further notice</td>
<td>Only via customer help desk. Confirmation of water order from WaterNSW is required.</td>
</tr>
<tr>
<td>Thalaba Creek Replenishment Flow</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Critical dates

1 JULY 2019: No General Security irrigation supply
1 NOVEMBER 2019: Environmental contingency allowance and General Security environmental water delivery
1 FEBRUARY 2020: Environmental contingency allowance water delivery
1 AUGUST 2021: Cease to flow conditions for Copeton – deep storage level

Note:
The above forecast critical dates are based on the end of October 2019 assessment, considering same assumptions in the above depletion curves.
Deep storage pumping is not considered, which may give some additional benefit in supplying critical water needs.

Projects

The following options can be considered as emergency response plans for drought management in Gwydir Valley:

1. pumping from Copeton Dam deep storage
2. using ground water as an alternative supply source
3. dam wall debiting for Environmental Contingency allowance and General Security water delivery.