Icon Water Limited

Murrumbidgee Ecological Monitoring Program
Observation Report – Autumn 2020
Impact Monitoring Round 3

May 2020

Table of contents

1. Introduction 3
   - 1.1 Background 3
   - 1.2 Adaptive management: changes to the MEMP 3
   - 1.3 Recent operation and MEMP program 4
   - 1.4 Purpose 4
2. Summary of autumn 2020 impact monitoring 5
   - 2.1 Monitoring site selection 5
   - 2.2 Burra Creek 12
   - 2.3 Murrumbidgee River (M2G) 14
   - 2.4 Murrumbidgee River (MPS) 17
3. Summary 20
   - 3.1 Overview of observed condition 20
   - 3.2 Potential concerns for Icon Water 21
4. References 22

Table index

Table 2-1 Sampling overviews 6

Table 2-2 Burra Creek monitoring sites 7

Table 2-3 Murrumbidgee River (M2G) monitoring sites 7

Table 2-4 Murrumbidgee River (MPS) monitoring sites 7

Table 2-5 *In-situ* water quality parameters in Burra Creek 13

Table 2-6 *In-situ* water quality parameters in the Murrumbidgee River (M2G) 15

Table 2-7 *In-situ* water quality parameters in the Murrumbidgee River (MPS) 18

Figure index

Figure 1 Monitoring site locations for the MEMP at Burra Creek 9

Figure 2 Monitoring site locations for the MEMP at Angle Crossing 10

Figure 3 Monitoring site locations for the MEMP at the Murrumbidgee Pump Station 11

Figure 4 Hydrograph for Burra Creek at the Burra Weir (410774) for the past 12 months 12

Figure 5 Hydrograph for the Murrumbidgee River Upstream of Angle Crossing (41001702) for the past 12 months 15

Figure 6 Hydrograph for the Murrumbidgee River Upstream of Mt. McDonald (410738) for the past 12 months 17

Plate Index

Plate 2-1 Photos of the Burra Creek macroinvertebrate sampling sites 13
Plate 2-2 Photos of quadrat surveys in Burra Creek showing composition of the substrate 14
Plate 2-3 Photos of the Murrumbidgee River (M2G) sampling sites 16
Plate 2-4 Photos of quadrat surveys in the Murrumbidgee River (M2G) 16
Plate 2-5 Photos of the Murrumbidgee River (MPS) sampling sites 19
Plate 2-6 Photos of quadrat surveys in the Murrumbidgee River (MPS) 19

1. Introduction

1.1 Background

The Murrumbidgee Ecological Monitoring Program (MEMP) has been supported by Icon Water to evaluate the potential impacts of water abstraction from the Murrumbidgee River and the influence of increased water volumes in Burra Creek. The MEMP was implemented prior to the commencement of the Murrumbidgee to Googong (M2G) and Murrumbidgee Pump Station (MPS) projects and has allowed Icon Water to collect pre-abstraction baseline data. This baseline data can be used in comparisons against post-abstraction data to investigate any changes to ecological communities due to the operation of M2G and MPS. The monitoring of several components of the aquatic ecosystem has generally occurred in autumn and spring each year since 2008 through to the most recent monitoring in autumn 2020.

1.2 Adaptive management: changes to the MEMP

Over the duration of the monitoring program there have been a number of changes and modifications in line with the adaptive management philosophy of the MEMP. During 2014 Icon Water commissioned a full independent review of the MEMP (Jacobs 2014). The review resulted in a number of recommendations to adapt the program so that Icon Water may continue to have a robust monitoring program, capable of detecting potential ecological impacts, while at the same time accounting for the lowered ecological risk during periods of standby and maintenance modes of operation. The program was adapted to modify the monitoring frequency, quantity and location of monitoring sites, and a rationalisation of macroinvertebrate and periphyton sampling methods.

Three modes of operation were defined for the M2G and MPS to help target the monitoring program. These are defined for the **M2G** as:

- **Suspension:** parts of the system may be decommissioned requiring lead time before start up. No water can be transferred.
- **Standby:** ready to run, all components in place and being operated routinely for maintenance purposes.
- **Operating:** operating and transferring to increase Googong reservoir storage levels.

For the **MPS,** the modes of operation are defined as:

- **Standby:** abstraction from the Murrumbidgee River is not occurring. Ready to run, all components in place and being operated routinely for maintenance purposes.
- **Recirculating Pump Operation:** flow up to 40 ML/d transferred to the base of the Cotter Dam to provide environmental flows to the lower Cotter River. Water to the Cotter River re-enters the Murrumbidgee River just upstream of the MPS.
- **Operating (full pump):** abstraction of up to 150 ML/d of water for raw water supply to Stromlo Water Treatment Plant for greater than 30 consecutive days. While this is the maximum capacity of the Murrumbidgee Pump Station, this extraction volume rarely occurs due to water quality in the Murrumbidgee River. Hence, smaller volumes are likely to be taken and shandied with cleaner Cotter River water from the Bendora Gravity Main.

During periods of standby, the risk from the operation of M2G and MPS to the ecological condition of the Murrumbidgee River and Burra Creek is minimal. Alternatively, it is anticipated that any risks to the Murrumbidgee River and Burra Creek are most likely to manifest during periods of full operation.

With this in mind, the revised MEMP adopts a two-stage approach which incorporates **sentinel** monitoring during standby modes and **impact** monitoring during the various operation modes. These two types of monitoring are described in sections 1.2.1 and 1.2.2 respectively.

1.2.1 Sentinel monitoring

The purpose of the sentinel monitoring is to understand if major catchment-scale changes to the aquatic ecology are taking place. Sentinel monitoring will occur during standby periods when the risk to the ecosystem due to maintenance water transfers is deemed to be very low. Sentinel monitoring will occur in autumn and spring every three years which begun in autumn 2015 with a reduced number of monitoring sites (1 upstream and 1 downstream of Angle Crossing (M2G); Burra Creek discharge structure (M2G) and at the Murrumbidgee Pump Station (MPS)). Periphyton sampling is not required in the sentinel monitoring and qualitative methods, such as photogrammetry and AUSRIVAS habitat assessments, are used to track the conditions of these sites on a broad spatial and temporal scale. Under this scenario, testing of hypotheses and targeted monitoring are not required.

1.2.2 Impact monitoring

The trigger for impact monitoring is the decision to operate the M2G or MPS infrastructure. This monitoring scenario requires a before and after approach, and relies on replicated sampling protocols. Under this monitoring protocol, several univariate indicators of river health and condition will be compared before and after the operation period at both upstream and downstream locations. Periphyton will be assessed during both time periods and compared between monitoring locations. The key difference between this and the sentinel monitoring is the number of sites, replicates and sampling events (impact monitoring requires at least one before and one after sampling event) and the level of detail used in the analysis.

Following the operation period, consecutive autumn and spring impact monitoring must also be carried out; and should pumping occur across an autumn and/or spring period, sampling will be carried out during those times.

1.3 Recent operation and MEMP program

The decision to transition to operation mode triggered impact monitoring in autumn and spring 2019. Impact monitoring will be conducted using the methods and protocols described above in Section 1.2.2.

Since the MEMP program review in 2014, autumn 2019 has been the first round of impact monitoring (for the M2G component only), and subsequently in spring 2019 and autumn 2020 (for both the M2G and MPS components).

1.4 Purpose

The purpose of this report is to:

a) provide a summary of the sampling conditions in Burra Creek and Murrumbidgee River during the autumn 2020 impact assessment monitoring; and

b) provide an early communication of any potential concerns to Icon Water prior to the completion of the full technical report.

A full technical report covering the findings of the autumn and spring 2019 is in preparation. A further before/after technical report will be prepared once the spring 2020 monitoring has occurred. These reports will consolidate results and provide recommendations for future monitoring with consideration given to the historical dataset (pre-operational impact monitoring – (autumn 2019, spring 2019) and sentinel monitoring (2015-2018).

2. Summary of autumn 2020 impact monitoring

Autumn monitoring for M2G was conducted between the 2nd and 4th of April 2020. Over the three days, the weather conditions were variable; with temperature ranging between 10-20°C, and rainfall recorded as 1.4 mm, 20 mm, and 8.2 mm each day respectively (recorded at Canberra Airport; BoM, 2020). Sampling for MPS occurred on the 4th April 2020; temperature ranging between 12 – 16°C and 8.2 mm of rainfall.

Sampling during autumn involved the collection of macroinvertebrate samples, water quality grab samples, estimates of the periphyton coverage in the benthic environment and photogrammetry of vegetation and geomorphological features. A summary of the sampling conducted in autumn 2020 is shown in Table 2-1.

The assessment of periphyton cover using cover estimates and photography of quadrats was not possible during the autumn 2020 sampling due to poor water clarity. Despite using underwater cameras and specialist equipment, the combined conditions of elevated turbidity and sediment deposits on substrates meant that this method was not possible in field conditions. A modified approach was applied, using a reach based assessment of periphyton cover, based on observations across the channel, and representative photographs. This alternate method provided a somewhat more subjective assessment, however this will still allow for a qualitative comparison of significant ecological changes.

It was apparent from considerable ash, silt and burnt debris deposits that the impacts of fires in the catchment was a major factor impacting the environmental condition of the Murrumbidgee River beyond the directly impacted areas, especially, water clarity, suspended organic material, and cover of silt.

2.1 Monitoring site selection

Changes to the locations of the monitoring sites on the Murrumbidgee River and three sites on Burra Creek were necessary to accommodate access issues and address Program review recommendations (Jacobs 2014). These changes are summarised in Table 2-2, Table 2-3 and Table 2-4 and monitoring site locations are shown in Figure 1, Figure 2 and Figure 3.

2.1.1 M2G sites

The Murrumbidgee River and Burra Creek were surveyed for potential monitoring sites in spring 2019 to locate suitable sites located closer to the abstraction and discharge points. Suitable sites were identified and sampled in the Murrumbidgee River upstream and downstream of the abstraction point at Angle Crossing, in spring 2019 and autumn 2020, for the M2G component.

The identification of new Burra Creek sites was challenging due to restricted access by landholders and safe access. Furthermore, due to drought conditions in spring 2019, the Creek was almost dry which made riffle and / or edge sampling impractical and inconsistent with the AUSRIVAS protocols.

The second downstream site was located close to Williamsdale Road (known as BUR 2) and the upstream site near the bridge where Burra Road crosses the Creek further south (known as BUR 1d). Previous monitoring site BUR 1c is no longer accessible, so an alternate site located on Burra Creek upstream was located 50 m upstream of the of M2G discharge location (BUR 1d).

2.1.2 MPS sites

Prior to spring 2019 sampling, Icon Water and GHD staff walked upstream of the Murrumbidgee Pump Station for approximately 1 km, attempting to locate an additional upstream site closer to the existing site (MUR28). There were no other suitable sites upstream of the MPS, but an additional site was found downstream.

Although a second site was not found upstream, additional riffle habitat was found at MUR28 downstream of the Cotter River confluence, but upstream of the MPS. Therefore the current configuration of the MPS includes:

- two sites downstream of the MPS (MUR 935 and MUR 936)
- one site upstream of the MPS (MUR 28) which includes two riffle samples collected upstream of the Cotter River confluence (MUR 28down), and two riffle samples upstream of the MPS and Cotter River confluence (MUR 28up).

It should be noted that the additional riffles samples may be temporary and only accessible during low flows.

Table 2-1 Sampling overviews

Site	Macroinvertebrates	Water Quality Grab Sample	Periphyton	Geomorphology	Riparian Vegetation
Burra Creek (M2G)					
BUR 1b	2 replicate edge samples	Collected – submitted to ALS for analysis	-	-	-
BUR 1c	**Site removed from program – site not accessible.**				
BUR 1d	2 replicate edge samples	Collected – submitted to ALS for analysis	-	-	-
BUR 2	2 replicate edge samples	Collected – submitted to ALS for analysis	-	4 Photo points	4 Photo points
BUR 2a	2 replicate edge samples	Collected – submitted to ALS for analysis	Representative photos taken & qualitative estimates of reach	4 Photo points	-
BUR 1a	-	-	-	3 Photo Points	-
BUR 2c	-	-	-	4 Photo points	4 Photo points
D/S Pool 29	-	-	-	3 Photo points	3 Photo points
Murrumbidgee River (M2G)					
MUR 17	2 replicate riffle samples	Collected – submitted to ALS for analysis	Representative photos taken & qualitative estimates of reach	-	-
MUR 18	2 replicate riffle samples	Collected – submitted to ALS for analysis	Representative photos taken & qualitative estimates of reach	-	-
MUR 19	2 replicate riffle samples	Collected – submitted to ALS for analysis	Representative photos taken & qualitative estimates of reach	5 Photo Points	-
MUR 20	2 replicate riffle samples	Collected – submitted to ALS for analysis	Representative photos taken & qualitative estimates of reach	-	-
Murrumbidgee River (MPS)					
MUR 28 up	2 replicate riffle samples	Collected – submitted to ALS for analysis	Representative photos taken & qualitative estimates of reach	-	-
MUR 28 down	2 replicate riffle samples	Collected – submitted to ALS for analysis	Representative photos taken & qualitative estimates of reach	-	-

Site	Macroinvertebrates	Water Quality Grab Sample	Periphyton	Geomorphology	Riparian Vegetation
MUR 935	2 replicate riffle samples	Collected – submitted to ALS for analysis	Representative photos taken & qualitative estimates of reach	-	-
MUR 936	2 replicate riffle samples	Collected – submitted to ALS for analysis	Representative photos taken & qualitative estimates of reach	-	-

Table 2-2 Burra Creek monitoring sites

Site	Location	Lat.	Long.	Notes
BUR 1b	~ 4 km upstream of Williamsdale Rd bridge	-35.597536	149.227023	Second upstream site added to meet requirements for the impact monitoring
BUR 1d	~ 50 m upstream of Williamsdale Rd bridge	-35.555963	149.222150	Replaces BUR 1c as access is no longer available
BUR 2	~ 100 m downstream of Williamsdale Rd bridge	-35.555531	149.223118	Second downstream site to meet the requirements for impact monitoring
BUR 2a	~ 400 m downstream of Williamsdale Rd bridge	-35.553320	149.225228	Existing site

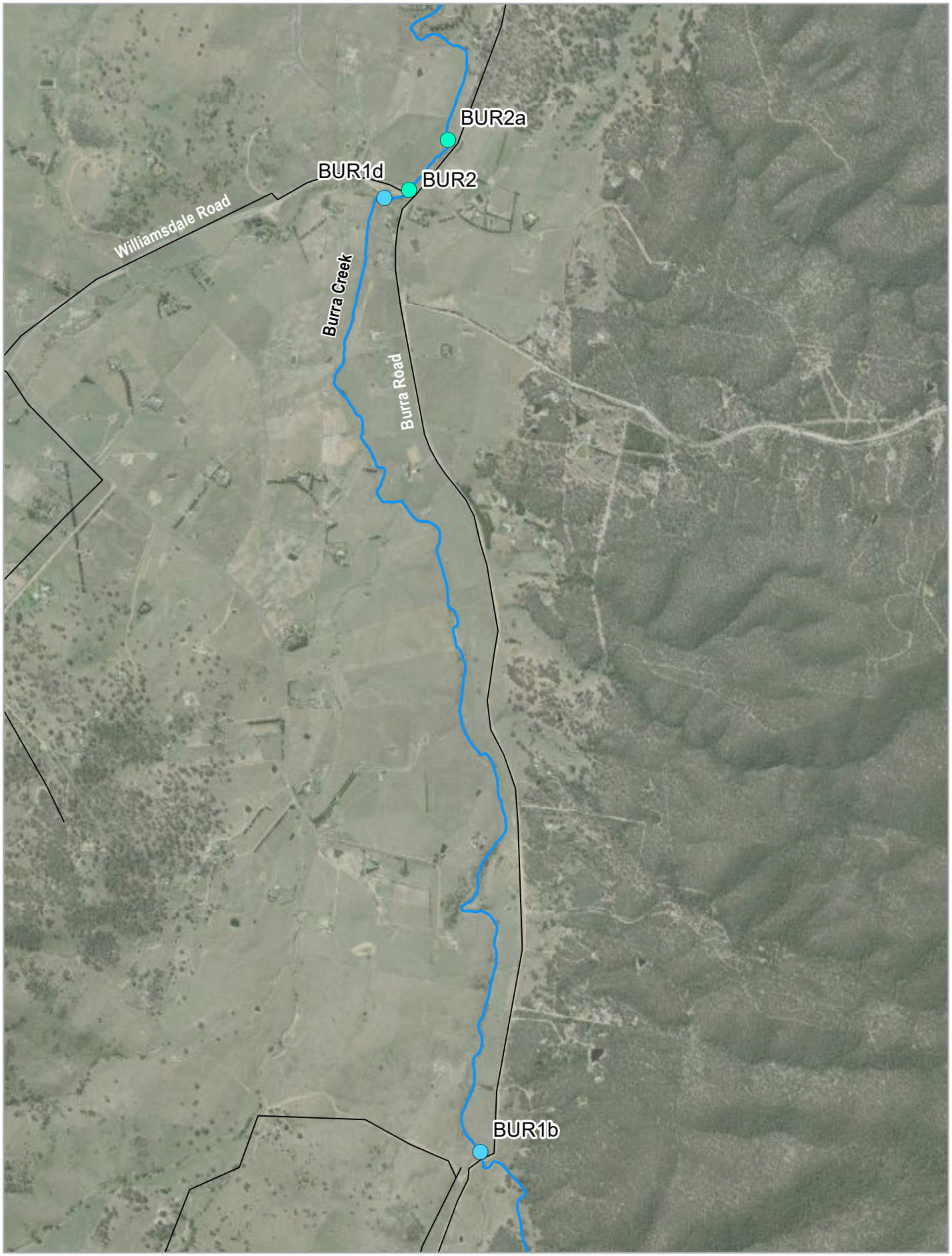
Table 2-3 Murrumbidgee River (M2G) monitoring sites

Site	Location	Lat.	Long.	Notes
MUR 17	~950 m upstream of Angle Crossing	-35.586453	149.112817	Second upstream site selected for impact monitoring. Might not be possible to sample this site during higher flow periods.
MUR 18	~600 m upstream of Angle Crossing	-35.587394	149.110067	Same as sentinel monitoring site
MUR 19	Immediately downstream of Angle Crossing	-35.582850	149.109812	Same as sentinel monitoring site
MUR 20	~400 m downstream of Angle Crossing	-35.580979	149.111303	Second downstream site selected for impact monitoring. Might not be possible to sample this site during higher flow periods.

Table 2-4 Murrumbidgee River (MPS) monitoring sites

Site	Location	Lat.	Long.	Notes
MUR28up	~300 m upstream of MPS	-35.324699	148.950417	Same as sentinel monitoring site
MUR28down	~150 m upstream of MPS	-35.32377	148.950129	Second upstream riffle (site) selected for impact monitoring. Might not be possible to sample this site during higher flow periods.

Site	Location	Lat.	Long.	Notes
MUR 935	~350 m downstream of MPS	-35.319633	148.951397	Same as sentinel monitoring site
MUR 936	~1200 m downstream of MPS	-35.317535	148.961213	Second downstream site selected for impact monitoring. Might not be possible to sample this site during higher flow periods.



Paper Size ISO A4

0 0.2 0.4 0.6 0.8

Kilometers

Map Projection: Mercator Auxiliary Sphere
Horizontal Datum: WGS 1984
Grid: WGS 1984 Web Mercator Auxiliary Sphere

N

GHD

Icon Water
Murrumbidgee Ecological Monitoring Program

Murrumbidgee to Googong Impact Monitoring Sites

Project No. **2316216**
Revision No. 1 **-**
Date **15/05/2019**

FIGURE 1

G:\23\16216\GIS\Maps\Working\Burra Creek.mxd
Print date: 15 May 2019 - 13:53

Data source: . Created by: pjtaylor

Paper Size ISO A4

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Kilometers

Map Projection: Mercator Auxiliary Sphere
Horizontal Datum: WGS 1984
Grid: WGS 1984 Web Mercator Auxiliary Sphere

N

GHD

Icon Water
Murrumbidgee Ecological Monitoring Program

Murrumbidgee to Googong Impact Monitoring Sites

Project No. 2316216
Revision No. **1**
Date **15/05/2019**

FIGURE 2

G:\23\16216\GIS\Maps\Working\Angle Crossing.mxd
Print date: 15 May 2019 - 12:23

Data source: . Created by: pjtaylor

MUR936

Murrumbidgee River

MUR935

MPS

MUR28down

MUR28up

Cotter River

Paper Size ISO A4

0 0.07 0.14 0.21 0.28

Kilometers

Map Projection: Mercator Auxiliary Sphere
Horizontal Datum: WGS 1984
Grid: WGS 1984 Web Mercator Auxiliary Sphere

N

GHD

Icon Water
Murrumbidgee Ecological Monitoring Program

Murrumbidgee Pump Station Impact Monitoring Sites

Project No. 2316216
Revision No. 1
Date **15/05/2019**

FIGURE 3

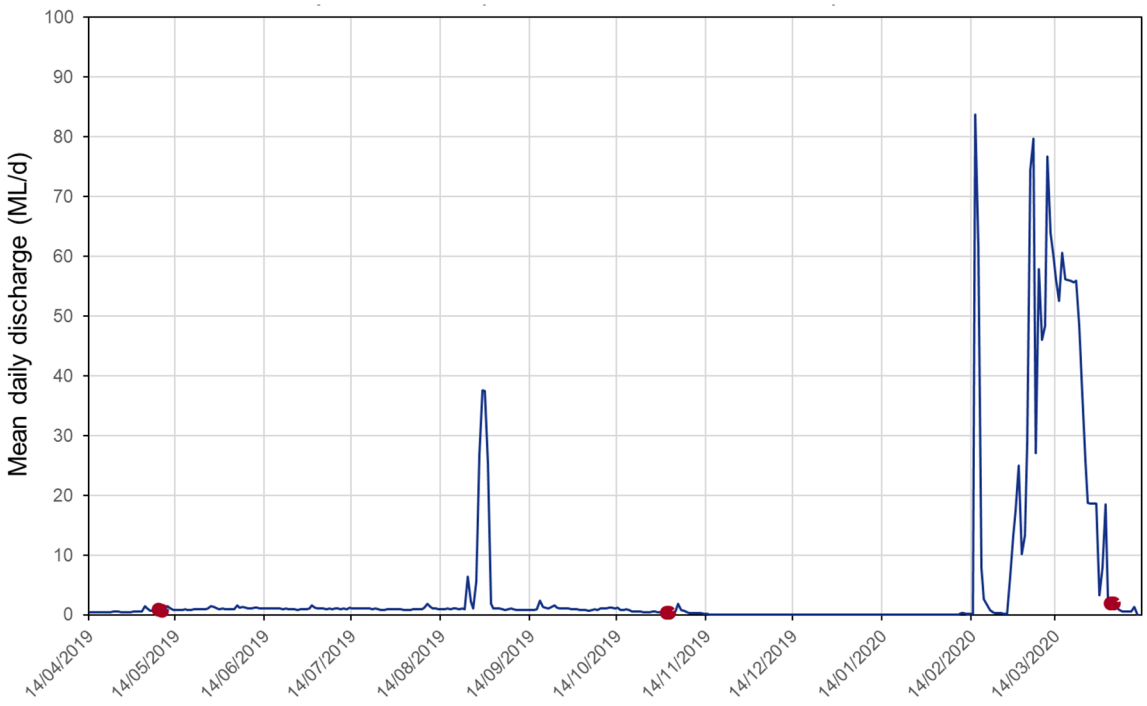
G:\23\16216\GIS\Maps\Working\MPS_updates.mxd
Print date: 21 Nov 2019 - 14:58

Data source: . Created by: pjtaylor

2.2 Burra Creek

There was no water being discharged from M2G at the time of sampling in autumn 2020. Mean daily flow in Burra Creek measured at Burra Weir gauging station was 1.81 ML/d on the two days which autumn 2020 sampling occurred (Figure 4). These readings represent a significant increase in flow since the spring 2019 sampling (0.391 ML/d), and autumn 2019 (0.746 ML/d).

There were a number of rainfall events in autumn; the most significant at the start of March (72.4 mm, 4th - 6th March) and start of April (29.6 mm, 3rd - 5th April) during the sampling period. The rainfall in the weeks preceding the autumn sampling is likely to have contributed to higher streamflow across the region, although there was no indication that water levels in the Creek had risen notably in the days preceding or during the sampling. However, there were indications that the stream flow had declined by approximately 0.3 - 0.5 m in previous weeks, based on stranded organic litter and vegetation observed on the stream banks.



Note: the red point indicates when sampling was conducted

Figure 4 Hydrograph for Burra Creek at the Burra Weir (410774) for the past 12 months

The channel contained beds of dense macrophyte growth (*Typha* spp., *Phragmites australis,* and Great Bulrush (*Schoenoplectus validus*)) and there was no riffle habitat at any of the monitoring sites, meaning that riffle samples were not collected.

In making comparisons with the historical water quality records during similar flow conditions, the *in situ* water quality results from autumn 2020 does not show anything outside of the normal (historical) range for all parameters.

In terms of upstream / downstream comparisons, all other parameters recorded slight fluctuations within historic ranges. A slight increase in turbidity was observed at sites further downstream, however the increase likely has negligible ecological significance and is most likely to be due to various sources of catchment runoff.

Table 2-5 *In-situ* water quality parameters in Burra Creek

Site	Date	Time	Location	Temp. (°C)	EC (µS/cm)	pH	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	Turbidity (NTU)	Alkalinity (mg/l)
BUR1b	3/04/2020	1130	Upstream	13.6	342	7.3	5.8	57	8.5	200
BUR1d	3/04/2020	0830	Upstream	14.7	439	7.6	5.3	54	9.5	200
BUR2	3/04/2020	0900	Downstream	14.8	434	7.4	5.3	54	10	200
BUR2a	3/04/2020	1000	Downstream	15.8	406	7.4	5.5	56	13	180

Plate 2-1 Photos of the Burra Creek macroinvertebrate sampling sites

Plate 2-2 Photos of quadrat surveys in Burra Creek showing composition of the substrate

2.3 Murrumbidgee River (M2G)

The Murrumbidgee River, like Burra Creek, had been experiencing a significant period of low flow, and steady decrease over the past year up until high flow events in February 2020, which resulted in two major peaks in flow (Figure 5).

Average flow in the Murrumbidgee River in autumn 2020 was 101.2 ML/d, which was slightly higher than autumn 2019 when the average daily flow was 97.2 ML/d. Flow at Angle Crossing on the days of sampling were 39.8 ML/d (3/4/2020) and 48.2 ML/d (4/4/2020).

As per the requirements of the impact monitoring, two replicate riffle samples were collected from each site.

Algae growth and periphyton cover were classified as 35 - 65% cover at all sites, which is an increase from 10% cover assessed in spring 2019. This is likely due to an increase in growth over the summer period. It is worth noting that the poor water clarity, silt deposition made the autumn 2020 assessment of periphyton cover difficult.

In situ water quality in the Murrumbidgee River were mostly within the ANZECC & ARMCANZ (2000) guidelines (Table 2-6), except for pH (all sites) and dissolved oxygen, which was outside the 90-100% saturation range. Compared to previous monitoring data, electrical conductivity was higher and dissolved oxygen saturation was lower. These differences are likely due to catchment wide differences, potentially related to runoff from bushfire impacted regions.

There were no notable differences in water quality parameters between upstream and downstream sites.

Table 2-6 *In-situ* water quality parameters in the Murrumbidgee River (M2G)

Site	Date	Time	Location	Temp. (°C)	EC (µS/cm)	pH	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	Turbidity (NTU)	Alkalinity (mg/L)
MUR17	4/04/2020	0930	Upstream	17.3	249	8.3	5.8	61	22	140
MUR18	3/04/2020	1140	Upstream	18.5	243	7.7	6.7	70	25	140
MUR19	3/04/2020	1430	Downstream	18	248	8.2	6.8	72	22	140
MUR20	3/04/2020	1300	Downstream	18.1	248	8	6.7	69	25	140

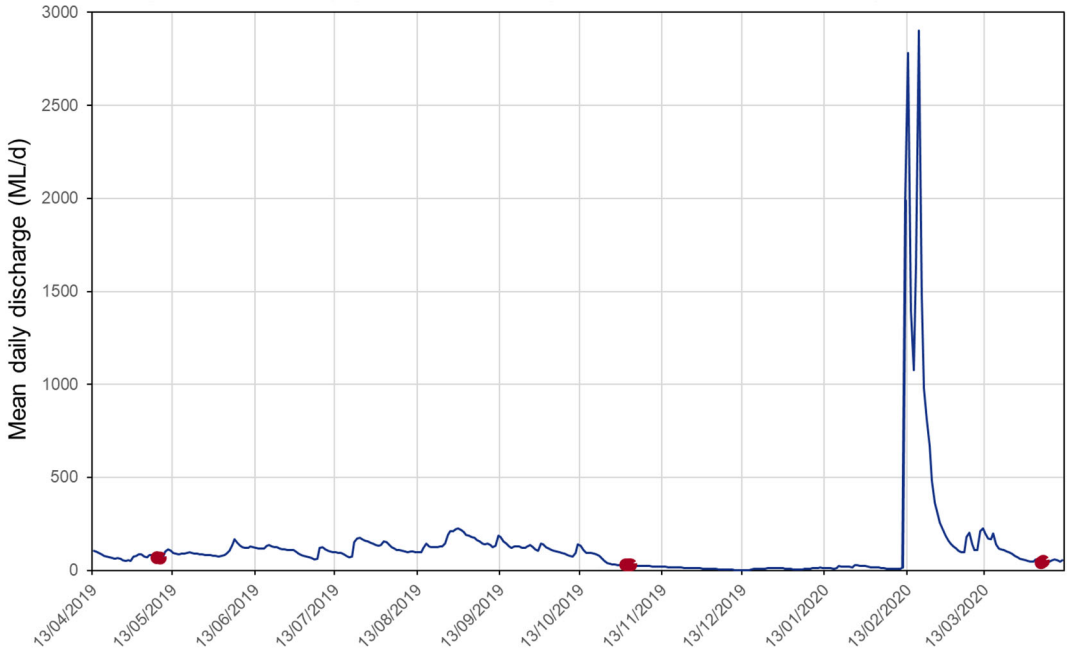


Figure 5 Hydrograph for the Murrumbidgee River Upstream of Angle Crossing (41001702) for the past 12 months

Plate 2-3 Photos of the Murrumbidgee River (M2G) sampling sites

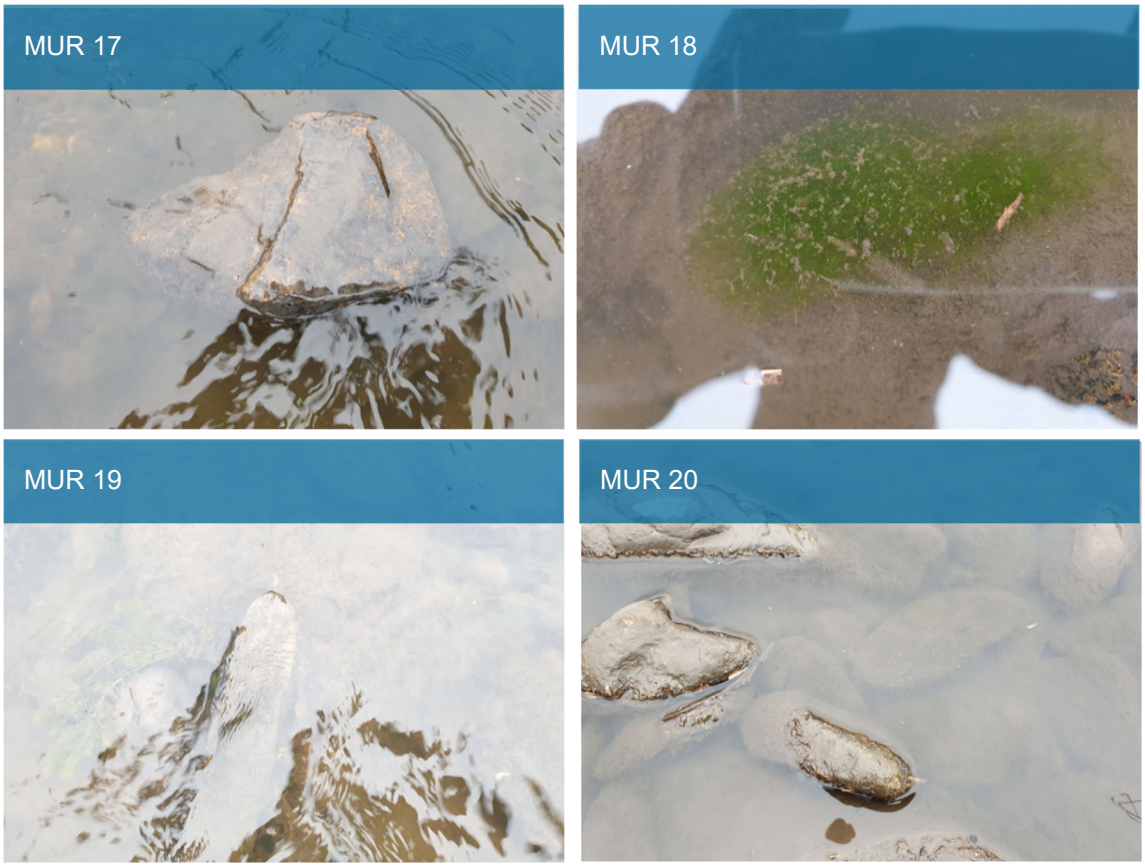


Plate 2-4 Photos of quadrat surveys in the Murrumbidgee River (M2G)

2.4 Murrumbidgee River (MPS)

River flow in this section of the Murrumbidgee River had been experiencing a significant period of low flow over the past year up until high flow events in February 2020, which resulted in two major peaks in flow (Figure 6). Average flow recorded at Mt. McDonald was 359.3 ML/d on the day of sampling, which was significantly higher than 38 ML/d in spring 2019, this is likely due to recent rainfall.

As per the requirements of the impact monitoring, two replicate riffle samples were collected from each site.

It should be noted that MUR28 is considered to be one site and has been split into an upstream section (upstream of the Cotter River confluence) and a downstream section (downstream of the Cotter River confluence) (Table 2-4; Figure 3), because a second site upstream of the pump station was not located.

Algae growth and periphyton cover were classified as 35 - 65% cover at all sites, which is an increase from 10% cover assessed in spring 2019. It is worth noting that the poor water clarity and silt deposition across all substrates made the autumn 2020 assessment of periphyton cover difficult. The only submerged macrophyte species was *Myriophyllum* spp.

Conductivity, pH, turbidity, and dissolved oxygen saturation *In situ* water quality parameters were recorded outside the ANZECC & ARMCANZ (2000) guidelines (Table 2-7). pH was consistently high across all sites, whereas conductivity recorded a notable decrease at MUR936, most likely attributable to the inflows from Cotter River immediately upstream of this site. Dissolved oxygen saturation was low at all sites (three outside guidelines), and turbidly samples were consistently higher with only MUR28up exceeding guidelines.

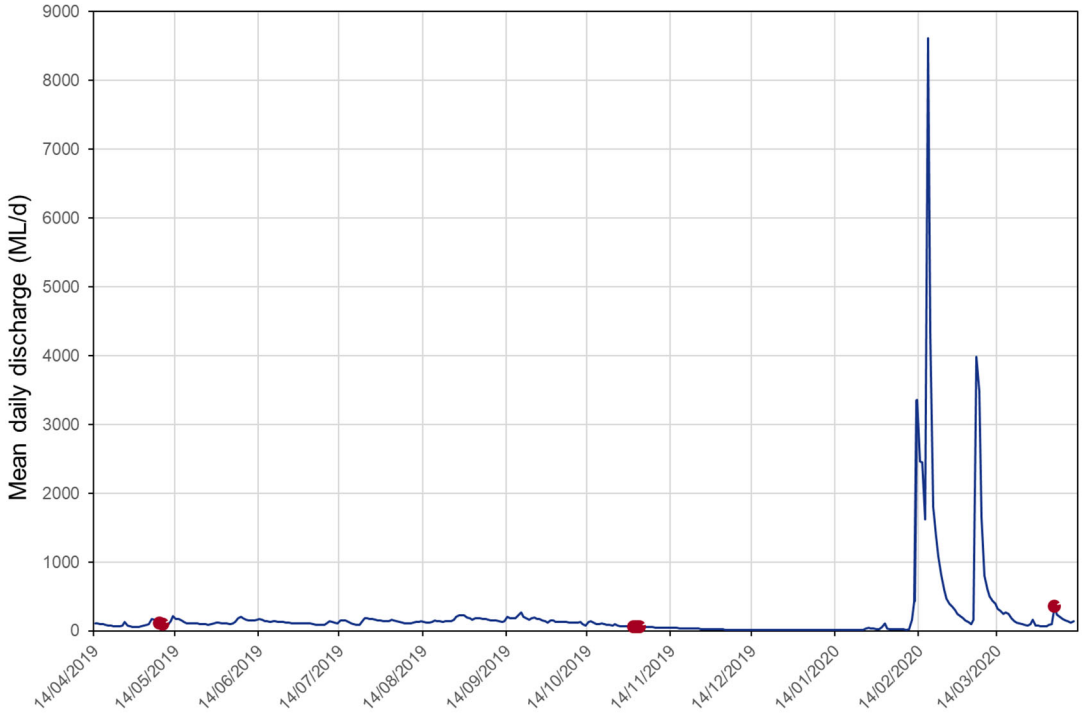


Figure 6 Hydrograph for the Murrumbidgee River Upstream of Mt. McDonald (410738) for the past 12 months

Table 2-7 *In-situ* water quality parameters in the Murrumbidgee River (MPS)

Site	Date	Time	Location	Temp. (°C)	EC (µS/cm)	pH	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	Turbidity (NTU)	Alkalinity (mg/L)
MUR28up	4/04/2020	1430	Upstream	18.9	303	8.7	8.2	88	25.2	120
MUR28down	4/04/2020	1330	Upstream	18.4	187	8.5	8.2	87	25	120
MUR935	4/04/2020	1615	Downstream	19.7	271	8.8	8.1	89	23.2	140
MUR936	4/04/2020	1700	Downstream	19.2	25.4	8.8	8.3	90	18.9	140

Plate 2-5 Photos of the Murrumbidgee River (MPS) sampling sites

Plate 2-6 Photos of quadrat surveys in the Murrumbidgee River (MPS)

3. Summary

The objectives of the impact monitoring are to "*demonstrate whether current operational mitigation rules are effective in not degrading river health".* To this end, hypotheses have been developed and will be tested using this modified monitoring program design. These hypotheses are:

H1a. *Flow abstraction will not result in the deterioration of the macroinvertebrate community (measured using biological indices) at sites downstream of the abstraction point (Angle Crossing for M2G and downstream of MPS) relative to sites upstream, informed by prevailing conditions in the broader region*

H1b: *Flow discharge to Burra Creek will not result in the deterioration of the macroinvertebrate community (measured using biological indices) at sites downstream of the inflow relative to sites upstream of the abstraction point, and informed by prevailing conditions in the broader region.*

H2a: *Flow abstraction in the Murrumbidgee River will not result in the development of increased periphyton to the extent that it impacts on the quality of the riffle habitat at sites downstream of the abstraction point (Angle Crossing for M2G and downstream of MPS) compared to sites upstream of the abstraction point, and informed by prevailing conditions in the broader region*

H2b: *Flow discharge into Burra Creek will not result in the development of increased periphyton to the extent that it impacts on the quality of the riffle habitat at sites downstream of the abstraction point (Angle Crossing) compared to sites upstream of the abstraction point, and informed by prevailing conditions in the broader region.*

H3a: *Flow transfer to Burra Creek will not result in bank erosion that is beyond that currently occurring in response to natural high flow events.*

H3b: *Flow discharge to Burra Creek will not result in changes in macrophyte or riparian vegetation that is beyond that currently occurring in response to natural high flow events.*

The operation of M2G and MPS triggers impact monitoring in which GHD will provide an impact report at the conclusion of the spring (2020) sampling period, where these hypotheses will be addressed using biological data and suitable metrics. Of note, this period of monitoring represents the first operational condition, so the focus will be on describing and comparing the condition to baseline data (autumn/spring 2019). The impact report will analyse and present the results of AUSRIVAS and other biological indices, including periphyton and water quality.

3.1 Overview of observed condition

In most aspects of river condition observed, the physical and ecological condition of the sites observed in autumn 2020 was similar to previous monitoring events. Importantly, there were no obvious differences in the water quality, substrate composition or flows between upstream and downstream locations during this round of impact monitoring, noting that water was not observed to be flowing from the discharge point at the time of monitoring.

The most notable difference observed from the autumn 2020 monitoring was deposits of coarse particulate organic material (CPOM) and fine particulate organic material (FPOM) and other debris and materials from bushfire affected regions, and poor water clarity at all sites in the Murrumbidgee River. Even though the runoff is likely to have entered the river during the heavy rain events in February 2020, the impacts on water clarity and silt layer over river bed substrates was obvious. At the time of autumn sampling, these impacts affected visibility of the substrate, which limited the ability to take photographs and conduct assessment of periphyton in quadrats. Note that the example photographs of periphyton included in this report were taken from still flowing areas in the littoral zone where water clarity was increased compared to the broader reach.

3.2 Potential concerns for Icon Water

The results from the autumn 2020 sampling and preliminary comparisons to previous sampling events suggests the following:

- There were **no** notable impacts observed during the autumn 2020 field sampling, which suggested that there were no major impacts from M2G or MPS operation.
- The field assessment found **no** obvious bank instability or erosion in Burra Creek associated with the M2G or MPS operation.
- There were **no** obvious impacts on riparian or instream vegetation in Burra Creek associated with the M2G or MPS operation.
- There were **no** major impacts on waterway condition or periphyton in riffle habitat in the Murrumbidgee River associated with the M2G or MPS operation.
- Preliminary analysis of *in situ* water quality reveals only **minor differences** from previous monitoring results, apart from the water clarity and siltation attributable to bushfire runoff noted previously.

4. References

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GHD

Level 7, 16 Marcus Clarke Street
Canberra ACT 2601
T: 61 2 6113 3200 F: 61 2 6113 3299 E: cbrmail@ghd.com

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